

University of
South Australia

Associations between age, executive function, health literacy, values and health behaviour of men during emerging and young adulthood.

Elena M. Rudnik

Bachelor of Arts Degree; Masters Degree in Grief and Palliative Counselling

(University of Adelaide**)**

This thesis is presented in fulfillment of the requirements

for the award of the

Degree of Doctor of Philosophy

School of Psychology, Social Work and Social Policy

University of South Australia

2012

Associations between age, executive function, health literacy, values and health behaviour of men during emerging and young adulthood.

CERTIFICATION

I, ELENA M RUDNIK, declare that this thesis, submitted in fulfillment of the requirement for the award of Doctor of Philosophy, in the School of Psychology, University of South Australia, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualification at any other academic institution.

Elena M Rudnik

Date: 21st February, 2012

Acknowledgments

The completion of this work has been overseen by my wise and supportive supervisor, Dr Janet Bryan. Her empowering manner has been appreciated. My gratitude also goes to co-supervisor, Dr Matthew Haren, who provided thoughtful feedback and a public health perspective. I am very grateful to the support given to me by the Spencer Gulf Rural Health School of the University of South Australia and the University of Adelaide, under the leadership of Associate Professor Gary Misan and Professor Jonathan Newbury. Research in rural and regional locations is challenging and the encouragement and practical assistance awarded to me has been valued. Thank you also to the Centre of Rural Health and Community Development and Flinders University's Barossa PRCC team for providing a great rural work space and moral support. PHC RED also provided financial assistance, which made it possible for me to eat as well as research.

The completion of this PhD has been possible due to the support of my loved ones. Their patience and understanding is heartfelt. Thank you to Mackenzie and Nicholas Travers, Barbara and Brian Rudnik, Fraser, Edward and Oscar Vivian. I dedicate this work also to the memory of Vanessa Rudnik, who inspires me daily. Thank you also to Professor Deborah Turnbull and Dr Judy Taylor for their initial encouragement which started my research journey. I acknowledge all of the participants who volunteered their time. I am grateful to vacation students Kate and Vernice who assisted with data entry and Tina Thornton of Academic Editorial Services who proof read the revised thesis for consistent style and formatting. Many agencies were so very helpful in the recruitment and data collection phase of this research. Great appreciation is extended to the PROS team at Health SA, OneSteel, Ahrens Engineering, Treasury

Wines Group, Barossa and Whyalla TAFE, Barossa Community Health Services and the UniSA Centre of Regional Engagement.

Abstract

BACKGROUND: Health behaviour models guide clinical practice but current models may not adequately explain the health behaviour of males through transition to adulthood (Renner, et al., 2007). Emerging adulthood is a developmental stage between the late teens and early twenties (Arnett, 2001) and young adulthood has been defined as extending to the age of 39 years (Roberts, Walton, & Bogg, 2005). Little research has examined the health behaviours of men at this stage of life. Individual behaviour, including binge drinking and unsafe driving of young people have been shown to be associated with age, gender and socioeconomic status (SES) (de Visser, Rissel, Smith, & Richters, 2006); however, it is likely that executive functions (EF) (Hall et al., 2008) and Health Literacy (HL) (von Wagner, Steptoe, Wolf, & Wardle, 2009) and values may be influential determinants of their behaviour (Steptoe et al., 1994). AIMS: This research aimed to identify the major cross-sectional correlates of male health behaviour during emerging adulthood. METHOD: Two studies were conducted. Study one involved the analyses of health status, health behaviour and SES data collected using computer-assisted telephone interviews (CATI) from a randomly selected sample of 5262 South Australian men aged between 16 and 44 years. Study two involved a sample of 102 men aged between 16 and 40 years who were recruited in regional South Australia. Data on alcohol consumption, smoking, physical activity, oral hygiene, fruit and vegetable consumption, drug use, body composition, sleep, driver safety and help seeking were collected by questionnaire. EF was measured by the Zoo Map Test, Self Ordered Pointing Test, Tower Test, Stroop Colour Word Test, Trail-Maker Test, Letter Cancellation Task and Initial Letter Fluency Task. Behaviour values were measured using a Likert scale rating of importance and HL was measured by the Newest Vital Signs (NVS), Shortened Test of Functional Health Literacy for Adults (S-TOFHLA)

and five critical health literacy questions (Ishikawa & Yano, 2008). In both study one and study two analysis of co-variance (ANCOVA) and logistic regression were used to test associations between age group (16–24, 25–29, 30–34, 35–40), health status and health behaviour. Hierarchical multiple linear regression analysis was used in study two to test associations between EF, HL and health behaviour values with composite health behaviour scores and adjusted for education and income as covariates. RESULTS: In study one there was a small, although significant effect of age on health behaviour score $F(4, 3202) = 3.85$, $p < .01$. The direction of effect was unexpected, with health behaviour scores lower for the older age groups, indicating less protective and more risk-taking behaviours. In both study one and two age accounted for a non-significant increment over the base model (education and income) in predicted variance in health behaviour. Inclusion of health behaviour values in study two accounted for 25% of variance with all combined variables accounting for 34% of variance in health behaviour ($\beta = .53$, $r^2 = .34$, R^2 change $= .25$, $p < .05$). HL and EF were not related to behaviour scores, although 12.9% of the sample was identified as having limited functional health literacy. CONCLUSIONS: In males navigating the transition to adulthood, those who place greater value on health behaviour had higher composite health behaviour scores, after adjusting for socioeconomic covariates. Unexpectedly, EFs and HL were found not to have a relationship with the health behaviour of young adult men. This finding reiterates the usefulness of engaging men and collecting information relating to health behaviour values as an initial screening of health behaviour. Further research is needed to investigate the development of health behaviour values of young adult men. This research has provided evidence that age during emerging adulthood is not clearly associated with health behaviour, and that all

men, not just the younger men, should be supported to value their behaviours that are linked to positive and negative health outcomes.

Table of contents

1. Health Status and Behaviours of Young Adult Men 1

Men's Health 3

Cognitive Development During Emerging Adulthood 4

Influence of Life-Course Events on Health Behaviour 6

Health Status of Young Adult Men 9

Diabetes 12

Blood Pressure 13

Asthma 14

Mental Health 15

Health Behaviours of Young Adult Men 16

Physical Activity 19

Obesity 20

Alcohol Consumption 22

Smoking 26

Fruit and Vegetable Consumption 26

Driving Safety 27

Illicit Drug Use 27

Fatal Behaviours and Cause of Death for Young Adult Males 28

Summary 31

2. Health Behaviour Models and Predictors of Behaviour 35

Health Behaviour 37

Health Behaviour Models 41

Demographic Predictors of Health Behaviour 47

Age 47

Socioeconomic Status 48

Psychological Predictors of Health Behaviour 50

Executive Function 50

Planning 62

Inhibition and Interference Control 62

Verbal Fluency 63

Health Literacy 65

Executive Function and Health Literacy Compared 68

Intelligence 69

Personality 72

Sense of Control 73

Health Behaviour Values 74

Health-Related Predictors of Health Behaviour 75

Health Status and Chronic Disease 75

Summary 78

3. Health Behaviours of Men aged 16–44 years: An Analysis of the South Australian Monitoring Surveillance System (SAMSS) Sample 81

Men's Behaviour During Emerging Adulthood 82

Socioeconomic Status, Education and Health Behaviour 84

Living at Home with Parents 85

Rurality 86

Health Status, Chronic Disease and Behaviour 86

Summary 87

Method 88

Participants 88

Measures 88

South Australian Health Monitoring Surveillance System 88

Socioeconomic 91

Health Status 92

Body Mass Index (BMI) 92

Mental Health 92

Composite Chronic Disease Score 93

Health Behaviours 93

Physical Activity 93

Smoking Status 94

Alcohol Consumption 94

Vegetable and Fruit Consumption 95

Composite Health Behaviour Score 95
Procedure 97
Obtaining Pre-Existing SAMSS Data 97
Human Research Ethics Approval 97
Design and Statistical Analysis 97
Data Screening 98
Results 99
Descriptive Statistics for the SAMSS Sample 99
Socioeconomic Status 99
Health Status 106
Health Behaviours 112
Age and Health Behaviour for Metropolitan and Rural/Regional Men 118
Age and Composite Health Behaviour 118
Age and Individual Health Behaviours 121
Health Status and Health Behaviour 125
Chronic Disease and Health Behaviour 125
Interaction Between Age and Chronic Disease As Predictors of Health Behaviour 125
Self-Reported Health Status and Health Behaviour 130
Interaction Between Age and Health Status as Predictors of Health Behaviour 130
Discussion 134
Limitations 138

4. The Relationship between Health Behaviours, Executive Function and Health Literacy among Males Aged 16–40 years 141

Executive Functions, Age and Health Behaviour 144

Planning 144

Inhibition 145

Interference Control 146

Verbal Fluency 147

Intelligence 148

Health Literacy 150

Health Behaviour Values 153

Sense of Control 153

Conscientiousness 154

Sleep 156

Teeth Brushing 157

Help Seeking 157

The Challenge of Recruiting Men for Primary Health Care Research 158

Summary 159

Research Questions 160

Method 161

Participants 161

Sample Size Calculations 162

Procedures 163

Recruitment 163
Exclusion Criteria 167
Location of Assessment 167
Assessment Routine 168
Human Research Ethics Approval 169
Measures 169
Self-Report Versus Measured data 169
Demographic Information 172
Health Status 172
Blood Pressure 172
Body Mass Index (BMI) 173
Waist Hip Ratio (WHR) 173
Chronic Disease Score 173
Psychological Distress 174
Measures of Health Behaviour 175
The Development of the Health Behaviour and Personal Information Questionnaire 176
Composite Health Behaviour Score 177
Measures of Executive Function (EF) 182
Planning 182
Inhibition 184
Interference Control 186

Verbal Fluency 186
Composite Executive Function 186
Measures of Intelligence 187
Composite Intelligence Score 189
Measure of Conscientiousness 189
Measure of Sense of Control 189
Measure of Health Behaviour Values 190
Measures of Health Literacy 190
Functional Health Literacy 190
Communicative and Critical Health Literacy 192
Data Analysis 193
Scoring and Recoding of Variables 193
Statistical Analysis 193
Data Screening 195
Results 198
Demographic Descriptive Statistics 198
Health Status Descriptive Statistics 203
Age and Health Behaviour 209
Age and Executive Function 220
Age and Intelligence, Behaviour Values, Sense of Control and Conscientiousness 227
Age and Health Literacy 236

Executive Function, Intelligence, Behaviour Value, Sense of Control, Conscientiousness and Health Behaviour....243
Health Literacy and Health Behaviour....250
Executive Function, Health Literacy and Health Behaviour....250
Discussion....255
5. General Discussion....265
A Model of Health Behaviour for Men During Emerging Adulthood....266
Effect of Age During Emerging Adulthood....267
Age and Socioeconomics....267
Age and Health Behaviour....268
Age and Executive Function....269
Socioeconomics and Health Behaviour....270
Health Status and Behaviour....271
Mental Health, Gender Roles and Health Behaviour....272
Intelligence and Health Behaviour....273
Health Literacy and Health Behaviour....274
Executive Function and Health Behaviour....275
Behaviour Values and Health Behaviour....276
Research Participation and Men's Health....278
Limitations....280
Conclusion....281

6. References.....283

7. Appendices.....371

Appendix 1 Recruitment Postcard – Side A and Side B.……373

Appendix 2 Male participants by age group in study two, Blokes Brains & Behaviours (BBB) as a percentage of the number of men living in Whyalla and Barossa as reported by Australian Bureau of Statistics (ABS, 2012) providing an indication of representativeness and response rate……..…... 375

Appendix 3 Participant Information Sheet ……...… 377

Appendix 4 Consent Form ……..…….……..379

Appendix 5 Health Behaviour and Personal Information Questionnaire (HBPIQ)…....381

Appendix 6 NEO Conscientiousness Questionnaire …….399

Appendix 7 Kessler 10 ……..401

Appendix 8 Measure of Communicative and Critical Health Literacy ……...…… 403

Appendix 9 Sample distribution and outlier adjustments made to continuous variables……405

List of Tables

Table 1-1 Proportion of Australian Males with Chronic Disease by Age Group 11

Table 1-2 Health Behaviour of the Proportion of Young Adult Australian Males by Age Group as Reported in the National Health Survey 2007–2008 18

Table 1-3 2001 and 2009 Australian Alcohol Consumption Guidelines for Adult Males Per Drinking Session (NHMRC, 2001, 2009) 25

Table 1-4 Major Underlying Cause of Death of Australian Males by Age Group in 2010 Showing Number of Deaths and Age-Specific Death Rate (ASDR) (ABS, 2012) 30

Table 2-1 Findings of literature review related to health behaviour and executive function (EF) of emerging and young adult males 56

Table 3-1 Scores allocated to individual health behaviours for the calculation of a composite health behaviour score 96

Table 3-2 Socioeconomic Status Descriptive Statistics for the SAMSS sample 102

Table 3-3 Health status descriptive statistics for the SAMSS sample 108

Table 3-4 Mean Chronic Disease Scores by age group 111

Table 3-5 Univariate health behaviour descriptive statistics for SAMSS sample 114

Table 3-6 Multivariate health behaviour scores and alcoholic drink consumption by age group with ANCOVA statistics with Age as a predictor and household income and education as covariates[a] 117

Table 3-7 Health behaviours categorised in accordance to recommended guidelines, by age group 123

Table 3-8 Logistic regression model with age group, education and household income as predictors of individual health behaviours 124

Table 3-9 Logistic regression model showing chronic disease score, education and household income as predictors of individual health behaviour 127
Table 3-10 Analysis of covariance (ANCOVA) showing insignificant non-significant interactions between age, health status, chronic disease status and Health Behaviour Score 128
Table 3-11 Health behaviour scores for men with and without a chronic disease by age group 129
Table 3-12 Logistic regression showing self-reported health status, education and household income as predictors of individual health behaviour 131
Table 3-13 Health behaviour scores for self-reported health status with ANCOVA statistics with age as a health status as a predictor of health behaviour score and household income and education as covariates[a] 132
Table 3-14 Analysis of covariance (ANCOVA) showing insignificant nonsignificant interaction between age, health status and health behaviour score 133
Table 4-1 Recruitment source of participants by age group 165
Table 4-2 Order and details of health behaviour, health status and psycho-metrics 171
Table 4-3 Variable values and weights for the Health Behaviour Composite Scores 180
Table 4-4 Inter-correlations for key predictor and outcome variables, age, education, income, health behaviour, executive function and health literacy 197
Table 4-5 Demographic descriptive statistics by age group 199
Table 4-6 Health Status descriptive statistics by age group 205
Table 4-7 ANOVA comparing age group means for health status variables 208
Table 4-8 Health behaviour descriptive statistics by age group 213

Table 4-9 Mean, ANOVA and ANCOVA statistics for continuous variables; health behaviour score, weekly alcohol consumption estimate and physical activity in the past two weeks by age group 218
Table 4-10 Regression coefficients for household income, education and age as predictors of health behaviour score 219
Table 4-11 Descriptive statistics of measures of Executive Function; Planning, Inhibition, Interference Control and Verbal Fluency.....223
Table 4-12 Linear regression coefficients showing variance in executive function, planning, inhibition, interference control, verbal fluency accounted for by education, income and age.....225
Table 4-13 Descriptive statistics of measures of Intelligence, Personality, Sense of Control and Health Behaviour Value.....229
Table 4-14 Multiple linear regression showing variance in intelligence, sense of control, conscientiousness and health behaviour value accounted for by education, income and age 234
Table 4-15 Health Literacy descriptive statistics by age group 239
Table 4-16 Functional Health Literacy classifications by age group. 240
Table 4-17 Multiple linear regression showing the amount of variance in Health Literacy scores accounted for by education, income and age [a].....241
Table 4-18 Multiple linear regression models showing amount of variance in health behaviour accounted for by executive function composite, planning, inhibition, interference control and verbal fluency.....245
Table 4-19 Multiple linear regression models showing amount of variance in health behaviour accounted for by intelligence, sense of control, conscientiousness and behaviour values.....247

Table 4-20 Logistic regression with the value of a behaviour, education and household income as predictors of the related individual behaviour. 249

Table 4-21 Multiple regression models showing variance in health behaviour accounted for by CCHL, FHL and Health Literacy 251

Table 4-22 Chi-square ($\chi 2$) for adequate functional health literacy and individual health behaviours 252

Table 4-23 Multiple linear regression models showing absence of moderator effect of Executive Function between Health Literacy and Health Behaviour 253

List of Figures

Figure 2-1 Framework of health literacy and health action (von Wagner, Steptoe, Wolf, & Wardle, 2009) 46

Figure 3-1 Health behaviour scores by age group of men living in metropolitan and non-metropolitan, rural South Australia, 2002–2008. 120

1. Health Status and Behaviours of Young Adult Men

The health and wellbeing of emerging and young adult men is the focus of increasing public health concern in Australia and internationally (Australian Institute of Health and Welfare [AIHW], 2010). The earlier onset of chronic disease and worsening mortality and morbidity are predominantly attributed to health behaviour (Australian Bureau of Statistics [ABS], 2010; World Health Organization [WHO], 2003, 2011). There is an absence of health behaviour models that consider age and gender; therefore, this research set out to investigate whether age and a range of psychological constructs are associated with the health behaviours of young adult men. Existing literature indicates that there are cognitive, social and behavioural differences between adolescents and older aged men (Arnett, 2001; Caspi & Shiner, 2005; Claude et al., 2002; Cohen et al., 2003), but little is known about the transition period referred to as emerging and young adulthood.

The first two chapters of this thesis report a narrative review of literature and how this thesis arrived at a framework of age, cognition and health behaviour of young adult men. The first chapter scopes existing research and what is known about the health behaviours of men between the ages of 16 and 44 years and the disparities in relation to socioeconomic factors such as age. The second chapter builds upon this background and presents a review of literature relating to health behaviour, psychological functioning and health literacy that are identified in existing behaviour models and research literature as likely to predict health behaviour of young adult and emerging adult men. Chapters three and four of this thesis describe two studies that were conducted; study one utilised a randomly selected dataset of over 5000 men aged between 16 and 44 years. Study one describes the health behaviour of emerging adulthood males and tests associations between this behaviour, age and sociodemographic factors. Study two advanced these aims by examining

multidisciplinary constructs, many not previously considered in relation to young adult men, that included age, executive function abilities, health literacy, intelligence, conscientiousness and health behaviour values. Study two involved the use of an extensive range of psychological tests with a smaller sample of men of a similar age, from two distinct non-metropolitan regions in South Australia. A wide selection of health behaviours were considered individually, as well as a health behaviour composite to provide a broader, more holistic perspective to health behaviour. The significance of this research is that some of these constructs, including executive function and health literacy, are believed to be modifiable, and if influential during a period of continued development, may offer an intervention option for health behaviour change (Gazmararian, Jacobson, Pan, Schmotzer, & Kripalani, 2010; Jaeggi et al., 2008).

Men's Health

Young adult men are believed to engage in more risky behaviour, less preventative behaviour and have a worsening health status than older men (AIHW, 2010; WHO, 2007). However, because they are difficult to engage in primary health research, this makes gathering evidence and explanations of behaviour more difficult (Holmila & Raitasalo, 2005; McCracken, Jiles, & Blanck, 2007; Park, Mulye, Adams, Brindis, & Irwin, 2006). In mixed gender community-based health research, men are often underrepresented (Bartlett, 2006; Cheung, 2004) and in male-specific studies, the 16–24-year-olds are most difficult to recruit (Fletcher, Higginbotham, & Dobson, 2002). As young adult men are also frequently underrepresented as users of health services, specific engagement efforts are required to increase their presence across the spectrum of primary health care (Willis & Porche, 2006).

With the release of the first Australian National Male Health Policy (Department of Health and Aging [DoHA], 2010), there has been a call for more research investigating issues unique to men to inform policy (Australasian Men's Health Forum, 2007; Collins, McLachlan, & Holden, 2011). Men's health is an emerging discipline that is gradually receiving more policy and research attention, with much of these attracted to biomedical outcomes such as prostate cancer and obesity of aging men (Aoun, Osseiran-Moisson, Collins, Newton, & Newton, 2009; Holden et al., 2006; Martin, Haren, Middleton, Wittert, & Study, 2007) or philosophical issues of masculinity (Mahalik, Burns, & Syzdek, 2007; Mullen, Watson, Swift, & Black, 2007; Sloan, Gough, & Conner, 2010; J. A. Smith, Braunack-Mayer, Wittert, & Warin, 2007). Relatively less research is published that specifically focuses upon the health of young adult men. Focusing on young adult men's behaviour specifically provides us with the opportunity to implement preventative measures, before the onset of chronic disease. Young adult men are often role models for young children and working with them has the potential to impact on current and future generations of South Australians (Collins, McLachlan, & Holden, 2011; Courtenay, 2000). This thesis represents a rare example of research in regional South Australia investigating health issues for young working age men.

Cognitive Development During Emerging Adulthood

Emerging adulthood is a relatively newly defined developmental period from late teens, approximately age 18 years, through the twenties and is usually achieved by the age of 30 years (Arnett, 2001, 2006; Eccles, 2003; Galambos, Turner, & Tilton-Weaver, 2005). Young adulthood has been defined as extending from emerging adulthood up to the age of 39 years (Roberts, Walton, & Bogg, 2005). It is in emerging

adulthood that the incidence of some 'risk behaviours', such as some types of substance abuse, binge drinking and unsafe driving peak (Arnett, 2000, 2001; de Visser, Rissel, Smith, & Richters, 2006; Delucchi, Matzger, & Weisner, 2008; Todesco, 2005). It is also the period in which some cognitive abilities, including executive function, continue to develop and reach maturity (Span, Ridderinkhof, & van der Molen, 2004; Tamm, Menon, & Reiss, 2002; Zelazo, Craik, & Booth, 2004). Cognitive development may well be an outcome of, or at least influenced by, environmental factors. Arnett (2000) reports that vocational education and training, exposure to love, work and a broadened worldview perspective through introduction with people outside their formative familial networks foster continued cognitive development. Cognitive development is implicated with learning and adaption and males often learn by applied experience, utilising a trial and error approach (Norfleet, 2007). This is consistent with de Visser et al.'s (2006) finding that young adult men aged between 16 and 24 engage in more risk-taking behaviours and the authors attribute the age-related behaviour change to psychological factors, suggesting that cognitive functioning influences behaviour. Thus, cognitive development can be considered both a cause of behaviour and an outcome of psychosocial events. Physiological changes to the prefrontal cortex occur during the transition from adolescence to adulthood (Bennett, 2006). This brain area is known to be important for the development of executive function, which includes planning, interference control, inhibition and verbal fluency and which are necessary for the interpretation of information, decision-making, conscious awareness, emotion and behavioural regulation. Brain development represented by increased white matter and functional maturing of the central nervous system, increased speed and efficiency of neural processing and information transfer in the brain is translated into improved cognitive function and behaviour (Bennet & Baird, 2006). The brain has been described

as being in a constant state of change with white matter peak occurring during midlife in men according to a male-only study of 70 men aged 19 to 76 years (Bartzokis et al., 2001). The development of the prefrontal cortex and connections with other parts of the brain, including and the limbic system, provide the capacity for increased self-regulation and reduced impulsivity (Chambers & Potenza, 2003; Crews & Boettiger, 2009). Gibbons, Gerrard, Reimer and Pomery (2008) report that a lack of experience, greater social peer influences, ill-defined or conflicting health goals and immature executive functioning that allow a person to consider risks make it less likely young people will anticipate alternate consequences of situations. Furthermore, when faced with a health risk situations such as driving to a party and then consuming alcohol, young people are more impulsive and less introspective, thus more likely to take health risks. It is therefore expected that the brain, repertoire of experience and executive function of a man in his late teens and early twenties may not be fully developed and this is expected to have consequences for behaviour, making it more likely that he will engage in impulsive risk-taking behaviour (Cameron & Leventhal, 2003; Gibbons et al., 2008; Luszczynska, Kiehl, Gutierrez-Dona, Kuusinen, & Schwarzer, 2004; Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2001). The primary aim of this research is to describe health behaviour and executive function of men in emerging and young adulthood and explore associations between these higher order cognitive functions, age and behaviour.

Influence of Life-Course Events on Health Behaviour

As well as neurological development, young adults are exposed to different social and economic experiences that are likely to influence behaviour. Life-course age-related events include leaving the parental home, becoming employed, getting married

and parenting children. These experiences are likely to increase exposure to health information, influence health-promoting attitudes (Hewitt, Baxter, & Western, 2006) and further develop cognitive abilities that are necessary for the self-managment of health behaviours (Jaeggi, Buschkuehl, Jonides, & Perrig, 2008; King & Chassin, 2004; Schwarzer, 2008).

Individual differences in developmental trajectories over emerging adulthood may, in part, be attributed to a person's level of assumed responsibility and exposure to decision-making experiences (Cohen, Kasen, Chen, Hartmark, & Gordon, 2003). Many more young people remain living with their parents for longer and this worldwide sociological trend has been associated with reports of delayed transition of young people into adulthood (Beaujot & Kerr, 2007; Clark, 2007; Mulder, Clark, & Wagner, 2002). In Australia over the last 20 years the proportion of young people aged 18 to 34 living with their parents has increased from 19 to 23% (ABS, 2009). An extension of time spent living in the parental home potentially means some young adult men are exposed to fewer decision-making experiences and opportunities for self-management (Cohen et al., 2003). In a large cross-sectional study of over 8,000 adults using computer assisted telephone interviewing (CATI) (Coid & Yang, 2010) and a longitudinal study that tracked 93 parent and child units from midadolescents to young adulthood (Seiffe-Krenke, 2006) both found that adult men who continued living at home with parents had poorer psychological health and were more likely to engage in risk-taking behaviour that included excessive alcohol and fighting. Indicators of responsibility and decision-making experience including employment, fatherhood, involvement in household managment and living independent of parents may need to be considered when developing predictive models of health behaviour, as these factors

may have implications for executive function development, psychological wellbeing and risk-taking behaviour.

The timing and context of life-course events such as fatherhood and independent living have implications for the wellbeing and possible behaviour of a young man. As men get older they traditionally become fathers and financial guardians for a family and this role model status provides a motive for more protective health behaviours (Heaton, Israelsen, Eggett, & Clarke, 2005; Hugh, 2001; Rhea, 2011; Thorn & Gilbert, 1998). The responsibility of fatherhood often sees a man become a role model for his children, including the demonstration of health-promoting behaviours (David & Chris, 2001). There has, however, been a sociological shift in more recent decades with fewer men fathering children and those that do, being less likely to permanently reside with their children due to divorce (Reimondos, Evans, & Gray, 2011). The socioeconomic status and age of fatherhood is an important determinant of future health and wellbeing of a man. Men from socioeconomically disadvantaged households are more likely to make an early transition to parenthood (Umberson, Pudrovska, & Reczek, 2010). Men who become parents before the age of 23 years are more likely to report poor mental health and low SES (Mirowsky & Ross, 2002). Both mental health and socioeconomic status are recognised as determinants of health behaviour (Batty, Der, Macintrye, & Deary, 2006; deVisser, Rissel, Smith, & Richters, 2006). Young fathers have been found to drink less alcohol than non-fathers of the same age, but with increased age go on to consume more alcohol than non-fathers (Wolfe, 2009). So while life-course events such as leaving home and having children may provide opportunities for personal responsibility and cognitive development and the adoption of more protective health behaviours (Galambos & Krahn, 2008), consideration needs to be given to the socioeconomic context of the transition to fatherhood (Pudrovska & Carr, 2009).

Becoming a father and role model to children when economic resources are scarce can be a stressful burden for a young man and capture them in a low SES lifestyle (Muhammad & Gagnon, 2010). Poor mental health, poor levels of wellbeing and low socioeconomic status are all recognised predictors of health risk behaviours. Therefore, while living independent of parents and the onset of fatherhood may be associated with age and the adoption of more protective behaviours, this may not be the case for young men from low socioeconomic backgrounds. Thus, the association between increased age and exposure to life events and the adoption of more protective health behaviours may be altered by socioeconomic status.

Health Status of Young Adult Men

Health encompasses physical, mental and social wellbeing and does not merely relate to the absence of disease or infirmity (WHO, 1946). Good health infers a quality of life, as well as a person's capacity to productively contribute to their community, and good health is an assumed right for people living in a developed country like Australia. *Australia's Health*, a report published by the Australian Institute of Health and Welfare (AIHW, 2006) identified mental health problems, obesity, substance use, accidents and injury as areas of particular concern for the health of young people aged 15–24 years. This age range is within the age range deemed to be emerging adulthood. Health status concerns for young Australian adults as identified in the Australian National Health Survey (ABS, 2012) are summarised in Table 1-1. Chronic diseases, which are long-term health conditions, vary with age, with respiratory conditions such as asthma more common in the younger age groups and arthritis, type II diabetes and cardiovascular disease more common conditions for people aged 35 years and over.

The health status of young adult men is worsening, with reports of increased diagnoses of diabetes (Mokdad et al., 2001), cardiovascular disease (Burke, Beilin, Dunbar, & Kevan, 2004), mental health illness (Goldney, Eckert, Hawthorne, & Taylor, 2010) and asthma (Thomsen, 2005). Each of these chronic diseases have associated risk factors that include obesity (Parmet, Lynm, & Glass, 2004), high blood pressure (Wang, Golden, Meoni, Klag, & Brancati, 2002) and psychological distress (Jorm et al., 2005). These risk factors are also associated with behavioural factors, such that obesity is associated with poor diet and inactivity (WHO, 2003) and psychological distress is associated with inactivity (Bauman & Owen, 1999), help seeking (Addis, 2003; Parrott, 2009) and poor work–life balance (Dear, Henderson, & Korten, 2002). The significance of health behaviour and chronic disease risk factors are that they are predominantly modifiable (Schwarzer, 2008) and early intervention during young adulthood may be necessary to alter the trend of premature deterioration of health (DeVol & Bedroussian, 2007).

Table 1-1 Proportion of Australian Males with Chronic Disease by Age Group

	Age group (years)			
	15–24	25–34	35–44	All Males
Diabetes mellitus				
Type 1	*0.4	*0.2	*0.6	0.4
Type 2	0.0	*0.3	1.5	4.1
Total diabetes mellitus	*0.4	*0.5	2.2	4.5
Asthma	11.2	9.5	10.2	8.9
Arthritis	1.9	4.6	9.0	12.9
Hypertensive disease	np	*1.2	4.4	8.8
Cardiovascular disease	3.5	5.5	10.4	15.2
High cholesterol	np	np	3.7	6.0
Alcohol and drug problems	*0.6	1.6	0.9	1.2
Mood (affective) problems	7.8	9.8	9.6	6.2
Anxiety related problems	2.8	4.4	3.8	2.9
Total mental and behavioural problems	12.2	13.9	13.0	10.3

Note. * estimate has a relative standard error of 25% to 50% and should be used with caution

np = Not available for publication but included in totals where applicable, unless otherwise indicated

Source: Adapted from *Australian Health Survey*, ABS (2012)

Diabetes

Diabetes mellitus (diabetes) is a metabolic disease in which high blood glucose levels result from defective insulin secretion, insulin action or both (WHO, 1999). There are several types of diabetes, each with different causes and clinical histories. The two main types of diabetes that affect young adult men are Type 1 diabetes and Type 2 diabetes (Tercyak et al., 2005). Both types of diabetes are reported to be a growing concern for young adult men around the world (Mokdad et al., 2001; Sawyer, Britto, Drew, & Yeo, 2007; World Diabetes Foundations, 2010), necessitating the introduction of alternate health service access targeting males, such as worksite diabetes assessment clinics (Aoun & Johnson, 2002) and telemedicine (Balamurugan et al., 2009).

Type 2 diabetes accounts for 90% of the diagnosed cases of diabetes (Forouhi & Wareham, 2010) and this is bought about predominantly by an unhealthy lifestyle (Parmet et al., 2004). Type 2 diabetes is more likely for people who smoke tobacco (WHO, 2000) are physical inactive (Bauman & Owen, 1999) have a diet low in vegetables but high in sugar and are overweight (Parmet, Lynn, & Glass, 2004). Family history is also a factor that determines a diabetes diagnosis and men with diabetes are more likely than women to pass on diabetes to their offspring (Gale & Gillespie, 2001) presenting generational implications and an apparent need to manage diabetes in young adult men. Diabetes is most prevalent in poorer countries, however, prevalence within developed countries is also increasing and people living in poorer households and the unemployed (Robbins, Vaccarino, Zhang, & Kasl, 2005) are at greater risk. An approach forward with regard to the management of diabetes includes the need to consider cultural and socioeconomic issues, including access to healthy food, language

barriers and health literacy that impair the dissemination of health messages about diabetes (Gonzales, 2012; Jack, Jack, & Hayes, 2012).

Blood Pressure

Blood pressure represents the forces exerted by blood on the wall of the arteries and is written as systolic/diastolic (for example 120/80 mmHg, stated as '120 over 80'). Systolic blood pressure reflects the maximum pressure in the arteries when the heart muscle contracts to pump blood. Diastolic blood pressure reflects the minimum pressure in the arteries when the heart muscle relaxes. The World Health Organization defines high blood pressure as: systolic blood pressure of 140 mmHg or more; or diastolic blood pressure of 90 mmHg or greater or receiving medication for high blood pressure (WHO, 1992).

High blood pressure is an increasing health concern for young adult men, being a symptom and risk factor for coronary heart disease, which is now a major cause of morbidity and mortality in Australian men (AIHW, 2006). Although high blood pressure is traditionally a concern for older men, there is evidence that young adult men are increasingly being diagnosed (Pedro, 2001). Apart from being a risk factor for chronic disease, high blood pressure can negatively affect cognitive function (Robbins, Elias, Elias, & Budge, 2005) and is believed to be associated with the onset of diabetes in young adult men (Wang, Golden, Meoni, Klag, & Brancati, 2002). High blood pressure is also associated with obesity and has been shown to improve with the introduction of protective health behaviours, including a healthy diet, regular exercise and weight reduction (Bosworth et al., 2009; Raitakari et al., 1995)

Asthma

Asthma is a respiratory illness that affects one in ten adults aged between 15 and 44. Asthma is also associated with obesity (Appleton et al., 2008; Thomsen, 2005; Beuther, Weiss, & Sutherland, 2006). Regular physical activity is encouraged as a managment strategy to reduce the onset and severity of asthma symptoms (Dogra, Kuk , Baker, Jamnik, 2011; Hallal, Victoria, Azevedo, &Wells, 2006). Asthma is also associated with poor health literacy (Adams, Appleton, Hill, Ruffin, & Wilson, 2009; Mancuso & Rincon, 2006) and health literacy is a key construct being investigated in relation to health behaviour in this thesis. Asthma is reported to be more prevalent in men with low education and in the unemployed, compared with more socioeconomically advantaged men (Chittleborough, Taylor, Dal Grande, Gill, Grant, & Adams., 2010).

Gender and age are influential to the diagnosis and managment of asthma. Asthma is more commonly diagnosed in childhood, but is increasingly being diagnosed in adults and this is associated with obesity (Sutherland, 2008) and exposure to environmental contaminants such as dust and cigarette smoke (Stapleton, Howard, George, Goover, & Self, 2011). More males than females are diagnosed with asthma in childhood, but this reverses after puberty (Fuhlbrigge, Jackson, & Wright, 2002). The issue that becomes more important, however, during young adulthood for males is the managment of pre-existing asthma. Personality (VanDeVen & Engels, 2011) and a sense of control (Williams, 2000) may influence how a young adult male manages his asthma. The association between personality, sense of control and health behaviour, including behaviours known to prevent asthma, will be tested in study two of this thesis. In a small study of 54 people with asthma, including 30 men aged between 34 and 37 years of age, men with asthma were found to ignore symptoms of their asthma until

they became severe more often than female asthmatics (Tovt-Korshynska, Dew, Chopey, Spivak, & Lemko, 2001). There are indications that this may also be the case for young adult males as teenagers who value masculinity more highly are less likely to worry about or preventatively manage their asthma at the expense of increased mortality risk (Williams, 2000).

Mental Health

Twenty-two per cent of men aged between 16 and 44 years of age report having a mental illness including anxiety disorders, affective disorders and substance use disorders (ABS, 2008). This age range encompasses emerging and young adulthood and is the age range of men included in study one and two of this thesis. Psychological distress is considered to be a good indicator of mental health status (ABS, 2003; Andrews & Slade, 2001;Australian Mental Health Outcomes and Classification Network [AMHOCN], 2005). Psychological distress is a term that describes the state of a person's general mental health, based upon their level of nervousness, agitation, psychological fatigue and depression (AMHOCN, 2005). The *National Mental Health and Wellbeing Survey* estimated that 21.4 % of men between 18 and 44 years had moderate psychological distress, 6.5% had high psychological distress and 2.2 % had very high levels of psychological distress (ABS, 2008). Age difference in mental health of young adult men have been reported, with younger men being found to have greater levels of psychological distress that older men (Chittleborough, Winefield, Gill, Koster, & Taylor, 2010) and younger 18 to 24-year-olds experiencing more moderate to high psychological distress than the men nearing the end of emerging adulthood (AIHW, 2006, 2010). Inflated levels of psychological distress have also been reported in men living in rural and regional Australia (Kilkkinen et al., 2007).

It is evident that the lives of an increasing number of young adult men are affected by chronic disease or risk factors that indicate an increased likelihood of developing one. The primary focus of this research is upon the behaviours that are associated with chronic disease, referred to throughout this thesis as 'health behaviours'.

Health Behaviours of Young Adult Men

Behaviours that account for the greatest impact on health in Australian young adults include tobacco smoking, physical inactivity, excessive alcohol consumption and the use of illicit drugs, low consumption of fruit and vegetables and unsafe driving (AIHW, 2006, 2010; Courtney & Polich, 2009; Delucchi, Matzger, & Weisner, 2008; Milligan et al., 1997). Generally, young adult males have been found to engage in more risk-taking behaviour, particularly drug use, alcohol consumption and unsafe driving (Burke et al., 1997; de Visser, Rissel, Smith, & Richters, 2006b), but more physical activity (Armstong, Bauman, & Davies, 2000; Bauman & Owen, 1999) than older men. The *Australian National Health Survey* provides a national summary by age group of some health behaviours discussed in this thesis. The proportion of young adult males who smoke, drink alcohol, have low exercise levels, obesity levels as per reported body mass index (BMI), fruit and vegetable intake as per recommended dietary guidelines for men aged 18–24, 25–34 and 35–44 are shown Table 1-2. These age groups are consistently reported in health survey data and are consistent with the period of emerging and young adulthood of relevance to this thesis. With increased age Australian males reportedly become less physically active, smoke more cigarettes, become more overweight; however, younger men drink alcohol at higher risk amounts.

The vast majority of Australian men consume insufficient amounts of fruit and vegetables.

This thesis does not elaborate upon gender differences but acknowledges past research that has consistently reported difference in health behaviour and preferred support service strategies of males compared with females of the same age (Bynes, Miller, & Schaeffer, 1999; Courtney, 2000; Davidson, Trudeau, van Roosmalen, Stewart, & Kirkland, 2006; Palm, 2007).

Table 1-2 Health Behaviour of the Proportion of Young Adult Australian Males by Age Group as Reported in the National Health Survey 2007–2008

Health behaviour / risk factor	Age group (years)		
	18–24	25–34	35–44
	%		
Physical activity a			
Met physical activity guidelines	37.3	34.3	29.5
Sedentary (no/low exercise)	33.2	33.8	37.1
Body Mass Index (measured)			
Underweight	*3.6	*2.2	**0.8
Normal range (BMI 18.5–19.99)	8.4	*2.5	*1.9
Normal range (BMI 20.00–24.99)	48.3	33.4	26.6
Overweight	28	42.5	44.2
Obese	11.9	19.5	26.6
Alcohol risk			
Low risk	52	53.5	59
Risky	6.1	8.3	7.1
High risk	10.2	9.1	8.2
Last consumed alcohol			
In previous 12 months	22.2	19.2	15.3
12 months or more ago	**1.2	2.6	4.2
Never consumed alcohol	7.7	7	5.5
Smoker status			
Current smoker	24.2	32.8	28.2
Non-smoker	75.9	67.2	71.8

Note. * estimate has a relative standard error of 25% to 50% and should be used with caution;

** estimate has a relative standard error greater than 50% and is considered too unreliable for general use

[a] Exercise undertaken in the two weeks prior to interview.

Physical Activity

Physical activity has been shown to have health benefits, both for the prevention and treatment of chronic disease (Bauman & Owen 1999) and psychological health (Hassmén, Koivula, & Uutela, 2000). Regular physical activity reduces cardiovascular risk factors such as obesity, high blood pressure, high cholesterol and diabetes. Taking part in physical activity improves mental wellbeing by reducing feelings of stress, anxiety and depression (Bauman & Owen, 1999; Dunn & Jewell, 2010; Grant, Wardle, & Steptoe, 2009; Street, James, & Cutt, 2007; Taliaferro, Rienzo, Pigg, Miller, & Dodd, 2009). People who are sedentary or exercise at low levels are more likely to report having high to very high levels of psychological distress compared with people who have moderate to high exercise levels (ABS, 2011).

The *National Physical Activity Guidelines for Australian Adults* (Department of Health and Aged Care, 2005) recommend all adults have at least 30 minutes of moderate-intensity physical activity on most days of the week. Moderate-intensity activities include brisk walking, swimming, doubles tennis and medium-paced cycling. Vigorous physical activity includes jogging and active sports such as football and basketball (Taylor & Campostrini, 2010). Just 20 minutes per week of any physical activity has been found to have mental health benefits, but a dose response of greater volume and intensity of exercise is associated with greater risk reduction of psychological distress (Hammer, Stamatakis, & Steptoe, 2009). As shown in

Table 1-2 the Australian national survey of physical activity found that 37.3 % of men aged 18–24 years, 34.3% of men aged 25–34 years and 29.5% of men aged 35–44 years were getting sufficient physical activity as per the national physical activity guidelines (ABS, 2011). The trend for men to exercise less as they get older and transition through emerging and young adulthood has been confirmed in other Australian surveys (Armstong, Bauman, & Davies, 2000; DoHA, 2011). The most common reason for men not getting exercise is insufficient time due to work or study, lack of interest, considering themselves too old, injury and illness (Allison, Adlaf, Ialomiteanu, & Rehm, 1999; DoHA, 2008).

Obesity

Obesity has been described as a global epidemic impacting on health of all ages, including young adult men (Mokdad et al., 2001). Obesity, the state of having excess body fat, increases the risk of developing a range of health problems, including Type 2 diabetes, cardiovascular disease, high blood pressure, certain cancers, sleep apnoea, osteoarthritis, psychological disorders and social problems (WHO, 2000). Obesity in young adult men is associated with a diet low in fruit and vegetables but high in sugar and fat, inactivity (Taylor, 1999; WHO, 2003) and low socioeconomic status (Ahlgren, Novak, & Hammarstram, 2006). The 2007–08 Australian National Health Survey, from which a summary is shown in

Table 1-2, found that among the men aged between 18 and 44 years, 38.0% were overweight and 19.6% were obese (ABS, 2010b). The prevalence of obesity increased with men's increased age. Reports from other countries indicate that obesity is a growing problem of relevance to the health of young adult men worldwide (Ahlgren et al., 2006; Leibel, Rosenbaum, & Hirsch, 1997; *Pharma Business Week*, 2007; Teixeira-Pinto, Neovius, & Rasmussen, 2008).

Measures of obesity include Body Mass Index (BMI), waist circumference and Waist Hip Ratio (WHR; Louise, 2005). The AIHW (2012) defines males with a waist circumference of at least 94 cm as being of increased risk of obesity and greater than 102 cm as substantially increased risk. As a measure of obesity in self-report research, BMI is more commonly referred to than waist circumference as people report their height and weight more often than their waist circumference (ABS, 2006). However, the more recent promotion of the importance of waist circumference as a chronic disease risk factor, evident in a recent Australian national health campaign (AIHW, 2012; Aoun, Osseiran-Moisson, Collins, Newton, & Newton, 2009), may result in increased numbers of people referring to waist circumference when discussing obesity.

The transition between adolescence and adulthood is recognised as a time of increased risk of the development of obesity (Gordon-Larson, Adair, Nelson, & Popkin, 2004). In a nationally representative cohort study, 4797 American adolescent males were tracked from ages 13 to 26 years. During this time 10% became obese, 11% remained obese and 3% of the sample went from being obese adolescence to non-obese adults. This study demonstrates that emerging adulthood is a time when the health of some young adults will worsen. Obesity is one chronic disease that is strongly

associated with health behaviour and therefore further investigation of predictors of such behaviour during emerging adulthood is required to inform interventions.

Alcohol Consumption

The current Australian guidelines for safe alcohol consumption recommend two standard drinks daily and regard more than four drinks daily as high risk (National Health and Medical Research Council [NHMRC], 2009). The Australian guidelines refer to standard drinks, which can be described in terms of alcohol concentration by volume (Kerr & Stockwell, 2012) or units of alcohol. A standard drink contains 10 grams of alcohol (DoHA, 2012). There is debate about how well consumers of alcohol understand alcohol content and judge standard drink size. This may give rise to people making errors and be more likely to underestimate the amount of alcohol they consume (Das, Corrado, Kyerematen, Smithson, & West, 2009; Prince, 2012). The 2009 Australian recommended alcohol consumption guidelines are a revision of the 2001 guideline that listed four drinks as a safe daily limit and six drinks daily as risky (NHMRC, 2001). The changing of recommended alcohol guidelines has implications for comparisons with risk calculations made prior to the change of guidelines. Both the 2001 and 2009 guidelines refrain from defining binge drinking but refer to excess drinking and levels of risk. The recommended alcohol guidelines for 2001 and 2009 have been summarised in Table 1-3.

.

The use of excessive alcohol is generally thought to be health damaging, causing cognitive impairment, organ damage and be a cause of injury from secondary risk-taking behaviours including motor vehicle accidents, fighting and falls (Courtney & Polich, 2009; Cranford, McCabe, & Boyd, 2006; George, Rogers, & Duka, 2005;

Goudriaan, Grekin, & Sher, 2007; Ramirez, Young, & Connor, 2003; Ratti, Bo, Giardini, & Soragna, 2002; Rodgers et al., 2005; WHO, 2011). There are reports that moderate alcohol use may have health protective qualities, being associated with improved cognitive function and blood pressure reduction (Sabia et al., 2009); however, evidence indicates that alcohol is generally more risky than protective for young adult males (Anstey, Windsor, Rodgers, Jorm, & Christensen, 2005; Graham, Agnes, Andrée, & Jürgen, 2007). It is estimated that nearly nine out of every ten Australian males aged between 18 and 39 years consumed some quantity of alcohol in 2010 and between three and four men in this same age group consumed more than two alcoholic drinks per day, which is considered risky to their health (AIHW, 2011).The number of males aged 16 to 17 years who drink more than the recommended amount of alcohol has increased since 2001 (NHMRC, 2009; White & Hayman, 2007). Young adult men aged 18 to 29 years are in the age group most likely to consume alcohol in risky quantities, formerly referred to as binge drinking (Caldwell et al., 2002), although the percentage of men who report drinking daily increases with age (AIHW, 2011).

Education level, parental drinking habits, risk-taking practices, personality, attitudes, use of cigarettes and marijuana and psychological distress have been found to be predictors of heavy drinking of young adults (Caspi et al., 1997; Grzywacz & Almeida, 2008; Kropp, Lavack, Silvera, & Gabler, 2004; Merline, Jager, & Schulenberg, 2008). Attendance at university has been associated with heavier drinking until the age of 22 years but is then a predictor of less frequent heavy drinking by midlife (Merline, Jager, & Schulenberg, 2008). Some research has found that mental illness is associated with an excess consumption of alcohol (Hall, 1996; Pitkanen, 1999; Swendsen et al., 1998), however there is evidence that psychological distress serves to polarise drinking behaviour of young adult men with high levels of psychological

distress likely to be either nondrinkers or heavy drinkers (Hall, 1996; Rodgers et al., 2000). Alcohol use among young adult men is of major public concern and this research will further investigate alcohol drinking practices and factors that may predict excessive drinking of young adult men.

Table 1-3 2001 and 2009 Australian Alcohol Consumption Guidelines for Adult Males Per Drinking Session (NHMRC, 2001, 2009)

	2001	**2009**
Short-term low risk	Up to 6 drinks	Up to 2 drinks
Short-term risky	7–10 drinks	3–4 drinks
Short-term high risk	11 or more drinks	5–6 or more drinks
Long-term low risk	Average 4 per day (28 per week)	
Long-term risky	Average of 5–6 drinks per day (29–42 per week)	
Long-term high risk	Average 7 or more drinks per day (49 or more per week)	

Smoking

Smoking tobacco by young people has been described as an epidemic resistant to community intervention (Hancock et al., 2001; Ling, Neilands, & Glantz, 2009). While the incidence of smoking tobacco has declined for older men and women across the developed world, people of low socioeconomic status and young people, especially those living in rural communities continue to smoke (Centers for Disease Control and Prevention [CDC]. 2010). The prevalence rates of young adult men in Australia who smoke are shown in Table 1-2 and range between 24.2% of 18–24-year-olds and 32.8 % of males 25–34-year-olds. The decline in smoking worldwide has been attributed to antismoking campaigns; however, counter advertising by tobacco companies is believed to be especially effective in young adults who often smoke socially, with approximately 20% going on to smoke regularly (Ling et al., 2009). Smoking is associated with a greater likelihood that a young person will use alcohol and illicit drugs (Costello, Dierker, Jones, & Rose, 2008), have poorer physical and mental health (Chien-Min, Hai-Lung, & Zu-Lin, 2008; Croghan et al., 2006).

Fruit and Vegetable Consumption

Diet plays a major role in a person's health and in recent decades evidence has shown that a diet that includes fruit and vegetables reduces the risk of various diseases, including diabetes (WHO, 2003). The National Health and Medical Research Council (NHMRC, 2005) recommend a minimum of three servings per day of fruit and three of vegetables for adolescents aged 12–18 years and two serves of fruit and five serves of vegetables for people aged over 19 years. The 2007–2008 National Health Survey found that 60% of males aged between 18 and 44 years consumed less than the recommended two serves of fruit daily and approximately 95% consumed less than the recommended 5 serves of vegetables daily (ABS, 2010a).

Driving Safety

Emerging adulthood is a time when many young men obtain a motor vehicle licence and while this can provide opportunity for increased independence, driving a vehicle presents potential risks. In 2003, 62.3% of men aged under 20 years of age had a licence to drive a motor vehicle (AusRoads, 2005). As shown in Table 1-2 the number of young adult men with a licence increases with age and the vast majority (94.6 %) being licensed drivers by the age of 30–39 years. Motor vehicle accidents caused by unsafe driving are the major cause of injury and death of young men aged between 18 and 34 years, as shown in Table 1-4. The health risks are even greater for young men living in rural and regional areas (AIHW, 2010; Gale, Lambert, & Hartley, 2008). Unsafe driving is commonly identified as driving after consuming alcohol, driving without wearing a seatbelt and driving at excess speeds (Fromme, Wetherill, & Neal, 2010; Michaud, Rodondi, & Narring, 2000). Unsafe driving has been found to be more common in the early twenties compared with late teens (Fromme, Wetheill, & Neal, 2010; Steptoe, Sanderman, & Wardle, 1995) and this may be attributed to increased access to motor vehicles and resources to pay for alcohol and petrol (Delucchi et al., 2008). Driving safely is associated with personality (Bogg & Roberts, 2004; Caspi et al., 1997) such that the conscientious are more likely to not engage in dangerous driving.

Illicit Drug Use

Illicit drug use is the taking of illegal drugs, which in many developed countries include heroin, marijuana, cocaine, methamphetamine, amphetamine, Ecstasy, pharmaceuticals such as sleeping pills and pain killers, naturally occurring hallucinogens and inhalants that are used inappropriately (AIHW, 2008). Illicit drug use is more common in males aged 20–29 years, with 30.5% reporting having used an illicit

drug in the previous twelve months, compared with 27% of males aged 18–19 years and 22.6% of males aged 30–39 years (AIHW, 2011). Over the past two decades there has been a change in age-related drug use trends, with a smaller proportion, from 46% in 1995 to between 27–30.5%, of males aged 18–29 years in 2010 reporting illicit drug use. The proportion of males aged 30–39 years using illicit drugs has remained consistent (AIHW, 2011).

Drug use has been described as a normal part of nightlife for young adults who frequent clubs and pubs (Duff, 2005; Kelly, Wells, & Parsons, 2006) in both metropolitan and regional locations (Gale et al., 2008). The average age of first use of illicit drugs, irrespective of gender, is 18.6 years for inhalants, 18.7 years for marijuana, 20.8 years for methamphetamines, 22.8 years for Ecstasy and 25.2 years for the use of sleeping pills and steroids (ABS, 2007). Long-term injecting drug users have a heightened risk of contracting a communicable disease such as hepatitis C or hepatitis B which can be fatal (AIHW, 2007). Of the men who reported being recent illicit drug users in the National Drug Strategy Household survey 21.5% had driven a vehicle while under the influence, 5.4% had operated hazardous machinery, 6.1% had verbally abused someone and 1.7% had physically abused another person (AIHW, 2011). Illicit use, unlike other risk-taking health behaviour is more prevalent for people with higher socioeconomic status (AIHW, 2005).

Fatal Behaviours and Cause of Death for Young Adult Males

As health behaviours and health status appear to alter for men throughout the period of emerging and young adulthood, there is also a change in the major causes and rate of death. For young male adults preventable injury from car accidents, assault and falls are a relatively high risk and from the late thirties men are more likely to experience work-related injuries or the onset of musculoskeletal conditions, arthritis,

cardiovascular diseases, hearing impairment and psychiatric disabilities (AIHW, 2006). More than twice as many males than females die from all causes during emerging and young adulthood (ABS, 2010). The most common cause of death for men aged between 15 and 44 is reported as accidents, poisoning and cardiovascular injury (AIHW, 2006). The number of deaths and the age-specific death rates of Australian males are shown in Table 1-4 and are based upon data published by the Australian Bureau of Statistics in 2012. Age-specific death rates refer to the number of deaths that are registered during a calendar year at a specific age per 1,000 of the estimated resident population of the same age at the midpoint of the year (ABS, 2010). Intentional self-harm was a major cause of death for all age groups throughout emerging and young adulthood, although the rate increases with age. Motor vehicle-related accidents (MVAs) were the only major cause of death that declined with age. MVAs are a major cause of death for 15–24 and 25–34-year-old men, but not the over 35-year-olds. Regional young adult men, those living outside major Australian cities, are of particular concern as they have higher rates of preventable death attributed to risk-taking behaviour, particularly MVAs (AIHW, 2010).

Table 1-4 Major Underlying Cause of Death of Australian Males by Age Group in 2010 Showing Number of Deaths and Age-Specific Death Rate (ASDR) (ABS, 2012)

	Age Group					
	15–24		25–34		35–44	
	Number	ASDR	Number	ASDR	Number	ASDR
All causes	904	55.8	1,299	80.8	2,188	139.3
Intentional self-harm	216	13.3	294	18.3	433	27.6
Motor vehicle accident	204	12.6	139	8.7	Na	-
Event of undetermined intent	58	3.6	96	6.0	108	6.9
Accidental poisoning	42	2.6	163	10.1	177	11.3
Pedestrian injured in transport accident	30	1.9	na	-	na	-
Heart disease	25	1.5	75	4.7	280	4.6
Assault	25	1.5	29	1.8	Na	-
Malignant neoplasms of digestive organs	na		32	2.0	121	7.7
Diseases of the liver	na		na		82	
Cerebrovascular disease	na		na		48	

Note. na = not listed as a major cause of death for specified age group

Summary

Men in Australia live approximately five years less than females (AIHW, 2008) and regional young adult men have poorer health status and mortality rates than men living in urban regions (AIHW, 2010). The wellbeing of our young adult males represents an important social and economic resource and because of this is a public health concern. The current research is valuable because it will describe the health behaviours of South Australian young men during emerging and young adulthood and so will address an identified gap in knowledge about the health of young adult men (Australasian Men's Health Forum, 2007; de Kretser, 2006; Ho, Davidson, & Ghea, 2005). A formative aim of this study is to examine the prevalence of health conditions and health behaviours that contribute largely to the burden of disease in Australian males (Mathers, Vos, Stevenson, & Begg, 2001). Secondly, this study will examine the cross-sectional associations between age and health behaviours, including alcohol use, smoking, exercise, safe driving, illicit drug use, fruit and vegetable consumption over the course of emerging and young adulthood. This research will contribute to the epidemiological literature on male health trends during emerging aduthood and will provide an objective focus for a neuro-psychological study that will examine the primary hypothesis that age and executive function will be associated with protective and risky health behaviour during emerging and young adulthood. Other psychosocial variables (intelligence, personality, sense of control, health behaviour values and health literacy) will also be examined as predictors of health behaviour.

A life-course approach, increasingly referred to in epidemiology, posits that the development of chronic disease in old age is influenced by social exposures and behavioural lifestyle factors throughout all of life, including childhood, adolescence and

young adulthood (Ben-Shlomo & Kuh, 2002). Early childhood exposures have consistently been identified as influential to adulthood health, but increasingly young adulthood is being reviewed as important as young adults are parents of young children and determine not only their own health behaviours but also those of their dependent children (Wethington & Johnson-Askew, 2009). Critical periods that may impact upon a person's current and therefore future health that are relevant to emerging and young adults include the transition from school to work, leaving the parental home, establishing a home, transitioning to parenthood, adapting to job changes and the onset of chronic disease (Heikkinen, 2011). The age at which a person may experience these life-course events is variable (Price & McKenry 2003), but is more commonly expected to occur before middle adulthood, which is deemed to commence at age 40 (Willis & Martin, 2005). The age range deemed as 'emerging' and 'young adulthood' is therefore not etched in stone, but may be identified as being anywhere between adolescence, approximating the age of 16, to the middle adulthood, approximating the age of 40.

Emerging and young adulthood is a period in a man's life that often involves social, economic, cognitive and behavioural change (Arnett, 2001; Zelazo et al., 2004). It is also a period that is increasingly associated with worsening health status and chronic disease risk factors. The development of interventions during this period of change require evidence-based information about what factors are most influential to behaviour. There is a body of research committed to health behaviour interventions and the development of health behaviour model; however, these models may insufficiently consider some potential influences, such as cognitive development, during the transition through emerging and young adulthood (Renner, Spivak, Kwon, & Schwarzer, 2007) and this research seeks to address this aspect. This research seeks a better understanding of psychosocial predictors of protective and risky behaviours to allow for the targeting

of public health resources and the development of strategies to support young adult men.

2. Health Behaviour Models and Predictors of Behaviour

This chapter builds upon the background of current health status and behaviours of young adult men contained in Chapter 1. The aim of this chapter is to propose how executive function and health literacy fit within existing health behaviour models and identify other key psychosocial factors that may be associated with young adult men's health behaviour. The aim of this chapter is to provide a narrative of where this thesis sits within the field of psychology and public health, rather than a systematic review of the literature. Health behaviour research has produced an abundance of literature and this was scoped to allow for the arrival of a refined framework of age, cognition and behaviour. A structured review of literature relating to executive function, health behaviour and young adult men is reported in this chapter.

Health behaviours that include poor diet, smoking, alcohol consumption and physical inactivity, are important risk factors for the development of chronic diseases that result in premature morbidity and mortality (WHO, 2003). Numerous health behaviour models have been developed in psychology and public health disciplines identifying factors that predict health behaviours. Literature comparing these models report similarities in constructs but differences in terminology and suggest that interdisciplinary research may provide clarification of key constructs (Noar & Zimmerman, 2005b). Health behaviour models have, however, been criticised for being too general and 'one size fits all', not catering for complex behaviours or the diversity of personal circumstances (Kirscht, 1983; Rakeover 1997; Weinstein, 1993, 2007). Behaviour models are often developed with reference to a specific behaviour and there is concern that these models may not be generalised to predict alternative behaviours or health behaviour more generally (Armitage & Conner, 2000).

Popular health behaviour models may not readily apply to young adult males but instead cater for the circumstances of older people (Renner, Spivak, Kwon, & Schwarzer, 2007) due to the relative absence of young adult males involved in health behaviour research (Weinstein & Rothman, 2005). Age is not a variable that is included in popular health behaviour models (Renner et al., 2007) even though young men and older men are believed to behave and think differently. The Mahlik and Burns (2011) study identified age differences in health beliefs and health knowledge in relation to heart disease prevention of 161 men across four student year levels at one American university. It is reasonable to suspect this finding relates to young adult men, even though the age of the sample was ill-defined. The Meyer, Talbot and Ranalli (2007) study raises the relevance of a man's interest in a behaviour as a determinant of that behaviour, which in the case of this study was prostate cancer prevention. Further research is needed to establish whether psychosocial variables used in popular health behaviour models are associated with the health behaviours of young adult men. Additional variables, suspected of being age-related—including health literacy, cognitive ability and, more specifically, executive function—may have particular relevance to health behaviour but have not yet been researched with a sample of young adult men (Bradley & Wildman, 2002; Burke et al., 1997; Courtenay, 2000; Denton, Prus, & Walters, 2004; Jorm, Anstey, Christensen, & Rodgers, 2004; Stewart & Zelinski, 2000).

Health Behaviour

Health behaviours have been shown to influence health status of young adults (Barreto, Passos, Azeredo, & Giatti, 2009). Gaining a better understanding of the predictors of health behaviour complements the Declaration of Alma-Ata on Primary

Health in 1978, which cited the right and duty of all people to participate in the planning and implementation of their health care and a focus upon prevention of chronic disease (WHO, 1978). The prevention of illness through healthy lifestyles and behaviour is recognised as an important goal of primary health care to defer morbidity and postpone mortality (Ebrahim et al., 2008; Hayman, 2010; Kelly et al., 2008; Tamakoshi, Tamakoshi, Lin, Yagyu, & Kikuchi, 2009). There is potential for public health messages and practitioners to influence behaviour and support improved self-management to avoid the onset of a chronic disease and associated negative health impacts (Aoun et al., 2009; Bell & Orpin, 2006; Bosworth et al., 2009; Cook & Schlenger, 2002; Schmutte et al., 2009)

Health behaviour is behaviour undertaken by individuals to enhance or maintain their health (Kasl & Cobb, 1970; Stroebe, 2000). Health behaviour has been defined as having four dimensions: wellness behaviour, accident control, traffic risk-taking and substance risk-taking (Vickers, Conway, & Hervig, 1990). Behaviour is 'preventative' when a person has the intention of alleviating the impact of potential risks and hazards in their environment. Similarly, 'positive behaviours' are beneficial to health and desirable to enact. Conversely, negative behaviours are detrimental to health and desirable to stop (Kirscht, 1983). Positive, 'health enhancing' (Schwarzer & Luszczynska, 2008) or health protective behaviours (Sheeran et al., 2007) include eating adequate fruit and vegetables, physical exercise, weight control, dental hygiene and accident prevention. An older definition of preventive behaviour required a person to believe themselves to be healthy and have the purpose of preventing disease (Kasl & Cobb 1966), but it has been argued that sick people can still engage in preventative actions in addition to sick role adherence behaviours (Abraham & Sheeran, 2007; Kirscht, 1983). Negative health behaviours, which are also referred to as 'health risk

behaviours' (Sheeran, Milne, Webb, & Gollwitzer, 2007), 'health-compromising behaviours' (Schwarzer & Luszczynska, 2008) and 'health-damaging behaviours' (McKenzie, Neiger, & Thackeray, 2009) include problem alcohol drinking, illicit drug use, smoking, reckless driving and overeating (Schwarzer, 2008).

Health behaviour and health action are both terms used in the literature and how they differ is unclear. Smedslund (2000) makes a distinction between health behaviour and health action, claiming action is subjective and intentional while behaviour is objective and causational (Smedslund, 2000). Von Wagner, Steptoe, Wolf and Wardle (2009), by contrast use the term 'health action' to describe lifestyle-related behaviours. This definition, based on the work of Paasche-Orlow and Wolf (2007), divide health actions into the three domains of: access and utilisation of health care, patient provider interactions and self-care. Throughout this thesis, the term health behaviour will include all health actions and also lifestyle behaviour (Denton, Prus & Walters, 2004), that are implicated with the development of serious illness (health risk behaviours) and those known to foster good health (health protective behaviours) (Mielewszyk & Willig, 2007).

While health behaviour is often represented in research literature in terms of individual behaviours, there are examples where a collective concept has been used (Kvaavik, Batty, Ursin, Huxley, & Gale, 2010; Parakh, King, Owen, & Jamrozik, 2009). Health behaviour as a collective term includes a range of individual behaviours that a person engages that have an impact upon their health. Combining the behaviours provides a robust perspective of behaviour and accommodates for natural fluctuations in individual behaviours that can produce unreliable results in cross-sectional research (Wardle & Steptoe, 1991). Health behaviour is a complex concept. Research concerned

with similarly broad constructs, quality of life (Sloan, Aaronson, Cappelleri, Fairclough, & Varricchio, 2002) and stresses (Grzywacz & Almeida, 2008) have used multiple measures and composite variables. It has been argued that composite measures that are derived from multiple individual measures allow for a more detailed evaluation of a complex construct and may result in an increase in internal consistency (Martinez-Martin, 2010), improved statistical power (Shieh, 2010) and the identification of better equation models (Landis, Beal, & Tesluk, 2000). Total scores generated from the sum of single-item scores can result in greater precision and less biased estimates of health (Erikson, Kendall, Anderson, & Kaplan, 1989). Erikson et al. 1989, however, also recognised the importance of using of validated individual-item measures to avoid bringing together different concepts and therefore producing composite measures that make little sense (Martinez-Martin, 2010). A composite health behaviour measure allows for the investigation of overall management, rather than the limited assessment of one single element of behaviour (Stemple, Yancey, Kral, Sense, Sutton, & Ortega, 2008). Birkimer, Druen-Perri, Holland, and Zingman (1996) used two composite predictor variables, each derived from three individual items to explore internal states as predictors of exercise, alcohol use, junk food consumption and seat belt use of 130 nineteen-year-olds. This thesis will address the call for a more generalised approach to health behaviour (Armitage et al., 2000) by exploring predictor variables identified in contemporary health behaviour models and their associations with a range of composite and individual health behaviours of a specific population, young adult men. This chapter examines existing health behaviour models from all relevant disciplines (i.e. neuropsychology, health psychology, social psychology, cognitive psychology, public health and epidemiology) in order to identify the key predictors of male health behaviour during emerging and young adulthood. In the following two chapters, these

predictor variables are tested for associations with health behaviours in two independent samples of men during the adulthood transition.

Health Behaviour Models

Health behaviour models identify predictors of behaviour and how they interact with each other. A theory is a set of inter-related concepts, definitions and propositions that present a systematic view of events or situations by specifying relations among variables in order to explain and predict the events or situations (Glanz, Lewis, & Rimer, 2002). Theories are combined to produce a model (Cottrell, Girvan, & McKenzie, 2009); for example, the health belief model (Rosenstock, Strecher, & Becker, 1988) incorporates Lewin's decision-making theory and subjective expected utility theory (Conner & Norman, 2007). Terminology and constructs are created for use in a specific theory (Kerlinger, 1986). The focus of health behaviour models is to identify a set of predictors of health behaviour (Renner 2007). Predictors are also referred to as 'predictor variables' or 'factors' and are used to try to predict an outcome variable (Field, 2005).

The development of a model of health behaviour requires prospective research to consider new behaviours and predictor variables with specific populations to provide pilot results that can help set priorities for adequately controlled experiments (Weinstein, 2007). This research aims to consider the health behaviour of young adult men and the relevance of a selection of variables that exist in popular and less known contemporary models of health behaviour. A comparison of the published health behaviour theories, models, constructs and terminology has, to some degree, been achieved (Noar et al., 2005a; Smedslund, 2000; Wagner et al., 2009; Weinstein, 1993). Noar and Zimmerman (2005b) report that many constructs from popular health

behaviour theories are the same, but terminology is different and the lack of consensus has produced a fragmented literature that ideally would be integrated to produce a common set of terms. Given complex interactions of single and multiple health behaviours, social situations and the vast number of predictors that have been identified, it seems unlikely that one model will suit all people and all behaviours (Mielewczyk & Willig, 2007; Smedslund, 2000), but the call has been made for research to achieve this goal (Mielewczyk et al., 2007; Noar, Chabot, & Zimmerman, 2008; Noar et al., 2005b; Rothman, 2009; Weinstein & Rothman, 2005).

Research in health behaviour is longstanding and contemporary models reflect multidisciplinary influences. Psychology, more specifically social psychology, has contributed social cognitive constructs such as goal setting, motivation and self-regulation (Mielewczyk & Willig, 2007), which have influenced many popular health behaviour models that include the health belief model (HBM) (Becker 1974), theory of reasoned action (TRA; Ajzen & Fishbein 1980; Fishbein & Ajzen 1975) that became the theory of planned behaviour (TPB; Ajzen 1991), social cognitive theory/social learning theory (SCT; Bandura, 1977, 1986), protection motivation theory (PMT; Boer & Seydel 1996; Rogers 1983) and the trans-theoretical model (TTM; Glanz & Maddock, 2000; Mielewczyk & Willig, 2007; Noar & Zimmerman, 2005b). Public health is concerned with the provision of health services (clinical), examination of patterns of disease and health at a population level (epidemiology) and the translation and the promotion of the epidemiological findings, consequences of behaviours and strategies for behaviour change (health promotion) (Bhopal, 2002; Stroebe, 2000). Public health behaviour models have built upon social cognitive models and included demographic and socioeconomic predictors of behaviour (Becker, 1974; Rosenstock & Strecher, 1988). The discipline of public health contributed the construct of health

literacy, which is increasingly been recognised as a predictor of health behaviour (Jorm, Jacomb, Christensen, Rodgers & Pollitt, 1997; Nutbeam & Kickbusch, 2000; Parker, Baker, Williams, & Nurss, 1995). The field of neuropsychology is a relatively recent contributor to health behaviour research, identifying brain function and associated cognitive abilities such as problem-solving capacity and self-regulation as key predictive factors of health behaviour (Cervone, Shadel, Smith, & Fiori, 2006; Hall et al., 2006; Luszczynska et al., 2004).

Contemporary theorists, including von Wagner et al. (2009) and Hall, Elias and Crossley (2006) have produced models that represent a new generation of interdisciplinary research, drawing on public health, social psychology, health psychology and cognitive psychology. The health literacy and health action (HLHA) framework (von Wagner et al., 2009) depicts the interactions between internal and external influences and health literacy, which in turn influence action control, health system factors and motivation to produce health actions. As shown in Figure 2-1 the HLHA framework integrates social, economic, cognitive, and environmental and public health constructs (permission to include this figure was obtained in writing on November 23 2011, from the copyright clearance centre on behalf of Sage publications). In the HLHA framework, the relationship between health literacy and health action, or health behaviour, is mediated by knowledge, beliefs and action control. Action control is further described as planning, organisation and task-specific skills that are also known as executive function. In the HLHA framework cognitive function is distinct from executive function. Cognitive ability is broadly defined in the HLHA framework and so this research set out to examine which components of cognitive ability and executive function are most strongly associated with health behaviour. Personality is not specifically identified as a predictor of health action in the HLHA

framework, however personality and more specifically conscientiousness are individual factors that are broadly identified as being associated with health behaviour. In addition to exploring individual factors and cognitive ability, this thesis will examine the interaction between executive function, health literacy and health behaviour.

The intention of this research is to identify which factors from various popular and contemporary health behaviour models have predictive relevance for young adult men that may inform future gender and life-stage appropriate model development. This research builds upon pre-existing work by investigating the predictive value of constructs from popular health behaviour models, as well as some new constructs from neuropsychology and public health. This research responds to the call for a collaborative interdisciplinary audit of traditional and contemporary models and constructs with specific populations and environments. With reference to the many health behaviour models, it is apparent that many variables are likely to be influential in how a person behaves. It is also apparent that different disciplines use different terminology, but there is often an overlap of meanings. A collection of variables have been identified that have either been recognised as predictors of health behaviour, but not commonly reported specifically relating to young adult men, namely age, socioeconomic status, personality, sense of control, health behaviour values, psychological distress and intelligence. As well as variables that are relatively new to the health behaviour debate and likely to be predictors, namely executive function, health literacy, chronic disease and health status. The emerging disciplines of neuropsychology, health psychology and health promotion have presented executive function and health literacy as constructs that might be included in future health behaviour models (Hall et al., 2006; Wagner et al., 2009; Wong & Mullen, 2009). Executive function, higher level cognitive abilities that include planning, inhibition,

verbal fluency and interference control have not been known to have been measured specifically in relation to the health behaviour of young adult men. The relationship between executive function, health behaviour and health literacy is further explored in the later part of this chapter.

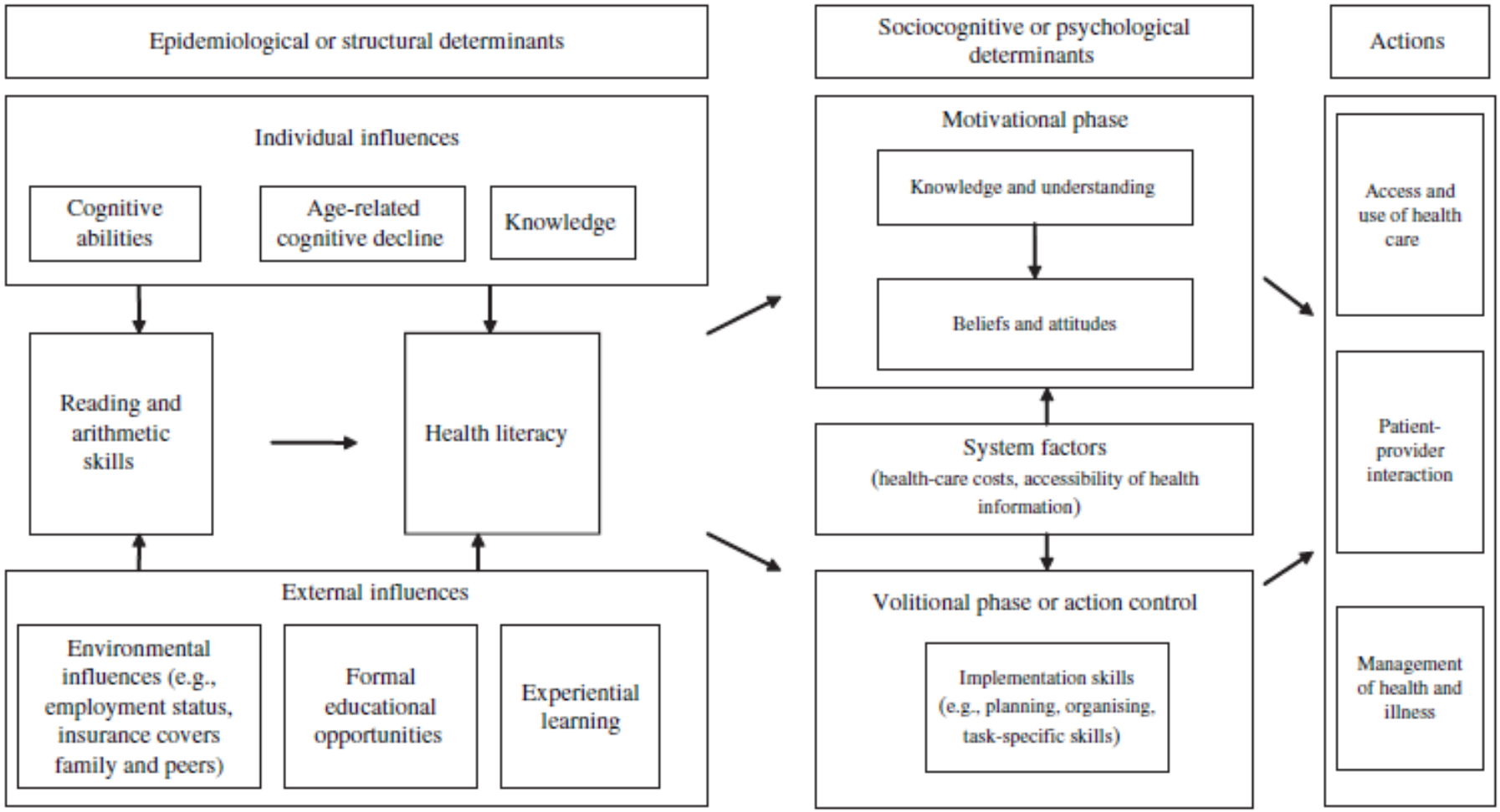


Figure 2-1 Framework of health literacy and health action (von Wagner, Steptoe, Wolf, & Wardle, 2009)

Demographic Predictors of Health Behaviour

Demographic information about a person includes their age, marital status and living arrangement, number of year's formal education, income and employment status. Demographics are routinely collected in national data collections concerned with health and population monitoring (AIHW, 2003).

Age

There is evidence that younger men take more health risks than older men (Burke et al., 1997; Byrnes, Miller, & Schafer, 1999); however, little is known about the trajectory of health behaviour from more risk-taking to more protective. Adolescents males are known to engage in experiential risk-taking, which has been attributed to a range of factors including social circumstances (Merline et al., 2008), family support (Roche, Ahmed, & Blum, 2008), hormones (Buchanan, Eccles, & Becker, 1992) mental health (Allison et al., 1999) and cognitive function (Fishbein et al., 2006; Hall et al., 2006; O'Sullivan, Gutnik, Yoskowitz, Patel, & Kaufman, 2006; Ramirez et al., 2003). There are indications that risk-taking behaviour does not simply decline gradually from adolescence to middle age, but instead some behaviours appear to become riskier in the early twenties and in middle age, become more protective (Fromme et al., 2010; Irwin, 2010). The fluctuations in behaviour throughout emerging adulthood may suggest that different behaviours are influenced by different factors at different ages. If one factor, such as age or cognitive function, were singularly predictive of behaviour then behaviour would change progressively, as both age and cognitive development are progressive throughout young adulthood (Kliegel, Mackinlay, & Jaeger, 2008; Tamm et al., 2002), declining only as a result of acquired brain injury (Raskin & Rearick, 1996; Warren, Moore, & Vogtle, 2008). Chapter 3

investigates age differences in behaviour and Chapter 4 extends this to examine age differences in cognitive and psychological factors that are associated with age and likely to influence health behaviour.

Socioeconomic Status

As well as cognitive development, socioeconomic changes occur for many men in young adulthood (Cohen et al., 2003) and this has an effect upon behaviour. Increased access to financial resources as a result of entering the workforce at a time when many young adult men do not have children or family financial commitments, increases the likelihood that they can afford to spend money on alcohol, drugs and takeaway food. The increased availability of a disposable income, coupled with the reduced guardianship of parents and little access to health service providers (Smith, Braunack-Mayer, & Wittert, 2006, 2008; Tudiver & Talbot, 1999) means that many emerging adults have greater disposable income and may also be isolated from experienced sources of health knowledge (Davies, Shen-Miller, & Isacco, 2010). This lack of experience is likely to manifest as reduced health literacy (Kirkcaldy, Furnham, & Siefen, 2004; Kripalani & Weiss, 2006; Manganello, 2008; Powell, Hill, & Clancy, 2007), delay the adoption of personal of protective health values, possibly making young adults more influenced by marketing and peer pressure (Ling et al., 2009) and more likely to engage in risk-taking behaviour (Kropp et al., 2004).

For the general population, the more years of formal education and higher personal income are indicative of better health status (Batty, Shipley, Mortensen, Boyle, Barefoot, Granbak, et al., 2008) and healthier behaviour (de Visser et al., 2006; Hammond, 2003; Lynch, Kaplan, & Salonen, 1997), but there are mixed reports about the association between socioeconomic status and health behaviour of young adult men. The death rate for males living in areas of most socioeconomic disadvantage is 80%

higher overall than for males living in areas of least disadvantage (AIHW, 2006). Socioeconomically disadvantaged young adult males are also more likely to assess their health as poor or only fair, drink alcohol at harmful levels, smoke, be obese, and have high blood pressure (AIHW, 2006; Allison et al., 1999). However, young adult men who are unemployed (Schuit et al., 2002), trade apprentices (Markkanen et al., 2006; Ulbricht, Hanke, Meyer, John, & Haug, 2011) and university students (Fromme et al., 2010) have all been found to commonly engage in high-risk behaviours (Michaud et al., 2000). This finding indicates that education level, in isolation of other factors, does not wholly predict behaviour of young adults who are in their teens and early twenties. Likewise, the accepted association between greater income and healthier behaviour does not fit well with research findings that students who have access to more financial resources are more likely to binge drink, use illicit drugs and consume takeaway food (Reeder, Darling, Williams, & McGee, 2006; Yilldirium & Demirbay, 2008). A change appears to occurs in the late twenties and thirties, when men who have graduated with a tertiary degree and have higher incomes report to drink less alcohol (Kerr, Greenfield, Bond, Ye, & Rehm, 2009) and smoke less (Centers for Disease Control and Prevention [CDC], 2010) than men with fewer years of formal education and lower income. It appears that the associations between years of formal education, income and health behaviour may be different for the men aged between 16 and their mid-twenties when compared with the older men. Thus, socioeconomic status may be more indicative of health status and behaviour in the later phases of emerging and young adulthood when career paths, family and social networks begin to stabilise. Associations between income, education, age, health status and health behaviour are explored in both Chapter 3 and 4.

Psychological Predictors of Health Behaviour

Health behaviour is influenced by many factors and different schools of psychology and public health have identified influential constructs (Hall et al., 2006; Stroebe, 2000; von Wagner et al., 2009). The health literacy and health action framework (von Wagner et al., 2009) is shown in Figure 2.1 and refers to cognitive skills and action control, including planning and organisation, as predictors of health behaviour. An investigation was conducted of the usefulness of select psychological cognitive constructs (executive function including planning, inhibition, interference control and verbal fluency and intelligence, personality, sense of control and health behaviour values), health literacy, chronic disease and health status that have not been thoroughly investigated in relation to young adult men. A description of each of these psychological functioning constructs is here provided as a background. Another key focus of this thesis is to explore whether psychological functioning is associated with age during emerging adulthood and to also explore associations between health behaviour, psychological functioning and age to identify which are significant.

Executive Function

Executive function are a collection of higher order cognitive abilities that integrate, organise and maintain other cognitive processes such as memory and attention (Wecker, Kramer, Wisniewski, Delis, & Kaplan, 2000). Executive function includes planning, interference control, inhibition and verbal fluency (Jurado & Rosselli, 2007; Lezak et al., 2004). Executive function reflects a multi-operational system mediated by prefrontal areas of the brain and their reciprocal cortical and subcortical connecting pathways (Stuss & Benson, 1986). Executive function allows a person to achieve goal-orientated behaviour, including the adjustment of thoughts and actions to accommodate to changing circumstances (Miyake, Friedman, Emerson,

Witzki, & Howerter, 2000). Terms other than executive function are found in the literature and include ‘executive control’ and ‘central executive control’ (Whitney, Arnett, Driver, & Budd, 2001), ‘central executive’ (Baddedley, Della Sala, Papagno, & Spinnler, 1997).

Executive function is a neuropsychological construct that incorporates self-regulation, sequencing of behaviour, flexibility, response inhibition, planning and organisation of behaviour (Brown, Braver, & Larry, 2009; Eslinger, 1996). Neuropsychology and social psychology (social cognitive models) both use the term self-regulation in relation to health behaviour, but their defined processes are different (Wodka 2007; Wong & Mullen, 2009). Social cognitive behaviour theories refer to self-regulation as any effort undertaken to alter behaviour (Cameron & Leventhal, 2003) and a construct that mediates intention and behaviour (Abraham et al., 1999). These self-regulatory processes involve the setting of goals, cognitive preparations and the ongoing monitoring and evaluating of goal-directed activies (Bermudez, 1999; Kruglanski et al., 2000; Norman & Conner, 2007). Social cognitive theory models view action and behaviour as extensively regulated by forethought, being the end product of a rational decision-making process based upon deliberative systematic processing of available information (Conner & Norman, 2007; Luszczynska et al., 2004). Self-regulation, in this context, is a conscious adaption of implementation intentions which are plans of when, where and how the goal intention will be translated to behaviour. Neuropsychology’s executive function includes abilities to plan and control and these processes are believed to be different. Planning has been found to involve more conscious systems compared with control that has been shown to operate outside conscious awareness and influence (Glover, 2004). The research tests both planning and

measures of control, interference control and inhibition, and their associations with self-reported health behaviour.

In addition to social psychology and neuropsychology defining self-regulation differently, they also measure their like-named constructs differently. Social psychology report self-regulation as perceived by the participant with use of self-administered tools including the Self-Regulation Questionnaire (SRQ; Brown, Miller, & Lawendowski, 1999) and shortened version, SSRQ (Carey, Neal & Collins, 2004). In comparison, measures of executive function involve the performance tests that are researcher administered. Scores typically reflect how well a person performs clearly defined task in terms of the number correct, errors and response times. Although there is contention about the construct validity of some executive function tests because they tend to measure more than one executive function ability, there is consensus about which neuropsychological tests assess specific executive function components (Alvarez & Emory, 2006; Chan, Shum, Toulopoulou, & Chen, 2008; Jurado & Rosselli, 2007; La Rosa, 1985; Lezak, 1983; Lezak et al., 2004; Ready, Stierman, & Paulsen, 2001). Self-regulation as defined and measured in social psychology seems to be operationalised as self-reported executive function.

A structured review was conducted to examine literature relating to young adult men, executive function and health behaviour. EBSCO, MEDLINE and PsychInfo were used to search for published research literature. Studies included in the review were published in English between 1980 and January 2012. No restriction of study design was imposed to allow the inclusion of all published research, due to the limited number of studies involving young adult men. No quality rating of the studies was attempted with the exception of including studies that appear to have been peer reviewed. Papers

reviewed provided results and analyses specific to males within the age range of 16 to 44 years. In an effort to locate articles not found in the keyword search, reference sections of published articles were also examined. Search methods involved the use of an asterisk (*) to allow for the inclusion of singular and plural terms as well as variations in spelling, an example of this is behavio* which was used to capture behaviour, behavior, behaviours. Health behaviour search terms used were health behavio*, smoking, alcohol, drug use, exercise, physical activity, sleep, driving, speeding, teeth brushing, oral hygiene, help seeking, Executive function search terms were *executive function*, EF, executive control, central executive, cognition, higher order cognition*, planning, verbal fluency, inhibition and interference control. Young adult, adult, emerging adulthood, male* and men were search terms used to filter the health behaviour and executive function literature. The results of the literature review are shown in Table 2-1.

The findings of the literature review indicate there is an inconsistent positive association between executive function and health behaviour. Cross-sectional methods were dominant, which limited the ability to conclude the direction of association. There were examples of high level EF being found to be associated with protective health behaviour including physical activity and consumption of a healthy diet (Hall et al., 2006; Hall et al., 2008; Wong & Mullen, 2009). Cross-sectional studies (Syngelaki, Moore, Savage, Fairchild, & van Goozen, 2009) indicate that poor EF may be a predictor of risk-taking behaviour such as gambling and smoking. There is evidence that other risk-taking behaviour, illicit drug use may have two-way associations, with a number of studies (Gonzales, Bechara & Martin., 2007; Hoshi, Mullins, Boundy, Brignell, Piccini & Curren, 2007; Sabia et al., 2009) finding that illicit drug use and exposure to unhealthy behaviours is associated with impaired EF. Variations in the

nature of relationships between EF components and various individual and composite health behaviours indicate that risk-taking and protective behaviours may involve different cognitive processes. The sample sizes were generally small and included few young adult and emerging adult males. Nonsignificant associations between EF and behaviour (Waldstein, Jennings, Ryan, Muldoon, Shapiro, & Polefrone, 1996; Wilens et al., 2011) may be attributed to methodological limitations, including the clinical categorisation of EF and small sample sizes. Three key papers that most specifically addressed the relationship between EF and health behaviour of young adults is the work are Hall et al., 2006; Hall et al., 2008; and Wong and Mullen, 2009.

Executive functions that are believed to develop at varying trajectories during the period of emerging adulthood (De Luca et al., 2003) have been identified as modest predictors of risky and preventative health behaviour (Hall, Dubin, Crossley, Holmqvist, & D'Arcy, 2009; Hall et al., 2006, 2008; Wong & Mullen, 2009). For example, after controlling for IQ and socioeconomic factors Hall et al. found interference control, an executive function measured using the Stroop test, to be a significant predictor for smoking and alcohol consumption but not exercise (Hall et al., 2008). In another study Hall et al. found that inhibition, measured by the Go-No Go test (Nosek & Banaji, 2001), predicted exercise and diet. Wong and Mullen further investigated Hall et al.'s findings and the role of planning and inhibition in explaining the translation of intention to behaviour of breakfast consumption of 96 Australian university students aged between 17 and 30; they found that planning may be necessary for the consistent performance of health protective behaviour but that inhibition is not predictive (Wong & Mullen, 2009). Not all studies are consistent and these two studies are examples of how different executive function components have been associated with different behaviours. From the available literature it is likely that that executive

function, planning and inhibition are useful abilities for the performance of protective behaviours and that interference control may aid a person reduce risk-taking behaviour.

While the majority of popular health behaviour models refer to attitudes, values and perceived self-efficacy as key predictors of behaviour, executive function represents the ability to plan, inhibit undesirable actions, stay on task, control interference, organise and retrieve information. Executive function represents the ability to be able to formulate an appropriate course of action and progress that idea, or behaviour intention, to a measurable reality. The existence of evidence to support the relevance of executive function to health behaviour is a sound base from which to investigate the predictive value of executive function, planning, inhibition, interference control and verbal fluency, for the health behaviours of young adult men.

Table 2-1 Findings of literature review related to health behaviour and executive function (EF) of emerging and young adult males

Authors	Sample	Method	Findings	Limitations
Gonzalez, Bechara, & Martin (2007)	52 participants aged 29–38 years stratified to three similar sized groups based upon drug use history, 30% male.	Cross-sectional comparison between a control group (*n* = 19), former alcohol abusers (*n* = 17), former methamphetamine users (*n* = 16).	No differences in EF between alcohol abstainers and control groups. Former meth. substance users had poorer working memory and decision-making abilities.	Small sample size. Focus was upon the impact drug use has upon EF and causality limited by cross-sectional design.
Hall, Elias, & Crossley, (2006)	217 adults aged 20–100 years, including 65 aged 20–40 years, 53% male.	Cross-sectional. Multiple regressions used to determine amount of variance in individual behaviours accounted for by EF (inhibition) after controlled for gender, age and IQ. Self-reported health behaviour measures included; sleep difficulties, times per week exercise or alcohol use problem assessment, and number of packs smoked in lifetime.	EF accounted for a significant 29% of smoking variance and 22% alcohol problems but a nonsignificant amount of variance in physical activity.	Stroop error scores for age groups (20–40, 41–65, 65+) were reported but age differences were not analysed. It is unclear why having problems sleeping is a considered a behaviour. Measure of lifetime smoking consumption is retrospective and current smoking status is not considered.

Authors	Sample	Method	Findings	Limitations
Hall, Fong, Epp, & Elias (2008)	64 undergraduates aged 18–22 years, 23% male	Cross-section EF testing (inhibition) and repeated health behaviour reporting after one week. Behaviour measured by self-reported physical activity, physical activity intentions and dietary behaviour. Hierarchical regression controlled for age, gender and education.	People with higher executive function are more likely to action behavioural intentions than people with low executive function. Intention and executive function account for 59 % of variance in physical activity and 61% in dietary behaviour.	Absence of justification of why two measures of reaction time from one Go-No-Go test performance was used as a measure of inhibition. Small sample size limits confidence and interpretation of regression and interaction analysis.
Hoshi, Mullins, Boundy, Brignell, Piccini, & Curran (2007)	109 males aged 25–50 years.	Cross-sectional convenience sample. Four groups, stratified by frequency of drug use including a nondrug user group. Each group size ranging between 25–28 participants. EF measures include inhibition, verbal fluency and planning.	Current recreational drug user group had lower inhibition than other groups. No group differences were found for planning or verbal fluency.	Unable to determine whether drug use predicts executive function or if EF predicts drug use due to cross-sectional design.

Authors	Sample	Method	Findings	Limitations
Ness (2008)	3481 males aged 18–35 years	Cohort study using longitudinal sociodemographic information and cross-sectional EF data. Summed answers to 15 questions from the Behavioural Rating Inventory of Executive Function - Adult Version. Score below 63 deemed as limited EF 90th percentile according to normative data). Health (including physical, mental, social) using Quality of Life measures not health behaviour.	Executive function limitations, like poor organisational skills, difficulty initiating a new task, or persistent memory problems, interfere with educational and job opportunities.	Did not look at behaviours, but physical functioning as indicative of health status. IQ was not related to risk-taking behaviour. The young offenders gambled more than the control group, but the pattern of ongoing gambling either after a loss or a win did not differ.
Reske, Delis, & Paulus (2011)	1025 stimulant users, 155 nondependent stimulant users, 49 non users. Male and Female aged 18-25 years.	Cross-sectional collection of neuropsychological measures (verbal fluency, verbal IQ, impulsivity) following stratification based upon self-reported lifetime illicit drug use.	Low executive ability in the form of verbal fluency is likely to precede and promote risk-taking stimulant use. Gender differences in verbal fluency with male occasional users of illicit drugs responding faster but with more errors than females and nonusers.	No age or proportion of male participation was reported. No analysis of age differences. Stroop Test and Trail Making Test administered but the results were not reported. Alcohol addiction resulted in stratification to the stimulant user group but it is not clear whether alcohol was considered a stimulant and no alcohol use measures were reported.

Authors	Sample	Method	Findings	Limitations
Sabia, Nabi, Kivimaki, Shipley, Marmot, & Manoux (2009)	White-collar office staff in London. 35–55-year-olds. 5,123 (72% men).	Longitudinal health behaviour and cross-sectional EF data collected. The number of self-reported unhealthy behaviours (smoking, alcohol, physical activity, fruit & veg consumption) were added together to produce a phase subtotal and a grand total by adding scores from the three phases. Executive Function measures included one measure of reasoning and two verbal fluency. Composite health behaviour and composite EF score used in analysis. EF dichotomised as poor or not poor EF for logistic regression with composite health behaviour.	Greater exposure to unhealthy behaviours from early to late midlife was found to be associated with a greater risk of poor executive function on longitudinal and cross-sectional analysis. Importance of combined impact of health behaviours and recommendation of a summary score of unhealthy behaviours.	The majority of the study participants were not young adults. The sample was not representative of the wider community but targeted white-collar and 50% of the cohort were not retained.
Syngelaki, Moore, Savage, Fairchild, & Van Goozen (2009).	104 males aged 12–18 years with a history of offending.	Cross-sectional matched group design. Risk-taking behaviour assessed using a gambling task. EF measures include attention, set shifting, reversal learning and spatial planning ability. Two matched groups, 103 offenders and 84 control group nonoffenders. Participants with below average estimated IQ were excluded.	Participants with impaired performance in shifting behaviour and planning engaged in more risk-taking behaviour.	Small sample of 37. Clinical measure of one risk-taking behaviour.

Authors	Sample	Method	Findings	Limitations
Waldstein, Jennings, Ryan, Muldoon, Shapiro, Polefrone, et al. (1996)	Young adult males aged 23-40 years (*n* = 26 normotensive, *n* = 59 hypertensive aged). Two middle-aged comparison groups.	A battery of 14 cognitive tests including three EF measures of attention and inhibition. Cross-sectional neuropsychological assessment of 123 hypertensive and 50 normotensive men aged 23–56 years. Stratified to four groups, based upon age and then hypertension.	Correlation between alcohol consumption and all neuro-psychological performance were non-significant for all groups. Focus of study was age differences in the relationship between hypertension and cognitive function.	No analysis of age differences between young and middle-aged normotensive men. Small group size.
Wilens, Martelon, Fried, Petty, Bateman, & Biederman (2011)	435 adolescents and emerging young adults aged 11–19 years in phase 1 and aged 15–24 years in phase 2	Longitudinal case control study involving young adults with and without attention deficit hyperactivity disorder (ADHD). Measures of EF included planning, organisation, inhibition, attention and verbal learning. EF dichotomised with EF deficit (EFD) defined as having 2 of 6 abnormal EF test results. Participants stratified as either control, EFD, ADHD, EFD & ADHD for analysis. Logistic regression used to assess association between EF and drug, alcohol and cigarette use disorders after controlling for SES.	EF deficit was not associated with the onset of drug use disorder or cigarette consumption. Cigarette smoke was associated with onset of EF deficits with causal pathways identified with a longitudinal design.	Definition of EFD rather than using a continuous measure was identified by authors as likely to have decreased the power to detect subtle differences in EF. DSM-IV criteria were used for behaviour; drug, alcohol and cigarette use, representing extreme examples of behaviour.

Authors	Sample	Method	Findings	Limitations
Wong & Mullen (2009)	96 university students aged 17–22 years, gender not reported	Cross-sectional measures of inhibition and planning. Two measures of behaviour (breakfast consumption), one week apart.	Linear hierarchical regression. Four measures of EF from two tests were entered into a regression model individually as predictors of behaviour. One of the planning measures significantly predicted behaviour (planning time), accounting for 2% of the variance, but inhibition and planning errors were non-significant.	Gender not reported and therefore we are not able to confirm relevance of this research for young adult men, controlled for intention. No reporting of socioeconomic status – was breakfast not consumed due to lack of financial resources.

Planning

Planning is a psychological process that governs the enactment of intention, enhancing the identification of a critical situation and the execution of the goal-directed response (Sheeran et al., 2007). Planning skills demonstrated by the ability to develop 'if-then' plans have been demonstrated to be effective in behaviour change of young adults to increase exercise, healthy eating, reduce alcohol and smoking (Gollwitzer & Sheeran, 2006, 2009; Sheeran et al., 2007). Planning is also included in social cognitive models of behaviour. Measures of planning include The Zoo Map Test (Wilson, Burgess, Emslie, & Evans, 1996), the Self-Ordered Pointing Task (Petrides & Milner, 1982; Ross, Hanouskova, Giarla, Calhoun, & Tucker, 2007) and the Tower Test (Delis, 2001). The ability to put a plan into action involves different cognitive skills than the act of development of a plan (Sniehotta, Scholz, & Schwarzer, 2005). This research investigated the relationship between the capacity to develop and action plans with reported health behaviour.

Inhibition and Interference Control

Inhibition has been described as a key process in executive functioning consisting of three interrelated process: (1) inhibiting a pre-potent response (2) stopping an ongoing response and (3) interference control (van Mourik, Oosterlaan, & Sergeant, 2005). The Trail Making Test (Reitan, 1985) is a measure of inhibition requiring the ability to shift course and attend to more than one stimulus, numbers and letters, at a time (Wecker, 2006). The Stroop colour word test is a measure of inhibition requiring a person to inhibit more habitual responses and replace this with a less familiar or automatic response (Golden, 1978; MacLeod, 1991; Stroop, 1935).

Interference control is a person's ability to adapt to a new behaviour, controlling for the interference that is possible from past behaviour (Stroop, 1935; Zalonis, et al., 2009). The Letter Cancellation Task (Geldmacher, Fritsch, & Riedel, 2000; Uttl & Pilkenton-

Taylor, 2001) is a measure of interference control because in this test participants are required to ignore interfering letters and identify specified letters.

The distinction between inhibition and interference control is not always clear, with some studies reporting the two constructs positively correlate while others have found they do not (Goeleven, De Raedt, & Dierckx, 2010). There are, however, indications that inhibition and interference control are different in regard to predicting health behaviour. Hall found that inhibition predicted protective behaviours and interference control predicted risk-taking behaviours, suggesting that the two constructs may have different predictive qualities (Hall et al., 2006, 2008). West describes the distinction with inhibition being the ability to ignore internal task-irrelevant stimuli where interference control is the ability to ignore external task-irrelevant stimuli (West, 1996). The ability to control interference and inhibit an undesirable behaviour is likely to assist a person seeking to modify a past health risk behaviour or replace a risk behaviour with a health-promoting one. Social cognitive models refer to self-control and personality models use the term conscientiousness to reflect the importance personal control has upon health behaviour. This research measured both executive function contructs, inhibition and interference control as well as conscientiouness, sense of control and examine which is most effective in prediting health behaviours of young adult men.

Verbal Fluency

Verbal fluency refers to the retrieval of words from memory (Hughes & Bryan, 2002). Verbal fluency tasks involve a person retrieving words with a phonemic criterion, such as words beginning with a specific letter. There is some debate about whether verbal fluency is an executive function or dependent upon them. Bryan reported that the retrieval of words is reliant on verbal ability, word knowledge and executive function (Bryan & Luszcz, 2000), but others have recognised verbal fluency as an executive function in its own right (Delis 2001; Jurado 2007; Salthouse, 1988). Verbal fluency is therefore referred

to in this thesis as an executive function requiring a person to be able to generate and use effective retrieval strategies and suppress the usual tendency to search for words based on meaning (Perret, 1974; Phillips, 1997, 1999; Phillips, Bull, Adams, & Fraser, 2002). Verbal fluency is believed to be the last executive function to mature and is influenced by environmental factors (Jurado, 2007). The initial letter fluency task (Lezak et al., 2004) is one test used to measure verbal fluency. The initial letter fluency task requires a person, within a time limit, to name as many words as they can that begin with a specified letter of the alphabet. Rules about the nature of the nominated words are stipulated by the researcher and these rules require the participant to self-monitor, as they must keep track of responses they have already given (Perret, 1974; Ruff, Light, Parker, & Levin, 1997).

To my knowledge there are no examples of research that has investigated verbal fluency as a predictor of a collection of health behaviour of young adult men. Reske, Delis and Paulus (2011) investigated verbal fluency of a mixed gender sample of 1025 stimulant users, 155 nondependent users and 49 participants with no history of stimulant use aged 18–25 years. The authors concluded that it is probable that a low executive ability in the form of verbal fluency is likely to precede and promote risk-taking stimulant use. Sabia et al. (2009) measured verbal fluency and the effect exposure to unhealthy behaviours has upon executive function. In this study involving middle-aged men, verbal fluency was reported but not analysed separately as a predictor of health behaviour. Verbal fluency scores, measured as semantic and phonemic fluency, at baseline appear lower for the men who engaged in more unhealthy behaviours, but the significance of these differences are not reported. Verbal fluency was included as a probable predictor of behaviour for a number of reasons. One being that low verbal fluency skills have been associated with functional health literacy deficits in older populations (Halm, Federman, Siu, Wolf, & Sano, 2009) and it is possible this relationship may be relevant for younger ages. Secondly, verbal fluency is an executive function that matures later (Jurado & Rosselli, 2007) around

the age when behaviour reportedly becomes less risky and more protective (Arnett, 2007; de Visser et al., 2006a; de Visser & Smith, 2007). Verbal fluency may equip a person with skills useful for communicating with others and to obtain health-related health knowledge that in turn influence behaviour (Bryan, Luszcz, & Crawford, 1997).

Health Literacy

Health literacy is a public health construct with origins in acute care and health promotion but a well-cited definition demonstrates influence from psychology; Health literacy is the cognitive and social skills which determine the motivation and ability of individuals to gain access, to understand and use information in ways which promote and maintain good health (Nutbeam, 2000). Health literacy is a construct that was introduced in the 1980s and its definition varies between the disciplines of health promotion, acute care clinicians and health educators (Pleasant, 2008). Concerns by acute care and medical practitioners that patients were unable to read medicine bottle labels or understand basic health behaviour instructions led to the development of what has become known as 'Functional Health Literacy' (Parker & Kindig, 2006; Wagner, Knight, Steptoe, & Wardle, 2007). Health literacy is commonly defined as a constellation of skills including an individual's ability to seek, understand and utilise health information (Baker, 2006; Department of Health and Human Services, 2010) and necessary for self-management (Manganello, 2008). Nutbeam and Kickbusch, (2000) from the discipline of public health, provide a more detailed definition describing health literacy as being made up of three components: functional health literacy, which is the basic understanding of factual health information; interactive health literacy, which concerns one's ability to coordinate functional literacy and apply social skills; and critical health literacy, a person's ability to evaluate information. Communicative and Critical Health Literacy (CCHL) is further defined as the ability to extract, understand and utilise health-related information as well as critically incorporate higher order critical thinking and integration of health information at

an individual and community level (Chinn, 2011; Ishikawa & Yano, 2008). The construct of health literacy has developed greatly from the original ability to read health information, which is captured by the functional health literacy definition that is so often cited in the literature (Nutbeam, 2008). Health literacy is different from health knowledge, the former describes the ability to access and comprehend information and the latter refers to the exposure and retention of information (Beier & Ackerman, 2003; Levinthal, 2008; Macek et al., 2010). Health literacy is therefore a multilayered construct that describes the cognitive, literate and social skills needed for a person to orientate their way through a health system and critique and utilise health information effectively to self-manage their health.

There seems little doubt that many people have problems understanding health information and applying it to their own circumstance, which is reported in health literacy research (ABS, 2006; Jordan, Buchbinder, & Osbourne, 2010). As many as nineteen tools have been developed to measure health literacy but they predominantly measure numeracy and literacy and have failed to capture other skills necessary for a person to obtain up-to-date quality information and incorporate this information into their everyday lives (Jordan, et al., 2010). Barber et al. (2009) identified the need for health literacy measures to include negotiation skills, self-efficacy skills and illness management. The most frequently cited health literacy measures are the Test of Functional Health Literacy in Adults (TOFHLA) and the shortened version (S-TOFHLA; Parker et al., 1995), Newest Vital Signs (NVS; Weisset al., 2005) and the Rapid Estimate of Adult Literacy in Medicine (REALM; Davis et al., 1993). The S-TOFHLA and NVS, two commonly cited health literacy measures, have been found to differ in how they categorise inadequate health literacy (Dunn-Navarra, Stockwell, Meyer, & Larson, 2012). Dunn-Navara et al., report that S-TOFHLA performance is believed to reflect processing capacity and general knowledge. Only one example of Communicative and Critical Health Literacy (CCHL) for a community sample

has been identified (Ishikawa & Yano, 2008) and this has feasibly contributed to health literacy research being dominated by functional health literacy. This research uniquely incorporates three measures of health literacy—functional, communicative and critical—and examines the associations between this construct and the health behaviours of young adult men.

Australian population estimates of health literacy are that between 6.8 and 26% of people have inadequate health literacy, with the variation in health literacy estimates dependent upon which health literacy measure was used (ABS, 2006; Adams, Appleton, Hill, Dodd et al., 2009; Barber et al., 2009). Concerns about the prevalence of low health literacy have been reported in many other countries including the United States (Carmona, 2006; Kutner, Greenberg, Jin, & Paulsen, 2006) the United Kingdom (von Wagner et al., 2007) and Korea (Kim, 2009). Older people with limited formal education and low incomes have been most commonly found to have poorer health literacy skills (Baker, 2006; Barber et al., 2009; Gazmararian, Williams, Peel, & Baker, 2003). Men, however, have been found more likely to have lower health literacy scores than females (von Wagner et al., 2007). The usefulness of health literacy measures as a primary health care tool to identify people who do not have capacity to independently seek and utilise health information and avoid chronic disease is essentially unknown (Paasche-Orlow & Wolf, 2008). Von Wagner (2009) states that it unlikely that health literacy has a direct effect on most health outcomes; instead it mediates processes that he calls health actions.

Inadequate health literacy has been found to be associated with more health risky and less protective behaviours (Wallace 2006; von Wagner et al., 2007). Health literacy was included in this research to gain a better understanding of how health literacy influences health behaviour of young adults, which is seen as the first phase that will inform future research concerned with the relationships between health literacy and

behaviour. This research has considered whether functional, communicative and critical health literacy is associated with health behaviour of young adult men.

Executive Function and Health Literacy Compared

There are parallels between health literacy and other psychological constructs, including executive function. The similarities between the constructs have been recognised; 'It would seem that the new, omnibus edition of health literacy incorporates all of the major psychological, social and environmental constructs that influence individual health choices' (Tones, 2002, p. 289). Tones's bone of contention is that the construct of health literacy is a 're-packaged version of existing theoretical formulations' using existing social and cognitive psychology theories. Health literacy, with reference to Nutbeam and Kickbusch's (2000) definition, requires the use of executive function, namely planning, verbal fluency, ability to be adaptive, problem-solve and critically appraise complex information, which are psychological constructs. Health literacy has been found to have a strong association with verbal fluency in older adults (Halm, Federman, Siu, Wolf, & Sano, 2009). However, verbal fluency is more specifically about word retrieval compared with the broad construct of health literacy. The dominant literacy component in functional health literacy measures seemingly aligns functional health literacy more closely with verbal fluency and verbal IQ. If health literacy tools were able to measure the supplementary skills of critical analysis, negotiation, word retrieval and conflict resolution, to be aligned with Nutbeam and Kickbusch's (2000) three-tiered definition of health literacy, the association between health literacy and verbal fluency would probably be reduced. It is evident that functional health literacy, verbal fluency and verbal intelligence are important to health behaviours and a person's ability to self-manage their health, but little is known which construct is most influential to young men's behaviour.

It is unclear if health literacy measures and the executive function measures are equally useful in predicting health behaviours. This research examined relationships

between health literacy, health behaviour and executive function. In addition to exploring the relationship between executive function and health behaviour, this research investigated whether executive function modifies the relationship between health literacy and health behaviour. A distinction is made between executive function as a modifier between health literacy and health behaviour, as opposed to a mediator (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). This suggests that the relationship between health literacy and health behaviour does not always involve the engagement of executive function, but that the relationship may be modified by executive function for some behaviour. Executive functions are more important in the management of changing circumstances (Miyake et al., 2000). Health behaviours that have become routine may not rely upon the engagement of some executive function, such as planning for example. This is represented in the HLHA Framework (von Wagner et al., 2009) with the pathway between health literacy and health action potentially bypassing action control implementation skills. This research explored how much variance in health behaviour is accounted for by health literacy and executive function of young and emerging men, as this had not previously been considered. It is further proposed that executive function may have a modifying effect that influences the relationship between health literacy and health behaviour, especially when the behaviour or circumstances are unfamiliar.

Intelligence

Intelligence is the 'ability to understand complex ideas, adapt effectively to the environment, learn from experience and engage in various forms of reasoning to overcome obstacles by taking thought' (Neisser et al., 1996, p. 77). Intelligence has been explored by neuropsychologists, cognitive psychologists and epidemiologists as a potential predictor of health behaviour (Boyce & Dax, 1974; Hemmingsson, Essen, Melin, Allebeck, & Lundberg, 2007; Tsaousis & Nikolaou, 2005; Wennerstad et al., 2010). Epidemiologists commonly identify socioeconomic factors, including employment status, income and

education, as prime predictors of health behaviour and have shown interest in the association between IQ (intelligence quotient) scores and socioeconomic factors (Batty, Shipley, Mortensen, Boyle, Barefoot, Granbaek, et al., 2008; Modig-Wennerstad, Silventoinen, Batty, Tinelius, & Bergman, 2008; Wennerstad et al., 2010). Intelligence has not been shown to convincingly predict health behaviours, resulting in calls for research to investigate other factors that may mediate or moderate the relationship with health behaviour and IQ scores (Batty et al., 2006; Gottfredson, 2004).

There is some evidence that intelligence and executive function both influence behaviour, but the relationship between the two constructs is not clear. Hall examined Canadian college students and reported that IQ scores accounted for no more variance in behaviour than executive function (Hall et al., 2006). This does not eliminate intelligence as a probable predictor of health behaviour, but does indicate that the executive function construct may encompass intelligence, or that intelligence may encompass executive function. Generally, intelligence is different from executive function. However, published debate has provided evidence of some executive function components, such as verbal fluency, correlating with psychometric intelligence tests, but on the whole they appear not to be the same (Ardila, Pineda, & Rosselli, 2000; Arffa, 2007; Blair, 2006; Diamond, 2008; Duncan, Emslie, Williams, Johnson, & Freer, 1996; McGrew, 2009; Wechsler, 1997). The Wechsler Adult Intelligence Scale third edition (WAIS III; Wechsler, 1997), which has now been updated with a fourth edition (WAIS IV; Wechsler, 2008) is a commonly used psychometric test of intelligence with versions adapted for children, adolescents and adults and standardised for many countries worldwide. Intelligence tests have, however, been criticised for not being sensitive enough to measure a person's ability 'to act purposefully' (i.e., controlling and planning behaviour), and 'to think rationally' (i.e., organising and directing cognition), which are included in Wechsler's 1939 definition of intelligence (Ardila et al., 2000; Wechsler, 1939). The different components of intelligence, non-verbal

intelligence and verbal intelligence are believed to mature at different ages (Conrad, Jones, & Whipple, 1940; Jaeggi et al., 2008), thus when investigating age-related predictors of behaviour, it may be more useful to refer to the two components of intelligence rather than one broad construct.

Verbal intelligence is a component of intelligence relating to the ability to comprehend and produce verbal information. Verbal intelligence has been shown to be a good estimate of general IQ (Barker-Collo et al., 2008; Yuspeh & Vanderploeg, 2000). Young men known to have engaged in risk-taking actions have been shown to have lower verbal IQ scores (Neisser et al., 1996; Savage, Fairchild, Van Goozen, Moore, & Syngelaki, 2009). The Spot the Word test (Baddeley, Emslie, & Nimmo-Smith, 1993; Mackinnon & Christensen, 2007; Windsor & Anstey, 2008) is a measure of verbal IQ.

Non-verbal intelligence includes the ability to reason and problem-solve with abstract concepts (Wechsler, 1997). The Matrix reasoning is a subtest of the WAIS III that measures abstract reasoning ability, perceptual organisation and perception of risk, which are nonverbal abilities (Tam, 2004 Donders, Tulsky, & Zhu, 2001). The inability to reason has been associated with risk-taking behaviour including dangerous driving and unsafe sex (O'Sullivan et al., 2006; Patel, Gutnik, Yoskowitz, O'Sullivan, & Kaufman, 2006).

Verbal and nonverbal cognitive ability has been shown to be associated with emotional control and risk-taking behaviour. Verbal and nonverbal cognitive processes are interactive mechanisms and are both required for a person to effectively use language skills (Botting, 2004) and language skills enable a person to understand health information and make health behaviour-related decisions (Partida, 2012). Low verbal cognitive ability has been associated with executive function difficulties in the elderly (Yuspeh & Vanderploeg, 2000) and children (Henry, 2012), although a study involving hearing-impaired children found no association between language ability, problem-solving and executive function

(Remine, Care, & Brown, 2008). There is a paucity of research that considers the association between verbal, nonverbal intelligence, executive function and health behaviour of young adult men. In a sample of 207 male and female adolescent participants aged 11–16 years, low nonverbal cognitive ability was associated with problem antisocial behaviour and lower capacity to control emotional arousal (Flouri, Hickey, Mavrouveli, & Hurry, 2011). Similarly, in a study involving 8,433 male and female army recruit applicants aged 14–21 years, people with low verbal intelligence were found less likely to drink alcohol, but those with low verbal intelligence were more likely to misuse alcohol (Windle & Blane, 1989). There is established links between verbal and nonverbal intelligence and health behaviour, but how intelligence and executive function compare as predictors of health behaviour of young and emerging adult males remains unclear.

Personality

Personality denotes the totality of an individual's enduring traits (Richards, 2009). Health behaviour models depict personality traits as being associated with health habits, including smoking and poor diet (Smith, 2009). Various personality models and tests exist to measure personality traits and these tend to be self-administered questionnaires (Hyler, 1994; John & Srivastava, 1999; Larstone, Jang, Livesley, Vernon, & Wolf, 2002). The five factor model and associated Neuroticism, Extraversion, Openness Personality Inventory Revised (NEO-PI-R; Costa & McCrae, 1992) is commonly used in research investigating links between personality and health behaviour (Norman & Conner, 2007). The five factor personality trait model contains five dimensions called neuroticism, extraversion, openness, agreeableness and conscientiousness. Conscientiousness refers to the ability to control one's behaviour and complete tasks (McCrae & Costa, 1987) and has been identified as a trait that is positively associated with protective behaviours and negatively associated with risk-taking behaviours of young adults (Bermudez, 1999; Bogg & Roberts, 2004; Booth-Kewley & Vickers, 1994; Caspi et al., 1997; Courneya, Bobnick, & Schinke,

1999; de Bruijn, Brug, & Van Lenthe, 2009; Goodwin & Friedman, 2006; Skinner, Hampson, & Fife-Schaw, 2002). The NEO-PI-R has good construct validity, internal consistency and test–retest reliability (Costa & McCrae, 1992) and conscientiousness scores repeatedly predict both risky and protective behaviour of adult community samples. It is for these reasons that conscientiousness has been included in study seeking to predict young adult men's health behaviour.

Sense of Control

Sense of control (SOC) in the context of health has been further defined as the degree to which a person perceives themselves to be in control of their health, perceive powerful others to be in control of their health, or regard chance as a major determinant of their health (Skinner, 1996; Wallston, Wallston, & DeVellis, 1978). A personal sense of control influences a person's thoughts about the expected outcomes, goals and barriers and enablers of behaviour (Conner & Norman, 2007). Sense of control is a construct that was operationalised by Lachman and Weaver (1998) to be made up of two dimensions, namely personal mastery and perceived constraints.

There is some confusion about how sense of control (Lachman & Weaver, 1998), health sense of control (Connor & Norman, 2007), health locus of control (Steptoe & Wardle, 2001; Wallston, 2005) and self-efficacy differ in relation to health behaviour (Rodgers, Conner, & Murray, 2008). This represents another example of similar terminology describing similar constructs, as described previously in this chapter. Health-specific sense of control (Abella & Heslin, 1984; Lau, 1982; Lau & Ware, 1981; Perlman, Bobak, Steptoe, Rose, & Marmot, 2003; Steptoe & Wardle, 2001; Wallston & Wallston, 1980) combines health beliefs and the sense of control. Both sense of control and health sense of control have been shown to correlate highly with preventative health behaviour (Lachman & Weaver, 1998) and health beliefs (Conner & Norman, 2007).

Sense of control as a predictor of health behaviour has been compared with self-efficacy, resulting in some theorists dismissing sense of control in favour of self-efficacy as a more useful predictor (Bandura, 1997; McKenzie et al., 2009; Rodgers, Conner, & Murray, 2008). Sense of control differs from self-efficacy as sense of control describes a person's belief that performing a behaviour will make a difference to their circumstances and self-efficacy is broadly a person's belief that they can perform the behaviour (Scholz, Benicio, Shonali, & Schwarzer, 2002; Scholz, Keller, & Perren, 2009). Young adult men have been found to overstate their abilities, exaggerating their self-efficacy (Freund, 2006), indicating the need for caution in the use of self-administed self-efficacy measures. It is unclear whether sense of control is similarly exagerated by young adults. Research has indicated that the predictive value of sense of control may be better when considered in combination with health values (Conner & Norman, 2007;Wallston, 1992; Weiss & Larson, 1990) and socioeconomic status (Kraus, Piff, & Keltner, 2009; Lachman & Weaver, 1998). The associations between sense of control and health behaviour and also income, education and health values and health behaviour are examined in Chapter 4 of this thesis.

Health Behaviour Values

People place a value on their health (DeVellis & McConkie-Rosell, 2000; Ugland, 1989) as well as specific behaviours that a person believes will preserve or risk their health (Allicock, Sandelowski, DeVellis, & Campbell, 2008). Values are influenced by health knowledge, with the provision of behaviour-specific information to young adults having been found to influence the attributed value and influence behaviour (Scioli, Biller, Rossi, & Riebe, 2009). Young adults, however, reportedly attribute values to behaviours irrespective of their knowledge about the health pros and cons (Statzer, 2010).

Values influence attitudes (Milfont, Duckitt, & Wagner, 2010) and both values and attitudes have been shown to influence behaviour. The health belief model refers to

attitudes, rather than values, describing them as cognitive, emotional and behavioural reactions that influence behaviour and can be negative or positive (Ajzen & Madden, 1986; Ajzen & Tinmko, 1986; Kraus, 1995; Stroebe, 2000). Attitudes are specific to behaviours and generate actions and intentions that further influence specific behaviour (Noar et al., 2008; Stroebe, 2000). For example, a person's attitude about physical activity may be unrelated to their alcohol consumption attitudes. Likewise, a person may have a negative attitude toward eating vegetables, but they may know they are good for their health and believe that eating them is important. The Health Behaviour Survey (Grant, Wardle, & Steptoe, 2009; Steptoe & Wardle, 2001) collected information on importance values of specific behaviours from young adults in Europe. This research will replicate this with young adults living in Australia and investigate whether the health behaviour values of specific behaviours is associated with the actioning of that behaviour.

Health-Related Predictors of Health Behaviour

Health Status and Chronic Disease

Health status is a multidimensional concept incorporating physical and psychological health, including the symptoms of disease, activity limitations, depression, distress and a subjective appraisal of one's own health (Denton et al., 2004). Self-perceived health status for most people includes an overall estimate of their health and functioning, even if mental and physical health dimensions may differ for individuals (Hayward, Smith, Kaplan, & Kerr, 2003). There are concerns that the health status, both mental health status (Goldney, Eckert, Hawthorne, & Taylor, 2010; Jorm & Butterworth, 2006) and physical health status (Caldwell & Dear, 2004; Dear, Henderson, & Korten, 2002; Goldney et al., 2010; Jorm & Butterworth, 2006; Kilkkinen et al., 2007) have worsened for young adult men in the past decade. The health status deterioration of young adult men is reportedly more marked and of concern for rural and remote men (AIHW, 2010; Park, Mulye, Adams, Brindis, & Irwin, 2006; Phillips, 2009).

Chronic disease, by definition, has an impact upon health status and is often coupled with the medical expectation that a person will self-manage their condition by engaging in specific preventative behaviours (Sawyer et al., 2007). One explanation for the decline in health status of young adult men is the increased presence of chronic disease, bought about partially by the improved medical outcomes and life expectancy of children with chronic conditions who then become young adults (Ferrer et al., 2004). Young adults with chronic disease are rarely the focus of research, but there are a few studies that have found, against medical advice, young people with chronic disease such as diabetes and asthma are more likely than other young adults to engage in risk-taking behaviour such as inactivity, smoking, drug taking and alcohol use (Blomquist, 2006; Suris & Parera, 2005; Tercyak et al., 2005). The potential health consequence of risky behaviour for a person who already has a chronic health condition is greater than for other young adults (Sawyer et al., 2007), heightening the significance of research that investigates predictors or this health risk behaviour.

Mental illness, including depression and anxiety are chronic diseases and people with mental illness have also been found to engage in more health risk and less protective behaviours (Allison et al., 1999; McCarty et al., 2009) by smoking more, drinking more alcohol, exercising less and are more likely to be obese (Sawyer et al., 2007; Strine et al., 2004; Suris & Parera, 2005). A longitudinal study following men and women between the age of 24 and 30 reported significant associations between health status (depression) and behaviour (alcohol use) of young adult males (McCarty et al., 2009). The research found that the associations change over time throughout the period of emerging adulthood, with alcohol consumption being more often by men in their late twenties and early thirties as a means of coping with stress compared with the men in their early twenties.

The direction of influence between health behaviour and health status requires longitudinal research. Therefore, whether health status influences health behaviour or vice

versa cannot be clarified with cross-sectional studies, thus limiting the capacity of this study to report directional findings. The literature, including longitudinal research, can be somewhat informative, and I have based my research questions and analysis on evidence available (Hakkinen, Rinne, Vasankari, Hakkinen, & Heikki, 2010; Lu, Samuels, & Kuo-Cherh, 2002; McCarty et al., 2009). It is apparent from the literature that health status influences health behaviour, and that when young adults have a lowered health status, they are less likely to engage in protective behaviour and more likely to engage in risk-taking behaviour.

The cognitive load required to self-manage health is greater for people with chronic disease, requiring the processing of complex information and adapting of behaviour (de Ridder, Geenen, Kuijer, & van Middendorp, 2008; Price, 2007). No current health behaviour models appear to capture this. Given there are reports of young adult men's worsening health status, and also concern for a perceived increase in health risk behaviours, as described in Chapter 1, I investigated associations between the two. Not only is it likely that the presence of a chronic disease will be associated with health behaviours, but the association may vary depending upon the age of the person. As previously stated, a key hypothesis of this thesis is that age is a significant factor in predicting health behaviour of men during emerging and young adulthood. Secondary to this is that young adults with a chronic disease, particularly if it has a negative effect on their health status, will have a worse health behaviour profile than young adults with no chronic disease. Age and the developing executive function are relevant to this relationship as the men transitioning through emerging adulthood may struggle with the cognitive load required for chronic disease self-management.

Summary

Health behaviour is an extensively researched field but questions remain regarding what factors most effectively predict the behaviour of young adult men. Debate about the validity and reliability of existing health behaviour models point to the reality that one model is unlikely to fit all behaviours and all people. The viewpoints and terminology used by the disciplines traditionally interested in health behaviour, namely public health and social psychology, are now joined by health psychology, cognitive psychology and neuropsychology. This research builds upon the multidisciplinary literature and contributes to a knowledge base relevant to the health behaviours of young adult men.

Health behaviours that include health protective and health risk behaviours are influenced by self-regulation as well as social, cognitive, conative and biological variables (Hall et al., 2006). The factors influencing behaviour are complexly intertwined. The list of factors that have been found to influence health and health behaviour is lengthy and the interactions produce a complex web indicative of contemporary health behaviour models becoming more multidisciplinary but behavioural specific. A key reference for this research is the von Wagner et al. (2009) HLHA Framework, which includes a combination neuropsychological, public health and social psychological constructs. Based upon this framework, this research has specified measurable factors from the broad constructs included in the framework and identified additional factors that may have relevance to the health behaviour of young adult men. In Chapter 3, some factors in the model, namely age, socioeconomic status and health status, and their associations with the health behaviour of emerging and young adult men are explored. In Chapter 4, additional factors including select psychological constructs (executive function, intelligence, personality and health values) and public health constructs (health literacy and health status) and their associations to health behaviour are examined. Some of the constructs, namely the value of

specific behaviour, conscientiousness and sense of control have previously been found to be predictive of behaviour in older populations and European samples (Abella & Heslin, 1984; Peltzer, 2000; Steptoe & Wardle, 2001; Wardle & Steptoe, 1991) but have not been tested with Australian younger adults. Other constructs, namely health literacy, planning, interference control, inhibition, verbal fluency, intelligence and health status are still relatively unresearched as predictors of young adults health behaviour.

One strength of this research is that the target group are young adult men, who are underrepresented in primary health care research, have worsening health status and reportedly do not fit well with popular health behaviour models (AIHW, 2010; Renner et al., 2007; Weinstein & Rothman, 2005). This multidisciplary study has examined predictive qualities of constructs derived from public health, social psychology, cognitive psychology and neuropsychology to inform clinicians and researchers who work with young adult men who must increasingly self-manage their health behaviours.

3. Health Behaviours of Men aged 16–44 years: An Analysis of the South Australian Monitoring Surveillance System (SAMSS) Sample

Men's Behaviour During Emerging Adulthood

This chapter describes a study analysing information from over 5,000 self-reported health questionnaires to describe the health behaviour of emerging and young adult men and test associations between this behaviour, age and sociodemographic factors. As introduced in Chapters 1 and 2, emerging adulthood is the period of development between adolescence and the mid- to late twenties (Arnett, 2001; Arnett, 2007; Frech et al., 2009; Galambos et al., 2005). Young adulthood is the extension of emerging adulthood and is estimated to be realised by age 39 years (Roberts, Walton, & Bogg, 2005). Social roles change as many young men transit from school to the workforce, friendship groups alter and for many, independence and decision-making opportunities and income increase. The majority of men during emerging adulthood are granted adult-like rights and responsiblities with regard to their behaviour (Barbalat, Domenech, Vernet, & Fourneret, 2010). There have been calls for the age of drivers' permits to be increased, reflecting social concern that some health behaviour choices may require a longer period of guardianship (Fromm et al., 2010; Walker, Butland, & Connell, 2000). Physiological, neurological and cognitive development have been found to continue after the legal adult age of 18, with the mid- to late twenties documented as the age at which maturity is reached (Cohen et al., 2003; Eccles, 2003; Frech et al., 2009; Galambos et al., 2005). High preventable death rates and injury from risk-taking behaviours may indicate that some young adult males do not have the capacity to self-manage their health and that adult expectations are being awarded prematurely (ABS, 2010a; AIHW, 2010; Fromme et al., 2010).

Health behaviours are expected to change throughout a person's life as proposed by the life-course theory (Dannefer & Uhlenberg, 1999). Risky drug and alcohol use by emerging adults have been shown to reduce at the milestone ages of between 21 and 24

years (de Visser et al., 2006b; Fromme, Wetherill, & Neal); however, there is evidence of age-related changes with older men, aged 30–39 years, increasingly likely when compared with younger aged men to use illicit drugs and consume alcohol daily at risky levels (AIHW, 2011). While there is some evidence that older men nearing the end of young adulthood engage in more protective behaviours, such as eating more fruit and vegetables (Barreto et al., 2009), there is contradictory evidence showing no age difference in fruit and vegetable consumption and that younger men engage in more physical activity (ABS, 2010). Two large cohort studies, one European and the other American, reported that men with no adverse health conditions maintain stable health behaviours between the ages of 24 and 42 years (Zalonis et al., 2009) and between ages 42 and 60 years (Ilomaki et al., 2009) suggesting a plateau of health behaviour may be achieved for many men at the age of mid-20s and maintained as least until the age of 60 years. These studies did not include men younger than aged 24 years so this thesis set out to extend the age range and explore whether there is a health behaviour plateau in the mid-20s and if men younger than 23 years report different behaviour to that of men aged from 24 to 44 years.

It is unlikely that all men will abandon all risk taking and adopt all protective behaviour, made apparent by the report that the quantity of alcohol consumed by Australian males is stable across all age groups until the age of 70, and it is only then that quantites decline (Coulson et al., 2010). This may indicate that with increasing age men continue to drink alcohol, but change their drinking patterns, drinking fewer drinks more frequently thus engaging in risky drinking less, while the younger men drink less often but when they do, they consume more alcohol and‘binge drink’(Williamson, Sham, & Ball, 2003; Yang et al., 2007). Not all men, however, change their behaviour and perceived social and cultural expectations have been generally attributed to the maintenance of risk-taking behaviour such as excessive alcohol consumption, smoking and insufficient vegetable consumption during middle age (Ilomaki et al., 2009; O’Brien et al., 2009).

Given this, however, it is hypothesised that mid-20s may represent a milestone age for many young men when health behaviours are modified, risky behaviours reduce and preventative behaviours increase. Participants included in this research were aged between 16 and 44, providing the prospect of identifying a change in behaviour at the conclusion of emerging adulthood that will be maintained throughout young adulthood in the 30s and early 40s.

Socioeconomic Status, Education and Health Behaviour

For the general population the more years of formal education and higher personal income are indicative of healthier behaviour (de Visser et al., 2006; Hammond, 2003; Lynch, Kaplan, & Salonen, 1997). Consistently, men who have achieved a university-level education engage in less risk-taking behaviour than men with a lower level of education (Kerr, Greenfield, Bond, Ye, & Rehm, 2009; CDC, 2010). More years of formal education provide a person with greater capacity to gain more financial resources to afford health-promoting activities and learn strategies to access knowledge that promote protective health behaviour. There is evidence, however, that young adult men with greater disposable income are more likely to binge drink, use illicit drugs and consume more takeaway food (Reeder, Darling, Williams, & McGee, 2006; Yilldirium & Demirbay, 2008). This association alters with increased age (Merline, Jager, & Schulenberg, 2008) so that associations between years of formal education, income and health behaviour may be different for the men aged between 16 and their mid-20s when compared with the older men. Thus, socioeconomic status may be more indicative of health status and behaviour in the later phases of emerging and young adulthood when career paths, family and social networks begin to stabilise. Associations between income, education, age, and health status and health behaviour are explored in both Chapter 3 and 4.

Living at Home with Parents

Increasing numbers of young adult men in Australia and throughout the world remain living with their parents well into the period of emerging adulthood (Cobb-Clark, 2008; Berrington, Stone, & Falkingham, 2009; Kitchen, 2011) and this may have implications for their socioeconomic status, perceived social roles, self-management and health behaviour. Young adult men living with parents often have greater socioeconomic status and have been found to engage in riskier behaviour (Berry, 2008; Mulder & Clark, 2002). Young adults living with parents that have their own source of income and are legally entitled to make their own decisions may be in a 'responsibility void', neither taking responsibility for their own self-management, but neither taking direction from their parents (Coid & Yang, 2010). Although living with parents may also provide a source of mentoring and health knowledge experience that can translate to better health behaviours (He, Kramer, Houser, Chomitz, & Hacker, 2004), few young adult men are inclined to seek this type of help (Price-Robertson, Smart, & Vassallo, 2009; Wimer & Levant, 2011). Parents of young adults may also no longer consider it their role to be responsible for their 'adult child' (Gitelson & McDermott, 2006; Turcotte, 2006). In comparison, young adults who live independently are more clearly responsible for managing all aspects of their wellbeing.

Living away from the protection of the parental home may provide important experiences. The retrieval and practical application of these skills during emerging adulthood, a period of social and economic change, may also be associated with a person's cognitive abilities and their capacity to adapt (Patrick, Blair, & Maggs, 2008) and self-manage their own health behaviours. Living with parents may therefore mean a young adult man has more disposable income, but have less independent living skills and take less active responsibility for actioning protective health behaviours. It is hypothesised that

men with greater household income will engage in more protective behaviours, but young adults living with their parents may not.

Rurality

As described in Chapter 1, emerging and young adult men who live in rural and regional locations are reported to have higher rates or morbidity and mortality due to health risk behaviours. This research will explore associations between age and health behaviours for both men living in metropolitan and non-metropolitan South Australia.

Health Status, Chronic Disease and Behaviour

Health status includes both how a person describes their state of wellbeing (Bennett, 2009) and whether they have been diagnosed with a medical condition or chronic disease risk factors (Hayward, Smith, Kaplan, & Kerr, 2003). Chronic diseases are illnesses that are long lasting and usually irreversible (Taylor, 1999). The presence of one or more chronic diseases is associated with poorer health status (Tamakoshi, Murata Kondo, Toyoshima, & Yatsuya, 2006). The management of chronic disease in Australia often involves consultations with medical practitioners and the expectations that a person with the chronic disease will self-manage their health (Glasgow et al., 2008). Age and behaviour are central to this thesis and in the previous Chapter I described why the presence of chronic disease may have a greater impact on health behaviours young adults. As described in Chapters 1 and 2, young adults who are in a state of neurological and psychological development are expected to struggle with the management of a chronic disease and practice fewer recommended protective behaviours compared with older more developed men who have a chronic disease. It is hypothesised that there will be an association between age group and health behaviour, such that younger men will engage more in risky behaviour, relative to middle-aged men. The association between health behaviour and age may be different for men who report having a chronic disease.

Summary

Very little is known about the health behaviours of men aged between 16 and 44 years and this research aims to address this gap. The period between adolescence and adulthood is an exciting and, for some, a dangerous phase. This phase of life is potentially dangerous because after the age of 18 years assumptions are made leading to a common expectation that an adult person has the ability to make sound decisions that are health promoting. Some health behaviour models would suggest that failure to make health-promoting actions may be due to poor access to finances, services and information. Another perspective is that cognitive and decision-making abilities have not yet developed and that age may be a predictor of behaviour. This research will supplement existing health behaviour models by investigating the predictive value of age and health status, controlling for socioeconomic factors that have been found to influence behaviour. This is significant as current health behaviour models described in Chapter 2 do not specifically refer to age or health status, but they may be important predictors for the behaviour of young adult men.

A second predictor of behaviour being investigated is health status. Ailing health has more commonly been researched with older populations, however reports of increased chronic disease in younger men suggests this may be necessarily considered as a predictor of young adult health behaviour. This research has implications for how public health messages are provided and the age at which people are considered suited to independently self-manage their health.

This study set out to test two age–behaviour hypotheses, which are: (a) health behaviour will improve with increasing age when comparing men of different age groups and (b) that the age and health behaviour association would be moderated by (*i*) chronic disease status and (*ii*) health status. The three key research questions are:

1. How are young adult men living in South Australia best described in terms of their socioeconomic, health status and health behaviours?
2. What are the associations between age and health behaviour for men of different age groups living in metropolitan and non-metropolitan South Australia?
3. What are the associations between age, health status and health behaviour?

Method

Participants

Participants were 5,262 males aged between 16 and 44 years. Data for this sample were collected between July 2002 and December 2008 and included all males aged between 16 and 44 years who completed a SAMSS CATI during this timeframe. The age range was selected based upon the emerging adulthood and young adulthood age estimate. Participants in the age group 40–44 years were included to provide the potential for a plateau of behaviour scores that is suggested in the literature (Laaksonen, Prattala, & Lehelma, 2003). The term plateau is used to describe a potential milestone change or levelling out of behaviour at the achievement of adulthood.

Measures

South Australian Health Monitoring Surveillance System

Health behaviour, health status and sociodemographic status were measured using pre-existing data collected by the South Australian Health Monitoring Surveillance System. Information about the health and behaviours of people are routinely collected from government-run health surveillance systems in a range of ways, including phone, face-to-face interviewing and internet (Link & Mokdad, 2005; http://www.abs.gov.au). The use of telephones to systematically collect personal information occurs throughout the world to

inform and influence public health policy (Chittleborough, Taylor, Baum, & Hiller, 2009). Data collected using computer-assisted telephone interviewing methods has been found to be comparable to face-to-face interviews, which are more costly and therefore limit sample size potential (Nelson, Holtzman, Bolen, Stanwych, & Mack, 2001; Taylor et al., 2006). The telephone was used in the Men in Australia telephone survey (MaTES) to collect information for a relatively large-scale male reproductive health information from middle-aged men, collecting very personal and private data (de Kretser et al., 2006; Holden et al., 2006). The use of the telephone provides an element of anonymity and privacy that may increase the reporting of stigmatised behaviours, and are likened to the use of computers for collecting information (Ghanem, 2005; Newman, 2002).

Australian states have telephone health surveillance systems (http://www.health.nse.gov.au) and the South Australian version is called South Australian Monitoring and Survellance System (SAMSS), which is managed by the South Australian Government Department of Health (http://health.adelaide.edu.au/pros/). SAMSS data is collected using computer-assisted telephone interviews (CATI) by randomly sampling from the electronic White Pages covering the whole of South Australia. CATI reduce sampling error as the interviewer is prompted to clarify responses to resolve anomalies and participants are only asked relevant questions, reducing interviewer sequencing errors (ABS, 2010b). A large randomly selected SAMSS sample provided representative data that was analysed to describe what young men are doing in relation to their health.

An introductory letter is sent by SAMSS to the household of each selected telephone number advising them of the health survey and to expect phone contact. One person from a household is selected based on who has a birthday closest to a fixed nominated date and there is no replacement for nonrespondents. People aged 16 years and over respond to questions about themselves. The single- and multiple- response questions provide categorical and continuous variables for a range of health and socioeconomic

information. The test–retest statistics for demographic questions used in SAMSS is extremely high (r = 0.97–1.00) and overall health status (Kappa = 0.60, 95% CI [.46, .75]) is moderate. Self-reported health behaviour questions ranged in reliability, with alcohol drinking (ICC 0.75 = 95% CI [.63, .83]), smoking (Kappa = 0.81 95% CI [.72, .89]), physical activity (ICC 0.47 = 95% CI [.27, .61]), fruit consumption $Kappa_w$ = 0.60 95% CI [.45, .76]) and vegetable consumption ($Kappa_w$ = 0.50 95% CI [.32, .69]) (Dal Grande, Fullerton, & Taylor, 2012). Kappa values (Kappa) are reported for nominal variables, weighted Kappa values ($Kappa_w$) are reported for ordinal variables and account for disagreement and chance, and interclass correlation coefficients (ICC) are reported for continuous variables (Cohen, 1968; Kottner, et al., 2011). The complete SAMSS questionnaire contained 196 socioeconomic, health status and health behaviour questions. Exclusion of questions specifically asked of females about childbirth and breastfeeding and questions asked only of participants under the age of 16 years resulted in 25 questions being deemed relevant to young adult men and this research.

SAMSS data are collected continuously throughout the year with questions being rotated. Some questions are asked of all participants for a period of time and then swapped for alternative questions. Some variables, namely physical activity, chronic disease status for cardiovascular disease (CVD), blood pressure and cholesterol have a lower sample size as these questions were not asked of all participants. It is common for surveillance systems to rotate questions so all participants in a set period of time are asked one set of questions, and in the consecutive period, all participants are asked a different set of questions. This practice reduces interview time and allows a broader range of health information to be collected thereby maximising outputs within time and budget limits (Mokdad, 2009; Nicholls, 1983).

SAMSS started in July 2000 and has maintained an interview rate of approximately six hundred (600) participants per month, with an average response rate of 69.3% (Del

Grande et al., 2012; Population Research and Outcomes Studies Unit, 2002). The response rate reported by SAMSS is the proportion of people who agree to participate in the CATI after being randomly selected from the electronic pages. This figure is less than the total number of all South Australian people who would ideally be included in a statewide health survey. In 2008, 68.7% of South Australian households were represented in the White Pages, but this is dropping annually (Dal Grande & Taylor, 2010). A limitation of recruitiment methods using the electronic White Pages is that only households with a listed landline phone or a mobile phone number are included. The participants of SAMSS represent a randomly selected sample of people who are registed with White Pages, and the response rate needs to be considered in this context.

Socioeconomic

Socioeconomic data included age group, work status, education, and income, area of residence, marital status and living arrangements. Age group included five age groups 16–24, 25–29, 30–34, 35–39 and 40–44 years. Employment status was coded into five categories: full-time employed, part-time employed, student, unemployed and seeking work or not employed (including retired, unable to work and stay at home). A student with a part-time job was classified as a student. Education was coded as four categories: not having completed high school, completed high school, trade diploma equivalent or university degree. Income was reported as annual household Australian dollars in the following five brackets, $0–20,000, $20,000–40,000, $40,000–60,000, $80,000–100,000 and greater than $100,000. Financial status was categorised as spending more than income, living from week to week or being able to save. Area of residence was reported either metropolitan or regional South Australia. Marital status was reported as either married or unmarried. Relationship status was reported separately and coded as either single or in a relationship. Living arrangement was either reported as living with an adult family member or in some other arrangement.

Health Status

Health status has been commonly self-reported, with research participants rating their health on a Likert scale from *excellent* to *poor* (Singh-Manoux et al., 2006; Hayward, Smith, Kaplan, & Kerr, 2003). Another measure of health status is the presence of chronic disease (Paterson, 2001; Taylor et al., 2010). Health status variables included a self-reported measure of health status (rated on a 5-point scale as *excellent*, *very good*, *good*, *fair* or *poor* (SF-1; Ware, Snow, Kosinski, & Gandek, 1993), body mass index (BMI) calculated from self-reported height and weight, mental health measured by the Kessler 10 (K10) and a composite chronic disease score combining current diagnosis of diabetes, asthma, high cholesterol, coronary vascular disease (CVD), arthritis, high blood pressure and mental health illness.

Body Mass Index (BMI)

There are three main methods used for monitoring obesity in settings such as population health surveys: body mass index (BMI), waist circumference and waist hip ratio (WHR). BMI and WHR were both reported in this research. BMI was calculated by dividing weight in kilograms by the square of height in metres from self-reported height and weight. This has been shown to correspond closely to measured height and weight (Taylor, Campostrini, Gill, Carter, Del Grande, & Herriot, 2010). The standard BMI classification used by the Australian Bureau of Statistics (ABS, 2011b) for adults aged 18 years or over is: underweight (BMI < 18.5), healthy weight (BMI ≥ 18.5 and BMI < 25), overweight (BMI ≥ 25 and BMI < 30) and obese (BMI ≥ 30) (ABS, 2010b; WHO, 2000).

Mental Health

The Kessler 10 (K10; Kessler & Mroczek, 1994), is a 10-item self-report questionnaire intended to yield a global measure of ‘non-specific psychosocial distress’ based on questions about the level of nervousness, agitation, psychological fatigue and depression in the past four weeks. The measure was developed to be informative about

those levels of distress that are associated with health impairment, in the 90th to 99th percentile of the general population range. The K10 is considered suitable for use with young adult men (Andrews & Slade, 2001; de Kretser, Cock, & Holden, 2006; Slade, 2001). K10 scores were categorised prior to obtaining the data, as low distress for scores of below 20, moderate distress for scores between 20 and 24, high distress for scores between 25 and 29 and very high distress for scores of above 30 (AMHOCN, 2005; Slade, 2001). The K10 is a statistically significant predictor of serious mental health illness, anxiety and depression (Furukawa, Kessler, Slade, & Andrews, 2003; Pouline, Lemoine, Poirier, & Lambers, 2005; Sunderland, Mahoney, & Andrews, 2012) and has excellent internal consistency and reliability with a Cronbach's alpha of $\alpha = 93$ and standard errors of measurement range from .14 to .24. (Kessler, Andrews, Colpe, Hiripi, Mroczek, & Normand, 2002). Tests for the K10 produce weighted kappa scores ranging from .42 to .74, which indicate the K10 is a moderately reliable instrument (Dal Grande, Taylor, & Wilson, 2002).

Composite Chronic Disease Score

A chronic disease score (CDS) was calculated by allocating a person one point for each chronic disease (diabetes, asthma, cardiovascular disease, arthritis, high blood pressure and mental illness) they reported to currently have. A score of zero indicates that a person has none of the listed chronic diseases.

Health Behaviours

Health behaviour variables included physical activity, smoking status, and alcohol use and vegetable and fruit consumption.

Physical Activity

Physical activity had been coded as *sufficient, insufficient activity* or *no activity* prior to obtaining the SAMSS data. Each minute of moderate-intensity physical activity (i.e. brisk walking, swimming, medium-paced cycling) was counted and each minute of

vigorous activity (i.e. jogging, active sports such as football and basketball) were counted as two minutes. Sufficient activity was defined as achieving at least 150 minutes per week of physical activity in the previous week, insufficient activity included greater than zero but less than 150 minutes of physical activity. Physical activity was dichotomised for logistic regression analysis, as either sufficient or insufficient. Sufficient activity was consistent with the definition above, 150 minutes of physical activity per week and insufficient and no activity categories were combined and coded as insufficient activity.

Smoking Status

Smoking status refers to the consumption of tobacco and was classified as current smoker, ex-smoker and nonsmoker. Participants who reported being a current smoker estimated the number of cigarettes consumed daily. Smoking was recoded as a dichotomous variable for logistic regression analysis as current smoker or nonsmoker, by combining ex-smokers and non-smokers together in one group.

Alcohol Consumption

Two alcohol use variables were used. Firstly, the number of alcoholic drinks usually consumed on an occasion of drinking and secondly an excess drinking classification. Participants were asked to estimate how many drinks they usually consumed on an occasion when they were drinking alcohol. The continuous alcoholic drinks variable was then categorised and reports of six or more drinks were classified as excess drinking, between three and five drinks were classified as moderate drinking and non-excess drinkers consumed less than two drinks. Excess drinking was recoded to a dichotomous variable for logistic regression analysis as with excess drinker or non-excess drinker. Excess drinking was defined as the consumption of more than two standard alcoholic drinks in any one day as this quantity reduces the lifetime risk of harm from alcohol-related disease or injury (NHMRC, 2009). Non-excess drinker was defined as the usual consumption of two or less drinks per session. ‘Short-term risk’ from drinking refer to the

risk of accidents and injuries occurring immediately after drinking and the risk of developing alcohol-related diseases from regular drinking over a lifetime was labelled as 'long-term risk' (Department of Health, 2004; NHMRC, 2001; WHO, 2000). Risk score calculations were conducted by SAMSS prior to this dataset being obtained. Calculations are based upon participant responses to; "How often do you usually drink alcohol?" and "On a day when you drink alcohol, how many drinks do you usually have?" This information was used to calculate the risk of harm from alcohol in both the short and the long term according to the guidelines on alcohol consumption produced by the NHMRC (CATITRC, 2003). The Australian alcohol guidelines refer to a standard drink and this is equivalent to 10 grams of alcohol or 12.5 mL. of pure alcohol (NHMRC, 2009).

Vegetable and Fruit Consumption

Daily vegetable consumption was coded into three categories. Less than one serve daily, between two and four serves daily or more than five serves daily. This was recoded to a dichotomous variable for logistic regression analysis of between zero and four serves recorded as insufficient and five or more serves per day recorded as sufficient vegetable consumption. Daily fruit consumption was reported as sufficient with consumption of two or more serves per day and insufficient as less than two serves per day.

Composite Health Behaviour Score

All but one of the 15 variables included in this analysis were categorical or ordinal. To generate a continuous health behaviour score, categorical and ordinal variables were recoded as 1 when an activity was classified as sufficient or protective to health and zero for insufficient or a health risky behaviour. One half point was allocated to moderate drinking of 3 or 4 drinks per day. The scores for each of the individual behaviours were then added together to produce a composite health behaviour score. The values allocated to individual behaviours to produce a composite health behaviour score ranging between zero and five are shown in Table 3-1.

Table 3-1 Scores allocated to individual health behaviours for the calculation of a composite health behaviour score

Health behaviour variable		Score
Exercise	Sufficient activity	1
	Insufficient activity	0
Smoking	Current nonsmoker	1
	Smoker	0
Vegetable consumption	>= 5 serves of vegetables daily	1
	< 5 serves of vegetables daily	0
Fruit consumption	>= 2 serves of fruit daily	1
	< 2 serves of fruit daily	0
Alcohol consumption	0 - 2 alcoholic drinks per session	1
	3 - 4 drinks per session	0.5
	>= 5 drinks per session	0

Procedure

Obtaining Pre-Existing SAMSS Data

The South Australian Monitoring and Surveillance System (SAMSS) was managed by the South Australian Government Department of Health (SA Health). The pre-existing data used in this analysis was obtained from SA Health in a Microsoft Excel format.

Human Research Ethics Approval

Approval was obtained to conduct this research from the University of South Australia's Human Research Ethics Committee (HREC) on September 17, 2008, protocol number P232/08.

Design and Statistical Analysis

This study used a cross-sectional design as participants were interviewed only once. The data collected in the 5,262 individual interviews were conducted over a period of 6.5 years, between 2000 and 2007. In order to answer the research questions, three stages of analysis were completed. First, the demographic, health status and health behaviour of participants were described for each age group and group differences were analysed using Pearson's chi square (χ^2) using the Monte Carlo method recommended for large samples (Field, 2005). Second, tests of association between age group and health behaviours were examined using analysis of covariance (ANCOVA) for continuous health behaviour scores and logistic regression for dichotomised categorical variables (physical activity, smoking status, alcohol use, vegetable and fruit consumption). Third, the relationship between health status and health behaviour score was examined using ANCOVA with the continuous health behaviour score as the dependent variable. To investigate the associations between health status and chronic disease with individual behaviours; physical activity, smoking, excess drinking, fruit and vegetable consumption, logistic regression analysis was conducted. Health status and chronic disease were entered into separate models as dependent variables.

Education and household income were included as covariates for all analyses based upon a theoretical rational. Evidence, described previously in this chapter, indicates that household income and education are likely to account for significant variance in the health behaviour of young adult men. The analyses have therefore examined associations between age and health behaviour and health status and health behaviour after accounting for the effect of household income and education level.

Data Screening

Before analyses related to each research question were conducted, data were screened for missing data, outliers and distribution of the continuous variables, alcohol, health behaviour score and chronic disease score. Using PASW 18 (formerly SPSS 17) all responses of *unknown* or *undecided* were coded as missing. Some variables had systematic missing data as some questions asked by SAMSS are rotated in 3-month cycles, meaning not all questions are asked all of the time. What this does mean, however, is that all people interviewed at a particular time are all asked the same questions, thus not presenting a source of bias. The percentage of missing data for physical activity was 17.6%, current high blood pressure was 16.6% and current cholesterol was 16.6%. The distribution of the missing data was examined and found to be equally distributed across age groups and not expected to bias results.

The distribution of continuous variables; the composite health behaviour score, alcohol use and chronic disease score were investigated to determine the suitability of using parametric tests. A significant Shapiro-Wilk (W) test for health behaviour score indicated the distribution was non-normal, W (3877) = .967, $p < .000$; however, visual inspection of a histogram and Q-Q plot showed a near normal distribution with a skewness statistic of zero. Shapiro-Wilk tests are very sensitive to departures from normality in large samples (Field, 2009; Tabachnick & Fidell, 2007). A significant Shapiro-Wilk statistic indicated the scores for the number of alcoholic drinks consumed on an occasion when

drinking were not normally distributed and outliers were identified, W (4712) = .770, $p <$ .000. Visual inspection of Q-Q plots and histogram for alcohol use confirmed this, showing a positively skewed sample with a skewness statistic of 2.4. Chronic Disease Score was not normally distributed, W (4387) = .598, $p < .000$, and positive skewness of 2.3, the visual inspection of Q-Q plots and histogram showed a good distribution. ANOVA tests are robust to moderate violations of normality (Field, 2005), so the analysis was deemed viable.

Results

Descriptive Statistics for the SAMSS Sample

The first research questions sought to provide a description of young adult men living in South Australia in terms of their socioeconomic status (SES), health status and health behaviour. Variables were identified as SES (age, employment, education, income, family financial status, area of residence, marital status, relationship status, living alone, living with family), health status (health status, BMI, diabetes, asthma, CVD, arthritis, high blood pressure, high cholesterol, mental health illness, psychological distress and chronic disease score) or health behaviours (physical activity, smoking, alcohol use, excess drinking, vegetable consumption, fruit consumption and health behaviour score). Categorical variables were analysed for frequency and median scores. The three continuous scores—health behaviour score, chronic disease score and alcohol drinks usually consumed when drinking—were analysed for frequency and mean scores.

Socioeconomic Status

Information from 5,262 men aged between 16 and 44 years were included in the analysis. Data were analysed as a whole sample and also within five age groups. As shown in Table 3-2, each of the five age groups was represented and the largest age group in the sample were the older men aged 40–44 years. It is noted that the youngest age group spans

nine years compared with the other age groups that span five years; however, the SAMSS data were obtained with these defined age groups and could not be manipulated. More of the older men lived in rural and regional areas compared with the younger age groups χ^2 (4) = 24.54, $p < .01$.

The vast majority were employed or students, with very few reporting being unemployed. The four education levels were evenly distributed, as were the income brackets. Most of the men reported being able to save money, implying their income is greater than living expenses. The majority lived in metropolitan Adelaide which is consistent with the distribution of the South Australian population.

The 16 to 24-year-olds were more likely to be students and in part-time employment and less likely to be in full-time employment compared with the older men. Over one third of the 40 to 44-year-olds had not completed high school and was more likely than the other age groups to report 'other' as their type of employment. There was a significant association between age and educational attainment, χ^2 (12) = 639.88, $p < .01$. The youngest and oldest age groups were less likely to have finished high school or have a tertiary degree. The percentage of men having completed high school declined with age group. More men aged 30–34 years compared with the men in other age groups had completed a tertiary degree. Trade qualifications were equivalent across age groups, with the exception of the 16–24-year-olds who were more likely to be students.

Nearly half of the 16 to 24-year-olds did not know or refused to provide their household income. Financial status was better for the younger age groups, with younger men, particularly the 24 to 35-year-olds reported a slightly greater capacity to save money, $\chi^2(16) = 49.67$, $p < .01$. The 16–24-year-olds were more likely to report living in a household with an income of more than $100,000.

The sample was evenly split between being married and unmarried, however, two thirds reported being in a relationship. The majority reported living with other people, but only a small number of these lived with a related adult, such as a parent. Relationship status changed gradually with age, with the older men more likely to be married, χ^2 (4) = 1396.83, $p < .01$ and in a relationship χ^2 (4) = 15.12, $p = .01$. The younger men were less likely to be living alone χ^2 (4) = 183.67, $p < .01$ and more likely to be living with parents χ^2 (4) = 63.12, $p < .01$.

Table 3-2 Socioeconomic Status Descriptive Statistics for the SAMSS sample

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Age		1439	(27.3)	697	(13.2)	896	(17.0)	991	(18.8)	1239	(23.5)	**5262**	**(100)**	
Employment	Full-time	569	(39.5)	566	(81.2)	737	(82.3)	824	(83.1)	1001	(80.8)	**3697**	**(70.3)**	**1562.2 (16)***
	Part-time	235	(16.3)	61	(8.8)	61	(6.8)	75	(7.6)	101	(8.2)	**533**	**(10.1)**	
	Student	529	(36.8)	29	(4.2)	14	(1.6)	16	(1.6)	10	(.8)	**598**	**(11.4)**	
	Unemployed	91	(6.3)	29	(4.2)	45	(5.0)	33	(3.3)	41	(3.3)	**239**	**(4.5)**	
	Other	15	(1.0)	12	(1.7)	39	(4.4)	43	(4.3)	86	(6.9)	**195**	**(3.7)**	
Education	Secondary Incomplete	593	(41.2)	110	(15.8)	186	(20.8)	260	(26.2)	387	(31.2)	**1536**	**(29.2)**	**639.9 (12)***
	Secondary Complete	514	(35.7)	164	(23.5)	168	(18.8)	134	(13.5)	180	(14.5)	**1160**	**(22.0)**	
	Trade or diploma	194	(13.5)	233	(33.4)	287	(32.0)	330	(33.3)	413	(33.3)	**1457**	**(27.7)**	
	Degree or higher	122	(8.5)	188	(27.0)	253	(28.2)	267	(26.9)	257	(20.7)	**1087**	**(20.7)**	
	Not stated	16	(1.1)	2	(0.3)	2	(0.2)	0	(0.0)	2	(0.2)	**22**	**(0.4)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Household income	Up to $12,000	22	(1.5)	12	(1.7)	19	(2.1)	28	(2.8)	48	(3.9)	**129**	**(2.5)**	**67.1 (24)***
	$12,001–$20,000	41	(2.8)	25	(3.6)	39	(4.4)	39	(3.9)	57	(4.6)	**201**	**(3.8)**	
	$20,001–$40,000	142	(9.9)	97	(13.9)	133	(14.8)	148	(14.9)	187	(15.1)	**707**	**(13.4)**	
	$40,001–$60,000	140	(9.7)	129	(18.5)	216	(24.1)	240	(24.2)	283	(22.8)	**1008**	**(19.2)**	
	$60,001–$80,000	143	(9.9)	150	(21.5)	174	(19.4)	187	(18.9)	237	(19.1)	**891**	**(16.9)**	
	$80,001–100,000	116	(8.1)	99	(14.2)	115	(12.8)	116	(11.7)	148	(11.9)	**594**	**(11.3)**	
	More than $100,000	202	(14.0)	104	(14.9)	136	(15.2)	154	(15.5)	202	(16.3)	**798**	**(15.2)**	
	Don’t know /refused	633	(44.0)	81	(11.6)	64	(7.1)	79	(7.9)	77	(6.2)	**934**	**(17.7)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Financial status	Spending more than income	38	(2.6)	32	(4.6)	33	(3.7)	51	(5.1)	67	(5.4)	**221**	**(4.2)**	**49.8 (16)***
	Live week to week	171	(11.9)	90	(12.9)	137	(15.3)	145	(14.6)	210	(16.9)	**753**	**(14.3)**	
	Money left but spend it	90	(6.3)	49	(7.0)	95	(10.6)	83	(8.4)	107	(8.6)	**424**	**(8.1)**	
	Can save a bit	611	(42.5)	341	(48.9)	424	(47.3)	513	(51.8)	637	(51.4)	**2526**	**(48.0)**	
	Can save a lot	249	(17.3)	170	(24.4)	194	(21.7)	181	(18.3)	188	(15.2)	**982**	**(18.7)**	
	Don't know / refused	280	(19.4)	15	(2.2)	13	(1.5)	18	(1.8)	30	(2.5)	**356**	**(6.8)**	
Area of residence	Metro. Adelaide	1089	(75.7)	521	(74.7)	649	(72.4)	695	(70.1)	841	(67.9)	**3795**	**(72.1)**	**24.5 (4)***
	SA Country	350	(24.3)	176	(25.3)	247	(27.6)	296	(29.9)	398	(32.1)	**1467**	**(27.9)**	
Marital status	Not married	1336	(92.8)	366	(52.5)	312	(34.8)	340	(34.3)	392	(31.6)	**2746**	**(52.2)**	**1396.8 (4)***
	Married/defacto	103	(7.2)	330	(47.3)	584	(65.2)	651	(65.7)	845	(68.2)	**2513**	**(47.8)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Relationship status	Single	508	(35.3)	272	(39.0)	295	(32.9)	328	(33.1)	384	(31.0)	**1787**	**(34.1)**	**15.1 (4)***
	In a relationship	923	(64.1)	421	(60.4)	599	(66.9)	659	(66.5)	850	(68.6)	**3452**	**(65.9)**	
Living Alone	Yes	77	(5.4)	130	(18.7)	187	(20.9)	209	(21.1)	270	(21.8)	**873**	**(16.7)**	**183.7 (4)***
	No	1354	(94.1)	563	(80.8)	707	(78.9)	778	(78.5)	964	(77.8)	**4366**	**(83.3)**	
Living with related adult	Yes	152	(10.6)	71	(10.2)	63	(7.0)	47	(4.7)	48	(3.9)	**381**	**(7.3)**	**63.1 (4)***
	No	1279	(88.9)	622	(89.2)	831	(92.7)	940	(94.9)	1186	(95.7)	**4858**	**(92.7)**	

Health Status

The majority of the sample described their current health status as *good* to *very good* as in. Table 3-3. There was a significant association between age group and health status, χ^2 (16) = 97.05, $p < .01$, with younger men reporting a better health status than the older men. The Body Mass Index (BMI) median was 'overweight' but an equal number were categorised as having a 'normal' BMI. As age increased, so did BMI, $\chi^2(12) = 383.15$, $p < .01$, with 70% of men aged 40–44 years overweight or obese compared with 35.5% of the 16–24-year-olds.

There were 4,387 men who reported if they had a current diagnosis of diabetes, CVD, arthritis, asthma, high blood pressure, high cholesterol or a mental illness. The majority of the sample, 70.4%, reported no diagnosed chronic disease. The prevalence of diabetes, CVD, arthritis, high blood pressure and high cholesterol were all lower than asthma and mental health illness. All of the medical conditions, with the exception of asthma, increased with age. Most of the sample were categorised as having low to moderate levels of psychological distress. Poor mental health was associated with greater age group, χ^2 (12) = 37.40, $p < .01$, with 3.2% of men aged 40 to 44 reporting very high levels of psychological distress. Men over the age of 30 years were significantly more likely to have a current mental health diagnosis. Chronic disease scores ranged from 0 to 6 with a median of 0 for all age groups. The frequency of chronic disease scores can be seen in Table 3-3 and mean chronic disease scores are shown in Table 3-4. There was a significant association between increased age group and increased chronic disease with men older than 40 years of age more likely to have more than one chronic disease compared to all younger aged men, χ^2 (4) = 112.92, $p < .01$. Age

group differences in chronic disease score were confirmed using ANCOVA, $F(4, 3547) = 33.32$, $p < .01$.

Table 3-3 Health status descriptive statistics for the SAMSS sample

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Health status	Excellent	316	(22.0)	199	(28.6)	213	(23.8)	202	(20.4)	210	(16.9)	**1140**	**(21.7)**	**97.1 (16)***
	Very good	649	(45.1)	274	(39.3)	367	(41.0)	392	(39.6)	477	(38.5)	**2159**	**(41.0)**	
	Good	369	(25.6)	171	(24.5)	229	(25.6)	276	(27.9)	373	(30.1)	**1418**	**(26.9)**	
	Fair	91	(6.3)	47	(6.7)	64	(7.1)	104	(10.5)	146	(11.8)	**452**	**(8.6)**	
	Poor	14	(1.0)	6	(0.9)	23	(2.6)	17	(1.7)	33	(2.7)	**93**	**(1.8)**	
Body Mass Index	Underweight	31	(3.0)	7	(1.1)	6	(0.7)	9	(1.0)	8	(0.7)	**61**	**(1.3)**	**383.2 (12)***
	Normal	631	(61.5)	320	(48.3)	316	(36.7)	296	(31.4)	353	(29.4)	**1916**	**(40.8)**	
	Overweight	271	(26.4)	249	(37.6)	403	(46.9)	441	(46.8)	536	(44.7)	**1900**	**(40.5)**	
	Obese	93	(9.1)	86	(13.0)	135	(15.7)	197	(20.9)	303	(25.3)	**814**	**(17.4)**	
Diabetes	No	1435	(99.7)	693	(99.4)	891	(99.4)	973	(98.2)	1196	(96.5)	**5188**	**(98.6)**	**60.6 (4)***
	Yes	4	(0.3)	4	(0.6)	5	(0.6)	18	(1.8)	43	(3.5)	**74**	**(1.4)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Asthma	No	1217	(84.6)	599	(85.9)	783	(87.4)	892	(90.0)	1098	(88.6)	**4589**	**(87.2)**	**19.2 (4)***
	Yes	222	(15.4)	98	(14.1)	113	(12.6)	99	(10.0)	141	(11.4)	**673**	**(12.8)**	
Cardiovascular disease	No	1428	(99.2)	692	(99.3)	889	(99.2)	972	(98.1)	1217	(98.2)	**5198**	**(98.8)**	
	Yes	11	(0.8)	5	(0.)	7	(0.8)	19	(1.9)	22	(1.8)	**64**	**(1.2)**	**12.6 (4)***
Arthritis	No	1421	(98.7)	676	(97.0)	859	(95.9)	906	(91.4)	1093	(88.2)	**4955**	**(94.2)**	**163.3 (4)***
	Yes	18	(1.3)	21	(3.0)	37	(4.1)	85	(8.6)	146	(11.8)	**307**	**(5.8)**	
High blood pressure	No	1212	(99.3)	549	(98.4)	711	(97.5)	785	(93.3)	942	(90.8)	**4199**	**(95.7)**	**126.9 (4)***
	Yes	9	(0.7)	9	(1.6)	18	(2.5)	56	(6.7)	96	(9.2)	**188**	**(4.3)**	
High cholesterol	No	1218	(99.8)	554	(99.3)	713	(97.8)	798	(94.9)	934	(90.0)	**4217**	**(96.1)**	**172.3 (4)***
	Yes	3	(0.2)	4	(0.7)	16	(2.2)	43	(5.1)	104	(10.0)	**170**	**(3.9)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Mental health condition	No	1340	(93.1)	632	(90.7)	782	(87.3)	875	(88.3)	1068	(86.2)	**4697**	**(89.3)**	**40.6 (4)***
	Yes	99	(6.9)	65	(9.3)	114	(12.7)	116	(11.7)	171	(13.8)	**565**	**(10.7)**	
Psychological distress	Low	960	(66.8)	501	(71.9)	645	(72.1)	711	(71.8)	861	(69.7)	**3678**	**(70.0)**	**37.4 (12)***
	Moderate	361	(25.1)	140	(20.1)	166	(18.6)	197	(19.9)	250	(20.2)	**1114**	**(21.2)**	
	High	101	(7.0)	46	(6.6)	58	(6.5)	56	(5.7)	85	(6.9)	**346**	**(6.6)**	
Chronic disease score	0	961	(78.7)	417	(74.7)	525	(72.0)	571	(67.9)	613	(59.1)	**3087**	**(70.4)**	**112.9 (4)***
	1	229	(18.8)	112	(20.1)	168	(23.0)	191	(22.7)	280	(27.0)	**980**	**(22.3)**	
	2	24	(2.0)	27	(4.8)	29	(4.0)	58	(6.9)	96	(9.2)	**234**	**(5.3)**	
	3	7	(0.6)	2	(0.4)	7	(1.0)	14	(1.7)	34	(3.3)	**64**	**(1.5)**	
	4	0	(0.0)	0	(0.0)	0	(0.0)	4	(0.5)	10	(1.0)	**14**	**(0.3)**	
	5	0	(0.0)	0	(0.0)	0	(0.0)	2	(0.2)	4	(0.4)	**6**	**(0.1)**	
	6	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.1)	1	(0.1)	**2**	**(0.0)**	

Table 3-4 Mean Chronic Disease Scores by age group

	Age groups												
	16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		ANCOVA
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Chronic Disease Score	0.24	0.51	0.31	0.58	0.34	0.60	0.45	0.79	0.62	0.92	0.40	0.72	33.32 (4, 3547)*

[a] n = 4387

Health Behaviours

While there was some variation between individual health behaviours, generally health behaviour was not associated with age. The frequencies and percentages of the five health behaviours are shown in Table 3-5. More than half of the 4,335 people asked about physical activity were categorised as getting adequate physical activity. Physical activity was significantly associated with age, χ^2 (8) = 163.75, $p < .01$. Age group comparison show that the older age groups are exercising less, with just over half of the men aged over 35 years getting sufficient physical activity. Most of the sample did not currently smoke tobacco. Those who did consume an average of 13 cigarettes per day (M = 13.0, SD = 10). The older age group were more likely to smoke compared to the younger age groups, χ^2 (4) = 24.98, $p < .01$. The mean number of alcoholic drinks consumed on an occasion when drinking alcohol was below five drinks (M = 4.48, SD 3.67) with a median of 3. Long-term and short-term risk to health from alcohol consumption was similar for all age groups, confirmed with a nonsignificant Pearson chi-square test. Even through just over one quarter of the 40 to 44-year-olds reported excess drinking the 16–24-year-old men were significantly more likely, when compared to the other aged groups, to consume more than four drinks on an occasion when they consumed alcohol, χ^2 (8) = 239.42, $p < .01$.

Very few men were eating the recommended five serves of vegetables daily and about one third were eating the recommended two serves of fruit per day. Fruit and vegetable consumption was consistent across all age groups, confirmed by nonsignificant chi-square tests of association between age and vegetable consumption, χ^2 (12) = 10.88, p =.54 and age and fruit consumption, χ^2 (12) = 12.66, p = .39.

Composite health behaviour scores were calculated for the 3,202 participants who had a valid score for all five variables. The minimum score was 0, maximum score was 5, mean score for the sample, as seen in Table 3-6, was 2.22 and a median of 2 (M = 2.22, SD = 1.08). The mean composite health behaviour scores were nonsignificantly different for the different age groups, $F(4, 3872) = 1.59$, $p = .17$, reducing by less than one health behaviour unit across the age groups ranging from M = 2.28 for men aged 16 to 24 and M = 2.18 for the 40 to 44-year-olds. This indicates that before accounting for any covariates, health behaviour was not associated with age, and the men in their late thirties and forties were behaving similarly to the men in their late teens and early twenties.

Table 3-5 Univariate health behaviour descriptive statistics for SAMSS sample

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Physical activity	No activity	92	(7.6)	58	(10.5)	93	(12.9)	141	(17.0)	176	(17.2)	**560**	**(12.9)**	**163.8 (8)***
	Insufficient	218	(18.1)	128	(23.1)	195	(27.0)	221	(26.6)	309	(30.1)	**1071**	**(24.7)**	
	Sufficient	894	(74.3)	367	(66.4)	433	(60.1)	469	(56.4)	541	(52.7)	**2704**	**(62.4)**	
Smoking status	Nonsmoker	802	(55.7)	327	(46.9)	373	(41.6)	357	(36.0)	426	(34.4)	**2285**	**(43.4)**	**25.0 (4)***
	Ex-smoker	311	(21.6)	182	(26.1)	267	(29.8)	330	(33.3)	448	(36.2)	**1538**	**(29.2)**	
	Smoker	326	(22.7)	188	(27.0)	256	(28.6)	304	(30.7)	365	(29.5)	**1439**	**(27.3)**	
Alcohol Use														
Short-term risk	Low risk	988	(68.8)	479	(68.7)	608	(68.2)	671	(67.8)	810	(65.4)	**3556**	**(67.7)**	**4.1 (4)**
	High risk	448	(31.2)	218	(31.3)	284	(31.8)	319	(32.2)	428	(34.6)	**1697**	**(32.3)**	
Long-term risk	Low risk	1356	(94.8)	671	(96.4)	853	(96.0)	940	(94.9)	1159	(93.7)	**4979**	**(95.0)**	**9.1 (4)**
	High risk	75	(5.2)	25	(3.6)	36	(4.0)	50	(5.1)	78	(6.3)	**264**	**(5.0)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Alcohol drinker status	Excess drinker	652	(52.2)	229	(35.9)	248	(30.5)	243	(27.1)	308	(27.5)	**1680**	**(35.6)**	**239.4 (8)***
	Moderate	288	(23.1)	216	(33.9)	274	(33.7)	281	(31.4)	339	(30.3)	**1398**	**(29.7)**	
	Non-excess	308	(24.7)	192	(30.1)	292	(35.9)	372	(41.5)	472	(42.2)	**1636**	**(34.7)**	
Vegetable consumption daily	≤ 1 serves	488	(34.0)	232	(33.3)	286	(31.9)	326	(32.9)	395	(31.9)	**1727**	**(32.9)**	**10.9 (12)**
	2-4 serves	846	(59.0)	424	(60.8)	542	(60.5)	591	(59.6)	758	(61.2)	**3161**	**(60.1)**	
	5 + serves	100	(7.0)	41	(5.9)	68	(7.6)	74	(7.5)	85	(6.9)	**368**	**(7.0)**	
Fruit consumption daily	< 1 serve fruit	946	(65.8)	474	(68.0)	635	(70.9)	673	(68.0)	863	(69.7)	**3591**	**(68.3)**	**12.7 (12)**
	2+ serves of fruit	492	(34.2)	223	(32.0)	260	(29.1)	317	(32.0)	375	(30.3)	**1667**	**(31.7)**	

		Age groups												
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	χ^2(df)
Health behaviour score	0.0	45	(4.4)	13	(2.6)	33	(5.0)	40	(5.3)	43	(4.6)	**174**	**(4.5)**	
	0.5	15	(1.5)	25	(4.9)	19	(2.9)	30	(4.0)	32	(3.4)	**121**	**(3.1)**	
	1.0	156	(15.1)	74	(14.5)	84	(12.8)	103	(13.8)	143	(15.3)	**560**	**(14.4)**	
	1.5	50	(4.8)	42	(8.3)	62	(9.5)	71	(9.5)	104	(11.2)	**329**	**(8.5)**	
	2.0	251	(24.3)	108	(21.2)	141	(21.6)	146	(19.5)	201	(21.6)	**847**	**(21.8)**	
	2.5	113	(10.9)	63	(12.4)	84	(12.8)	91	(12.2)	82	(8.8)	**433**	**(11.2)**	
	3.0	258	(25.0)	107	(21.0)	124	(19.0)	154	(20.6)	200	(21.5)	**843**	**(21.7)**	
	3.5	55	(5.3)	38	(7.5)	56	(8.6)	40	(5.3)	47	(5.0)	**236**	**(6.1)**	
	4.0	73	(7.1)	32	(6.3)	38	(5.8)	58	(7.8)	61	(6.5)	**262**	**(6.8)**	
	4.5	6	(0.6)	2	(0.4)	6	(0.9)	3	(0.4)	4	(0.4)	**21**	**(0.5)**	
	5.0	12	(1.2)	5	(1.0)	7	(1.1)	12	(1.6)	15	(1.6)	**51**	**(1.3)**	

[a] n = 5262

Table 3-6 Multivariate health behaviour scores and alcoholic drink consumption by age group with ANCOVA statistics with Age as a predictor and household income and education as covariates[a]

	Age groups										ANOVA	ANCOVA
	16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total		*F*(df)	F (df)
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)		
Health Behaviour Score	2.28	(1.0)	2.26	(1.1)	2.23	(1.1)	2.19	(1.1)	2.17	(1.1)	2.22	(1.1)	1.59 (4, 3872)	3.85 (4, 3202)*
Alcohol consumption	5.75	(4.2)	4.50	(3.3)	4.22	(3.7)	3.91	(3.3)	3.75	(3.0)	4.36	(3.6)	49.35 (4, 4708)*	39.11 (4, 3928)*

[a] $n = 3202$

* $p < .05$

Age and Health Behaviour for Metropolitan and Rural/Regional Men

The second research question asked whether age is positively associated with the health behaviours of emerging and young adult men living in metropolitan and non-metropolitan rural and regional South Australia. Health behaviour scores of metropolitan and rural men for each age group were compared using factorial ANOVA. Analysis of covariance (ANCOVA) and logistic regression were used to investigate the effect of age group upon health behaviour score, physical activity, smoking status, alcohol use, vegetable consumption and fruit consumption. ANCOVA was used to investigate the association between age and health behaviour scores of men from five age groups ranging between 16 to 44 years. Covariates entered into the model were education and household income. The Levene's test was nonsignificant, $F(4, 3204) = .53$, $p > .05$ indicating that variance in scores for each age group are equivalent, thus the assumption of homogeneity of variances was met.

Age and Composite Health Behaviour

Factorial ANOVA was used to compare the health behaviour scores for each age group of men living in metropolitan areas ($n = 2769$) compared with men living in non-metropolitan rural and regional areas ($n = 1108$) in South Australia. The main effect of rurality of residence was statistically significant, $F(1,3867) = 25.33$, $p < .01$, with men in non-metropolitan locations reporting significantly lower health behaviour scores ($M = 2.08$, $SD = 1.08$) than men living in metropolitan locations ($M = 2.29$, $SD = 1.08$). The main effect of age group was not significant, $F(4, 3867) = 1.62$, $p > .05$, as there was a nonsignificant association between age and health behaviour for men living in both metropolitan and non-metropolitan locations and this is shown in Figure 3-1.

As shown in Table 3-6, the results of the ANCOVA indicated that after controlling for education and household income, there was a very small, although significant effect of age on health behaviour score $F(4, 3202) = 3.85$, $p < .01$, partial $\eta^2 = .01$. The direction of the effect was unexpected, showing that the health behaviour scores were lower for the older age groups, indicating less protective and more risk-taking behaviour. A very small effect size indicates that age accounted for 1% of the variance. Post hoc group comparisons show that the relationship between age and health behaviour is only significant when comparing the health behaviour scores for the youngest, 16–24-year-olds and the oldest, 40–44 year age groups.

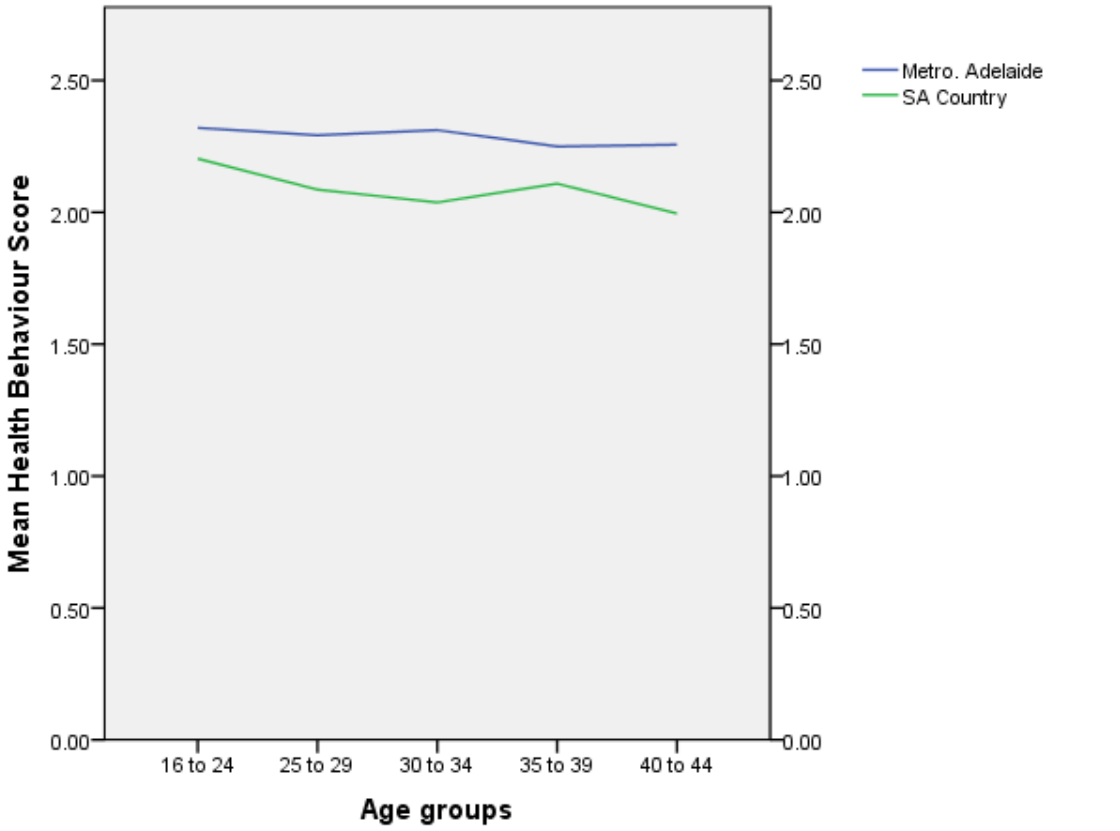


Figure 3-1 Health behaviour scores by age group of men living in metropolitan and non-metropolitan, rural South Australia, 2002–2008.

Age and Individual Health Behaviours

Logistic regression was performed to assess the impact of age group on presence of individual health behaviours, physical activity, smoking, alcohol binging, vegetable consumption and fruit consumption. The logistic regression analysis used dichotomous behaviour outcome variables, which were classified in accordance with published guidelines and these are shown in Table 3-7. While logistic regression was used to determine the probability of a behaviour occurring for each age group, continuous health behaviour variables (health behaviour score, alcohol consumption) and their relationship with age group were analysed using analysis of covariance (ANCOVA). ANCOVA models containing age as the independent variable and education and household income as covariates significantly predicted all behaviours except vegetable consumption. Results are shown in Table 3-8 and indicate that increased age group was associated with less physical activity, less smoking and less excess drinking. Age accounted for 5.3% of variance in physical activity, 4.4% of variance in smoking, 1.3 % of variance in fruit consumption and 4.4% of variance in excess drinking.

The association with age and alcohol use was further explored using a continuous number of alcoholic drinks usually consumed when drinking. ANCOVA was used to see whether the number of drinks differed with age group. As shown in Table 3-6, after controlling for household income and education, the number of drinks consumed was greater for the younger age groups, $F(4, 3928) = 39.11$, $p < .01$, partial $\eta^2 = .04$. There was a small effect size accounting for less than 4% of the variance. Planned contrasts revealed that the 16–24-year-old men reported greater alcohol consumption than all

other aged groups, but there were nonsignificant differences between consecutive age groups of men from the age of 30.

Table 3-7 Health behaviours categorised in accordance to recommended guidelines, by age group

		Age groups											
		16 to 24		25 to 29		30 to 34		35 to 39		40 to 44		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Physical activity	Insufficient	310	(7.2)	186	(4.3)	288	(6.6)	362	(8.4)	485	(11.2)	1631	(37.6)
	Sufficient	894	(20.6)	367	(8.5)	433	(10.0)	469	(10.8)	541	(12.5)	2704	(62.4)
Excess drinking alcohol	Excess drinker	940	(19.9)	445	(9.4)	522	(11.1)	524	(11.1)	647	(13.7)	3078	(65.3)
	Non-excess	308	(6.5)	192	(4.1)	292	(6.2)	372	(7.9)	472	(10.0)	1636	(34.7)
Smoking tobacco	Current smoker	326	(6.2)	188	(3.6)	256	(4.9)	304	(5.8)	365	(6.9)	1439	(27.3)
	Nonsmoker	1113	(21.2)	509	(9.7)	640	(12.2)	687	(13.1)	874	(16.6)	3823	(72.7)
Vegetable consumption	Insufficient	1334	(25.4)	656	(12.5)	828	(15.8)	917	(17.4)	1153	(21.9)	4888	(93.0)
	Sufficient	100	(1.9)	41	0.8	68	(1.3)	74	(1.4)	85	(1.6)	368	(7.0)
Fruit consumption	Insufficient	946	(18.0)	474	(9.0)	635	(12.1)	673	(12.8)	863	(16.4)	3591	(68.3)
	Sufficient	492	(9.4)	223	(4.2)	260	(4.9)	317	(6.0)	375	(7.1)	1667	(31.7)

Table 3-8 Logistic regression model with age group, education and household income as predictors of individual health behaviours

	Odds Ratio			χ^2	R_N^2
	Education	Income	Age		
Physical activity	1.14*	1.12*	0.78*	157.40*	.059
Smoking	1.30*	1.18*	0.92*	166.88*	.055
Vegetable consumption	1.09	0.99	1.03	2.79	.002
Fruit consumption	1.17*	1.06*	0.97	42.77*	.014
Binge Drinking	1.24*	.996	1.24*	140.63*	.048

Note. χ^2 = Chi square; R_N^2 = Nagelkerke's R^2
* $p < .05$

Health Status and Health Behaviour

In order to answer the third research question and explore the associations between health status, health behaviour and age group two measures of health status, chronic disease score, reported health status, health behaviour score and age group were analysed using logistic regression and ANCOVA.

Chronic Disease and Health Behaviour

Chronic disease score was significantly associated with physical activity, smoking and excess drinking. Logistic regression results are shown in Table 3-9 and indicate that an increase in chronic disease is associated with a decrease in the amount a man exercises, smokes and drinks excess alcohol. Chronic disease score was not associated with fruit or vegetable consumption.

Participants were then stratified as having either no common chronic disease or having at least one chronic disease. The presence of a chronic disease, after accounting for income and education level, was significantly related to composite health behaviour score, $F(1, 3205) = 7.60$, $p < .01$. $\eta^2 = 0.00$. Although statistically significant, the health behaviour mean scores for each group was small, $M = 2.27$, $SD = 1.1$, for men with no chronic disease and $M = 2.13$, $SD = 1.1$, for men with one or more chronic disease. Nil per cent of the variability of health behaviour score can be attributed to the presence of a chronic disease.

Interaction Between Age and Chronic Disease As Predictors of Health Behaviour

A factorial between-groups analysis of variance ANCOVA was used to compare the average health behaviour scores of the five age groups and the

presence of at least one chronic disease as shown in Table 3-10. There was a nonsignificant main effect of age on health behaviour score after accounting for education and household income, $F(4,3197) = 1.96$, $p = .10$, $\eta^{2=\cdot}=.002$ and a nonsignificant interaction effect between age and the presence chronic disease, $F(4, 3197) = 0.93$, $p = .45$, $\eta^2 = .001$. However, there was a significant main effect of the presence of chronic disease, $F(1, 3197) = 4.10$, $p = .04$, $\eta^2 = .001$ and people with at least one chronic disease had significantly lower composite health behaviour scores at all age groups as shown in Table 3-11. For example, men aged between 16–24 years with at least one chronic disease had a mean health behaviour score of 2.17 and men of the same age with no chronic disease had a mean health behaviour score of 2.32.

Table 3-9 Logistic regression model showing chronic disease score, education and household income as predictors of individual health behaviour

	Odds Ratio			χ^2	R_N^2
	Education	Income	Chronic Disease Score		
Physical activity	1.01*	1.13*	0.85*	63.32*	0.02
Smoking	1.29*	1.16*	0.86*	135.10*	0.05
Vegetable consumption	1.12	0.97	1.05	4.14	0.25
Fruit consumption	1.17*	1.04	0.97	31.61*	0.01
Binge Drinking	1.29*	0.98	1.03	53.91*	0.02

Note. $\chi 2$ = Chi square; R_N^2 = Nagelkerke's R^2
* $p < .05$

Table 3-10 Analysis of covariance (ANCOVA) showing insignificant non-significant interactions between age, health status, chronic disease status and Health Behaviour Score

		F	(*df*)	η^2
Chronic disease	Education	136.51*	(1, 3197)	.041
	Income	21.37*	(1, 3197)	.007
	Age	1.96	(4, 3197)	.002
	Chronic disease	4.10*	(1, 3197)	.001
	Age * Chronic disease	0.93	(4, 3197)	.001

Note: η^2= eta squared which is a measure of effect size
* $p < .05$

Table 3-11 Health behaviour scores for men with and without a chronic disease by age group

	Age group																			
	16 to 24				25 to 29				30 to 34				35 to 39				40 to 44			
	Chronic Disease				Chronic Disease				Chronic Disease				Chronic Disease				Chronic Disease			
	No		Yes		No		Yes		No		Yes		No		Yes		No		Yes	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Health behaviour score	2.32	(1.0)	2.17	(1.1)	2.26	(1.0)	2.17	(1.0)	2.25	(1.1)	2.20	(1.1)	2.23	(1.1)	2.16	(1.2)	2.27	(1.1)	2.03	1.11

Self-Reported Health Status and Health Behaviour

Self-reported health status was significantly associated with all individual health behaviours. As shown in Table 3-12, poorer health status was associated with insufficient physical activity, current smoking, insufficient vegetable and fruit consumption and excess drinking. Mean health behaviour scores ranged from $M = 2.6$, $SD = 1.0$, for people with excellent health status down to $M = 1.3$, $SD = 1.0$, for people with poor health status. ANCOVA results which are shown Table 3-13, indicate that health status, after controlling for income and education was significantly related to health behaviour score, $F(4, 3202) = 43.18$, $p < .00$. $\eta^2 = 0.05$. Five per cent of the variability of health behaviour score can be attributed to having a poor health status.

Interaction Between Age and Health Status as Predictors of Health Behaviour

A between-groups analysis of covariance (ANCOVA) was used to compare the average health behaviour scores of the five age groups for self-reported health status, as shown in Table 3-14. The sample with a valid health behaviour score and reported health status are independent random samples due to the structure of the CATI. In the sample who reported their health status, there was a nonsignificant main effect of age and health behaviour score after accounting for education and household income. There was a significant main effect of self-reported health status, $F(4, 3182) = 37.79$, $p < .01$, $\eta^2 = .045$. There was a nonsignificant interaction effect between age and health status, $F(4, 3182) = 1.47$, $p = .56$, $\eta^2 = .004$. This indicates that poor self-reported health status is associated with health behaviour similarly for all age groups.

Table 3-12 Logistic regression showing self-reported health status, education and household income as predictors of individual health behaviour

	Odds Ratio			χ^2	R_N^2
	Education	Income	HealthStatus		
Physical activity	1.06	1.10*	0.71*	137.49*	0.05
Smoking	1.25*	1.13*	0.68*	262.49*	0.09
Vegetable consumption	1.07	0.97	0.85*	8.99*	0.01
Fruit consumption	1.14*	1.03	0.78*	88.48*	0.03
Binge Drinking	1.26*	0.97	0.90*	68.73*	0.02

Note. χ^2 = Chi square; R_N^2 = Nagelkerke's R^2
* $p < .05$

Table 3-13 Health behaviour scores for self-reported health status with ANCOVA statistics with age as a health status as a predictor of health behaviour score and household income and education as covariates[a]

	Self-reported health status															
	Excellent		Very good		Good		Fair		Poor		*F*		(*df*)		η^2	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)						
Health Behaviour Score	2.62	(1.0)	2.30	(1.1)	2.01	(1.1)	1.80	(1.1)	1.25	(1.0)	43.18**		(4, 3202)		0.05	

[a] n = 3,209
* * p < .01

Table 3-14 Analysis of covariance (ANCOVA) showing insignificant nonsignificant interaction between age, health status and health behaviour score

		F	(*df*)	η^2
Self-reported Health Status	Education	111.71	(1, 3182)	.034
	Income	8.08	(1, 3182)	.003
	Age	1.47	(4, 3182)	.002
	Self-reported health status	37.79**	(4, 3182)	.045
	Health Status * Age	1.04	(16, 3182)	.005

* * $p < .05$

Discussion

The objective of this study was to provide a description of South Australian men aged 16 to 44 years by age group, health status and socioeconomic status. Three research questions and two hypotheses were tested: firstly, that health behaviour would improve with increasing age and secondly, that the age and health behaviour association would be moderated by (a) chronic disease status and (b) health status. This description was needed as working aged men are underrepresented in health research but they are overrepresented in avoidable mortality and morbidity statistics. This was done by analysing data collected by the South Australian population healthy surveillance system known as SAMSS between 2002 and 2008.

Education and income are commonly shown to influence health behaviour (Cottrell et al., 2009; Hakkinen et al., 2006; Hammond, 2003). Analysis models accounted for education and household income as I had expected the younger men may be in the process of completing their education and financially dependent on parental incomes, but this was not evident. The youngest men, aged 16–24 years and older aged men who were over 40, were less likely to be university educated or have completed high school. The men aged over 40 were more likely to be financially stressed, reporting their expenses exceeded their income and limited their capacity to save. One point of interest, that had implications to the sample size included in the inferential analyses, is that nearly half of the 16 to 24-year-olds did not know, or refused to report their household financial income, which is much more than any other age group. This may indicate a lack of interest or lack of opportunity for emerging adults to be included in household financial management discussions. The processes involved in making household decisions share similarities with health behaviour management (Gollwitzer & Sheeran, 2009; Sniehotta et al., 2005) and exposure to the consideration of cost and benefits, adaptive strategies and planning promotes greater

capacity to implement protective behaviours (Roche et al., 2008). Further research may consider the self-management skills of young adults who are able to report household financial status and have been involved in family decision-making and whether these skills are generalised for the management of protective health behaviour.

When behaviour is considered as a collective term, thus accounting for both risky and protective behaviours combined, and effect of education and household income is considered, age accounted for a significant, although very small amount of variation. The result was inconsistent with what I was expecting as health behaviour scores decreased with age, indicating that health behaviour become less protective and more health risky. The small effect size indicates, however, that other factors, in addition to age, influence the health behaviour of young adult men. The hypothesis that risk-taking behaviour would reduce with age and preventative behaviours would increase has been not been supported by these results.

Men living in rural and regional locations reported less protective health behaviours than metropolitan men and this was consistent for all age groups. This supports literature presented in Chapter 1 that highlighted public health concerns that rural men have worsening health status (AIHW, 2010; Kilkkinen et al., 2007) continue to smoke more (CDC, 2010), drink more alcohol and are injured more often in preventable motor vehicle accidents (AIHW, 2010). What this result does suggest is that all rural/regional men, and not just the emerging adult men, need to be the focus of health behaviour support. This finding also provides a background justification for study two of this thesis that focuses specifically upon rural and regional men and psychosocial factors that are associated with their health behaviour.

Age differences were identified for individual health behaviours. Older men are exercising less, smoking more and are fatter than the young men. The young men,

however, are drinking excess alcohol significantly more. Two thirds of the men in this sample were drinking in excess of the current 2009 Australian alcohol consumption guidelines (NHMRC, 2009). The problem is greater for the 16 to 24-year-olds, with three quarters of this age group being classified as excessive drinkers. Vegetable consumption was not predicted by age with only 7% of men reportedly eating the recommended amount of vegetables. This may suggest a need for further research to identify strategies targeting working-age men. Therefore, alcohol consumption is the only behaviour that 'improves' with age, becoming less risky. The preventative behaviour of getting regular physical activity, however, actually decreases with age. When considering individual health behaviours it is not evident that all risky behaviours are replaced with protective behaviours as age increases, but there is a change in behaviours. The composite health behaviour score used in analyses captured moderate drinking and physical activity, rather than dichotomised sufficient or insufficient categories used in the individual behaviour logistic regression analysis. I found that men engage in risk-taking health behaviours throughout and after the developmental period of emerging and young adulthood, but the older men have a different behaviour profile compared with the younger men.

The third question addressed was the effect of health status on health behaviour and whether this was the same for all age groups. Most (nine out of every ten men in the sample) reported being in at least good health, although one in three men had at least one chronic disease, over half of them were overweight and one in three had between moderate and very high levels of psychological distress. This represents a disparity between perceived health status and objective measures of health status. One possible explanation for this is that the existing medical conditions may be well managed and no longer perceived as impacting upon health. An alternative explanation is the reported tendency of men to minimise health complaints to preserve masculine stereotypes and images of strength (Addis & Mahalik, 2003; O'Brien, Hunt, & Hart, 2005), resulting in the

overreporting of good health. The disparity between self-reported health status and objective measures of health risk factors is less evident, however, when age group membership is considered. The older men who are less healthy reported a good health status, irrespective of worsening obesity and increased reports of chronic disease. This finding highlights the importance of considering age when investigating relationships between health status and health behaviour.

Self-reported health status and chronic disease scores were used as markers of health status and both were predictive of individual health behaviours and health behaviour scores. The theory of planned behaviour and health belief model suggest that people are motivated to take health action when personally vulnerable to a condition, and believe their action is important to the improvement or at least maintenance of their health (Howard, 1988). With these models in mind, it would be expected that men who had been diagnosed with a medical condition that is threatening their health would adapt their behaviour and engage in more protective and less risky behaviour. Men with chronic disease and poor health status, however, were found to be less likely to engage in protective health behaviours. This association did not alter with age, which is in contradiction to what I had expected. The effect chronic disease has upon health behaviour persisted across age groups, providing no evidence for the theory that older men may have a greater capacity than the younger men to self-manage a chronic disease and implement necessary protective health behaviours.

The nonsignificant interaction between health status and age indicates that health status influences health behaviour, no matter what the age of the man. This is significant as self-reported health status is relatively easy for clinicians to assess (Fayers & Sprangers, 2002) and could be included in men's health consultations. Furthermore, a national decrease in the health status of young adult men may pose concern for the associated potential increase of health risk behaviour that was evident in the findings of this research.

Age, health status, chronic disease, education and household income and rurality have been found to contribute to a model that significantly predicts the health behaviour of men. The small, though significant, amount of variation accounted for by age and health status of individual and composite health behaviour supports the need for multifaceted health behaviour models. The surprising finding is that it is increased age of men and non-metropolitan living that appears to be associated with poorer health behaviour. The influence of attitudinal, cognitive, neuropsychological, social and cultural influences will be investigated in the following chapter of this thesis and considered in addition to age and health status. Age and health status do appear to be relevant predictors of the health behaviour, but their relationships need further exploration in relation to other psychological factors.

In conclusion, this research presents information about the health behaviours and wellbeing of working age men as they transition through emerging and young adulthood. As men get older their health behaviours change but do not become more protective, instead they become less active and more overweight. The older men also continue to drink alcohol at levels greater than recommended; however, the younger men do this more often. Although rather than dismissing age as irrelevant, it is proposed that age may be relevant when considered in relation to other predictive factors. Psychological factors identified in the literature as relevant to health behaviour include executive function intelligence, attitudes, health knowledge and personality. Further research is required to explore these factors as well as age, socioeconomic status and health status as predictors of the health behaviours of young adult men.

Limitations

One limitation of note is that 17.7% of participants did not know or failed to report their household income, reducing the sample size from 5,262 to 4,328. Income and education were included as covariates for all inferential analyses based upon a theoretical

rationale, as both socioeconomic variables have been found to influence behaviour. Analyses were run with education as the only covariate, to allow for inclusion of more participant data, however, the findings remained the same. The sample size included in analyses was further reduced to 3,209, by the incomplete collection of health behaviour and chronic disease data due to systematic rotation of CATI questions by SAMSS. The SAMSS dataset used in this analysis is a large, randomly selected sample of metropolitan and regional young adult men, and this is a recognised strength allowing for the generalisation of my findings. The limitation, however, of accessing precollected data is that the vast majority of the variables had been categorised, thus limiting statistical procedure options.

4. The Relationship between Health Behaviours, Executive Function and Health Literacy among Males Aged 16–40 years

Psychological and cognitive factors are included in some popular health behaviour models but little research has been done to explore the predictive value of contemporary constructs such as executive function and health literacy. Even less work has been done to examine the relevance of these psychological constructs for men during emerging adulthood. As demonstrated in the previous chapter, demographic factors including age, health status, income and education have historically been thought to be a major factor associated with health outcomes and shown to account for some variance in the health behaviours of young adult men. Comparatively little is known about psychological factors and their relationship with health behaviour (Hall et al., 2008; Lachman & Weaver, 1998). The Health Literacy and Health Action Framework provides an interdisciplinary framework linking cognitive ability, psychological wellbeing, health literacy, as well as environmental, social and economic factors (SES) as predictors of health behaviour (Wagner et al., 2009). There is mounting evidence of the importance of higher order cognitive abilities, referred to as executive function, for the actioning of health behaviour; however, there is little clarity about which of the executive functions are most predictive (Hall et al., 2006, 2008, 2009; Hall & Fong, 2003; Wong & Mullen, 2009).

The complex nature of why people behave the way they do provides a challenge for primary health clinicians and health promotion agencies that have the role of disseminating health messages. This research recognises the public concern for behaviours such as excess drinking, illicit drug use, unhealthy eating, inactivity and dangerous driving that have implications for the health of all men, but that are believed to be particularly prevalent among younger men. It is unclear as to why public health messages and information are not alleviating chronic disease and health risk-taking behaviour of emerging and young adult men. A range of health promotion strategies commonly include television, print media, point of purchase and packaging warnings, but they have had limited effect on young adult men (Andersen, Astergaard, Maller, & Olesen 2001; Kaye & Wendy 2000;

Park & Breland, 2007; Tripodi, Bender, Litschge, & Vaughn, 2010). Social marketing (Donaldson, 2008) and negative advertising (Appolonio & Malone, 2009) aim to counteract the effective product marketing by use of branding, shocking graphics and personalising health campaigns to engage young people (Snyder, 2007). Health promotion media campaigns coupled with stricter regulations appear to have influenced intentions and awareness (Peterson, Waterfield, & Abraham, 2005), but have not resulted in sufficient health behaviour changes necessary to reduce the escalating onset of chronic disease (Giesbrecht & Greenfield, 2003). The identification of which people are most likely to engage in risk-taking behaviour and strategies to promote protective health behaviour is likely to require consideration of social, psychological, demographic and knowledge-based factors (Bandura, 2004; von Wagner et al., 2009). This research seeks to identify what psychological factors are likely to be most influential in health behaviour decisions of men and whether younger adult and older adult men require customised health-promoting interventions.

Further research is required to investigate the extent to which psychosocial factors predict health behaviours in emerging and young adulthood. This is a time when executive function, more so than intelligence, continues to develop and socioeconomic status often changes (Erickson et al., 2007; Fishbein et al., 2006; Jaeggi et al., 2008). A better understanding of which factors are most influential during emerging adulthood will assist the development of intervention strategies that may assist young adults implement protective behaviours. This thesis presents a series of research questions relating to whether age, executive function, health literacy, intelligence, sense of control, health behaviour values, conscientiousness and health status are major factors in predicting protective and health risk behaviours of emerging and young adult men.

Executive Functions, Age and Health Behaviour

Executive functions allow a person to correctly appraise a problematic situation, determine a plan of action to cope with the situation, carry out the plan and make appropriate changes when necessary (Giancola & Mezzich, 2000; Lezak, 1983; Lezak et al., 2004). As described in more detail in Chapter 2 of this thesis, inhibition, verbal fluency and planning have been identified as modest predictors of risky and preventative health behaviour in the general population (Hall et al., 2006, 2008, 2009; Wong & Mullen, 2009). There are many examples of research concerned with executive function that uses a single test (Allain et al., 2005; Chipala, 2010; Liset al., 2008; Patrick, Blair, & Maggs, 2008) or two tests (Hall et al., 2008; Wong & Mullen, 2009). However, executive function includes many components (Jurado & Rosselli, 2007) such as planning, inhibition, interference control and verbal fluency (Jurado & Rosselli, 2007). This research is a unique example of work that reports multiple tests of executive function, namely planning, inhibition, interference control and verbal fluency, and the relationship each of these have to the health behaviours of young adult men. As described in Chapter 1, executive function develops during young adulthood but there is an absence of research that has considered associations between executive function and health behaviour, specifically with emerging and young adult males. This research seeks to explore age differences in executive function across age groups of men and the associations these higher order cognitive abilities have with health behaviour.

Planning

Planning is the ability to identify and organise the steps and elements required to achieve a goal (Lezak et al., 2004) and planning skills continue to develop into early adulthood (Romine & Reynolds, 2005). The ability to plan, implement and review practices is recognised as necessary for the ongoing implementation of intentions (Sabin, 2009; Sheeran et al., 2007). The ability to plan is likely to promote protective behaviours;

for example, through the allocation of time to engage in physical activity and the preparation of a healthy diet. The juggling of busy lifestyles, often involving employment, family, social and spiritual elements can make the inclusion of protective behaviours such as regular physical activity difficult. A person must work within parameters such as available time to formulate strategies, decide on how they will exercise, where, with whom and what equipment is necessary and then adapt details to ensure regular physical activity is achieved (Hutchison, Breckon, & Johnston, 2009). Greater ability to plan is therefore expected to be associated with the actioning of more protective behaviours.

Inhibition

Inhibitory processes allow a person to stay on task and to block out irrelevant information (Lustig, Hasher, & Tonev, 2001). Inhibition is thought to be an important component of attention (Jurado & Rosselli, 2007). Inhibition may aid a person to replace a risk-taking behaviour, such as excess drinking, with more moderate alcohol consumption. Tests that measure inhibition included in this research were the Trail Making Test (Reitan, 1985) and the Stroop Colour–Word test (Stroop, 1935). Both of these tests require a person to replace a familiar behaviour, such as counting, with a less habitual behaviour such as alternating numbers and letters. The inhibition of internal task-irrelevant stimuli in these tests simulates circumstances relevant to health behaviour. A person may habitually have a cigarette while they consume alcohol and the task of not smoking while drinking alcohol will require them to inhibit that habitual response. Dumas and Hartman (2008) investigated age differences in inhibition of emerging and young adults and reported no significant change with age. The sample included 36 adults aged 18–30 years but gender was not reported. The authors concluded that the small sample size may have masked age differences. Rather than focus upon age differences of executive function in old age, this research is concerned with age differences within a more focused age range and sought to address power concerns by sampling over 100 young adult men.

Interference Control

Interference control is the ability to cope with competing cognitive demands, switch between different tasks (Hall et al., 2006) and ignore external task-irrelevant stimuli (West, 1996). A person with interference control difficulties will have an impaired ability to do or think of more than one thing at a time (Dumas & Harman, 2008). The ability to suppress irrelevant or unhelpful impulses is an executive function that is paramount for normal thinking processes and functional living (Garavan, Ross, & Stein, 1999). The management of one's health and achievement of a healthy lifestyle involves multitasking, managing conflicting influences such as work commitments, expectations of peers and media marketing and these often contradict protective health behaviour (Sawyer et al., 2007; Scioli, Biller, Rossi, & Riebe, 2009; Steinberg, 2007). The maintenance of a healthy diet involves cancelling out the messages provided by a host of advertising sources including takeaway food, cigarette and alcohol marketing. It is likely that a young adult man with good interference control skills will be more able to control potentially interfering influences and engage in more protective health behaviours. Bissett, Jonides and Nee (2009) report that the successful suppression of intrusive thoughts requires resistance to proactive interference and that inhibition and interference are dissociable and distinct from each other. Interference control is recognised as a multifaceted executive function (Dumas & Harman, 2008; Friedman & Miyake, 2004) and likened to the ability to be attentive (Casino, 2011) and attention control (MacLeod, Dodd, Sheard, Wilson, & Bibi, 2003). The Letter Cancellation Task requires a person to focus upon key letters and ignore irrelevant ones, with the pressure of time limits and the need for accuracy. This measure was selected as it as a measure of interference control that has been used in previous studies concerning age differences in attention and interference control (Roldán-Tapia, García, Cánovas, & León, 2012). Interference control was shown to decline. Age differences of a sample ranging from 20 to 65 years were noted, with increase in age associated with decline in cognitive function generally and also in interference control as

measured using a Letter Cancellation Task. Gender and age group analysis were not reported and so it is unclear at what age executive function peaks and this thesis aims to consider this.

Verbal Fluency

Verbal fluency involves the retrieval of words from memory and provides an indication of how well a person organises their thinking and uses self-initiated strategies for the retrieval of relevant words (Benton & Hamsher, 1989; Hughes & Bryan, 2002). Verbal fluency is believed to be the last executive function component to develop fully with increasing age (Ardila et al., 2000). The reported estimated age at which verbal fluency peaks ranges from the early teens (Regard, Strauss, & Knapp, 1982), midteens (Matute, Rosselli, Ardila, & Morales, 2004), to early twenties (Klenberg, Korkman, & Lahti-Nuuttila, 2001).

Definitions of verbal fluency share similarities with definitions of verbal intelligence and health literacy. The importance of verbal intelligence and health literacy to health is captured in the following definition: The ability to organise ones thoughts, identify and consider relevant health knowledge and communicate verbally to seek help is considered essential for good health outcomes and the implementation of protective health behaviours (Gottfredson, 2004). This definition is made with reference to verbal intelligence and functional health literacy; however, the description of ability resembles the abovementioned definitions of verbal fluency. Hultsch, Hammer and Small (1993) investigated whether age and self-reported health of 55–86-year-olds accounted for variance in verbal fluency, as well as other cognitive measures. Verbal fluency was a nonsignificant predictor. The work of Hultsch et al. included a sample of 484 men and women who were much older than the men included in this current research, and was concerned more with cognitive decline rather than development. Cognitive ability, including verbal fluency, has to my knowledge not been specifically researched as a

predictor of health behaviour of young men. However, both verbal intelligence (Windle & Blane, 1989) and functional health literacy, which have strong verbal component (Gottfredson, 2004; Manganello, 2008; Smith, 1995), have both been shown to influence health behaviour of young men. Although verbal fluency, verbal intelligence and health literacy are different constructs that are measured using different tools, the similarity in definition and the work of Hultsch et al. (1993) is the basis for including verbal fluency as a possible predictor of young men's health behaviour.

The Initial Letter Fluency Task (Lezak et al., 2004) is a measure of verbal fluency that requires a person to selectively retrieve words from memory, consider provided information and verbalise their selection within a time limit. This task may be comparable to a medical appointment situation, when a person is required to interprete complex information, formulate relevant questions and comments, usually within a time restriction. This research set out to compare verbal fluency with measures of functional health literacy and verbal intelligence and determine which are associated with young adult men's health behaviour.

Intelligence

Verbal intelligence and nonverbal intelligence have been found to account for some variance in health behaviour (Gottfredson, 2004) and these two measures of intelligence were used in this research. The Wechsler Adult Intelligence Scale (WAIS IV) is a commonly used measure of intelligence for adults aged between 16 and 89 years (Lichtenberger &Kaufman, 2009). Intelligence, like executive function, comprises specific components or domains. Matrix reasoning is one subtest of the WAIS that measures nonverbal intelligence and perceptual organisation. It is an untimed test that measures nonverbal reasoning ability with participants required to look at abstract patterns and select missing designs to complete the pattern (Wechsler, 2008). The Spot the Word Test

(Baddeley et al., 1993) is a measure of verbal intelligence that involves the identification of real words as opposed to made-up words (Mackinnon & Christensen, 2007). The Spot the Word Test was used by Jorm, Anstey, Christensen and Rodgers (2004) as a measure of verbal intelligence in young adults. The authors reported an increase in scores, thus greater verbal intelligence, between the ages of 20 to 24 and 40 to 44 years. The focus of the Jorm et al. (2004) study was upon gender differences of cognitive tests and they found health behaviour had a mediating effect.

Intelligence and executive function have both been shown to be associated with health behaviour (Hall et al., 2006) but the relative importance of these constructs for young adult men have not been made. There is some debate about whether executive function and intelligence are measuring the same type of abilities. Neuropsychology literature generally reports the two constructs are different (Ardila et al., 2000; Arffa, 2007; Blair, 2006; Duncan et al., 1996; Jurado & Rosselli, 2007) and the contemporary models of cognitive function indicate that executive functions are a component of intelligence (Floyd, Bergeron, Hamilton, & Parra, 2010; McGrew, 2010). Another school of thought is that executive function and intelligence are separate but that executive functions are required for the implementation of intelligence (Braver et al. 2001; Ranganath et al. 2003; Conway et al. 2003; Kane & Engle 2002). Intelligence is a theoretical psychometric construct derived from statistical procedures, while the construct of executive function has evolved from clinical and applied research (Hoelzle, 2008; McGrew, 2009). It is plausible that intelligence and executive function both have relevance to the health behaviours of young adult men; however, the changing nature of executive function during emerging adulthood, more so than intelligence, may provide a distinction between the two constructs and their relevance as a predictor of health behaviour. Thus, executive function may be the more useful predictor, and assessments of immature executive function in young adults may provide a valuable indicator of the need for health management support, even if only

temporarily. The clinical significance of this is that rehabilitation strategies have been shown to improve impaired executive function, and may therefore justify early assessment and intervention to increase the protective health behaviours of young adult men.

Rehabilitation strategies include individual and group programs that often involve repeated exposure to health-promoting information, goal setting and review strategies (Gillen & Burkhardt, 2004, Leddy, Sandhu, Sodhi, Baker, & Willer, 2012; Levack et al., 2006; Ponsford, 2005). Interventions can involve role plays and narratives about how to cognitively process and respond to situations and how to identify and modify barriers to goal achievement (Fishbein et al., 2006; Gollwitzer & Sheeran, 2009; Sheeran, Milne, Webb, & Gollwitzer, 2007). This research seeks to identify whether low levels of executive function are associated with high-risk health behaviour. If this is the case, then it is feasible that men found to have poor executive function may benefit from rehabilitation interventions.

Health Literacy

Health literacy has three components: (1) functional health literacy, which is the basic understanding of factual health information; (2) interactive health literacy, which is the ability to coordinate functional literacy and apply in a social setting; and (3) critical health literacy, which is a person's ability to evaluate information (Nutbeam, 2008; Nutbeam & Kickbusch, 2000). Adequate health literacy makes it more likely that a person can obtain information, personalise it to their own circumstances and incorporate this in their health behaviour decision-making and practice. The Shortened Test of Functional Health Literacy for Adults (S-TOFHLA; Parker et al., 1995) measures functional health literacy by assessing a person's ability to read and comprehend written statements. These functional literacy skills enable the effective reading of health promotion material and medical information (Nurss, 2001). The Newest Vital Signs (NVS), also a measure of

functional health literacy, requires a person to use both numeracy and literacy skills to answer questions in relation to an ice cream container nutrition label (Weiss et al., 2005). Both the NVS and S-TOFHLA have been used to measure health literacy in young adults (Smith, 1995; von Wagner et al., 2007). Functional health literacy has been found to be associated with health behaviour, but more research is needed to better understand the relevance this has to the health behaviours of young adult men (Manganello, 2008). Furthermore, researchers have not looked at the higher tiered health literacy skills, referred to as critical health literacy, and how this is associated with health behaviour.

Health literacy is believed to require a range of basic and higher order cognitive functions. It is unclear, however, whether cognitive function and health literacy are related (Manganello, 2007; Pleasant 2008; Tones 2002) and whether higher levels of cognition, especially verbal ability, is required for higher health literacy. One obstacle for research in this field is that health literacy has not been adequately operationalised (Baker, 2006) and commonly used tests are inconsistent (Jordan, Osborne, & Buchbinder, 2010; Osborn et al., 2007). Health literacy measures assess only the most basic functional health literacy skills, comprehension and simple use of provided health information, but overlook critical health literacy (Chinn, 2011). This research included measures of both functional and critical health literacy as individual predictors of health behaviour, as well as combined to produce a composite health literacy score, derived from two functional health literacy measures—S-TOFHLA (Parker et al., 1995) and the NVS (Weiss et al., 2005)—and one relatively unknown measure of interactive and critical health literacy developed by Ishikawa and Yano (2008). Ishikawa et al. (2008) used five questions that participants self-rated their own abilities to obtain, critique and personalise health-related information. This method represents a unique approach, producing one measure of health literacy that incorporates functional, critical and communicative health literacy in line with Nutbeam

and Kickbusch's (2000) definition of health literacy, as opposed to the common practice of just using measures of functional health literacy.

The health literacy and health action framework (von Wagner et al., 2009) identifies implementation skills including planning, organising and action control, as mediators between health literacy and health behaviour. There is also evidence that other cognitive abilities, including verbal fluency (Halm et al., 2009), memory and processing speed (Levinthal, Morrow, Wanzhu, Jingwei, & Murray, 2008) and intelligence (Smith, 1995) mediate the relationship between health literacy and health behaviour; however, this work was not specific to young adult men. This research set out to examine whether there is a relationship between executive function, health literacy and health behaviour of young adult men. It is hypothesised that executive function and health literacy will be positively correlated, but that executive function will moderate the relationship between health literacy and health behaviour of young adult men. Moderation analysis considers the unique conditions under which two variables are related with the expectation that the relation between the variables will be different at different levels. Moderation analysis is recommended for studies exploring those for whom a particular change mechanism is valid, whereas mediation analysis allows for the explanation of how behaviour change takes place (MacKinnon & Luecken, 2008). A moderator (Executive Function) specifies on whom or under what condition another variable (Health Literacy [HL]) will operate to produce the outcome (Health Behaviour) (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). I am interested in describing the relationship between HL and Health Behaviour, as well as the relationship between EF and Health Behaviour and whether there is any interaction for men of different age groups during emerging adulthood.

Health Behaviour Values

Nearly 20 years ago Jane Wardle and Andrew Steptoe investigated the health behaviour of young adults living in 20 countries across Europe (Wardle & Steptoe, 1991). They concluded that there is a close association between health beliefs, the values placed upon health and health behaviour. Health behaviour values are developed and influenced by family, peers and education systems (Abella & Heslin, 1984; Wallston, 1992) and these values influence how people, including young adult men behave (Kristiansen, 1985; Kropp et al., 2004; Steptoe et al., 1995; van Harreveld, van der Pligt, & de Vries, 1999). The value placed on health generally may be different from the value placed on specific health behaviours (Lau, Hartman, & Ware, 1986). For example, a person may value being healthy and disease free, but not identify physical activity or eating fruit as an important behaviour. The Health Behaviour Survey (Steptoe & Wardle, 2001; Steptoe et al., 1994) included specific behaviour value questions. Participants are asked to rate between 0 and 10, the importance value they place upon specific health behaviours. It is hypothesised that the value a young adult male places on a specific health behaviour will influence their implementation of that behaviour.

Sense of Control

Sense of Control, has been recognised for many years as a psychological construct with important implications for health (Steptoe & Wardle, 2001). Sense of Control, when considered in combination with health values has been found to be predictive of health behaviour (Conner & Norman, 2007; Weiss & Larson, 1990). People with a high sense of control believe that what they do makes a difference and they behave in healthier ways, while those with a weak sense of control do not believe in a link between their actions and their health and are more likely to engage in health-damaging behaviours or at least fail to engage in health-promoting actions (Lachman & Weaver, 1998). Sense of Control is the

collective term that is measured by Lachman et al. (1998) using a series of questions and scales for perceived constraint and personal mastery. Personal mastery resembles 'self-efficacy' (Bandura, 1997) and is defined as a sense of efficacy or effectiveness in carrying out goals (Lachman et al., 1998). Perceived constraints are defined as the extent a person believes there are obstacles or factors beyond one's control that interfere with reaching goals. Sense of Control was measured in this research using Lachman et al.'s (1998) 6-item scale, which was included the International Health Behaviour Survey that was obtained via email from Professor Steptoe (http://www.ucl.ac.uk/psychobiology/research/ihbsdetails). The six Sense of Control items include three items that measure personal mastery and three items that measure perceived constraints. As stated previously in this thesis, some constructs are referred to using different terminology that is often discipline specific. Sense of Control is commonly referred to in the health behaviour literature (Rodin, 1989; Lachman & Weaver, 1998) as an alternative to Locus of Control (Rotter, 1954; Steptoe & Wardle, 2001) and Health Locus of Control (Sirois, Davis & Morgan, 2006; Wallston & Wallston, 1980) and there are examples of Locus of Control and Sense of Control being used interchangeably (Newman, Brown, & Rivers, 1983). In Lachman's earlier research (Lachman, 1986) the author refers to Locus of Control but adapts to using the term Sense of Control in more recent publications (Lachman, Ziff, & Spiro, 1994; Lachman & Weaver, 1998). Throughout this thesis the term Sense of Control is used.

Conscientiousness

The Big Five personality traits are neuroticism (sometimes referred to as emotional stability), extraversion, openness, agreeableness and conscientiousness (Costa & McCrae, 1992; Cronbach & Meehl, 1955). Of these traits, conscientiousness has been identified as a key personality predictor of health (Goodwin & Friedman, 2006). Conscientiousness is a person's propensity to follow socially prescribed norms for impulse control, to be task and

goal directed, to plan, be able to delay gratification and to follow norms and rules (John & Srivastava, 1999). Conscientiouness matures with age and is further developed by exposure to work and family responsiblities (Roberts, Walton, & Bogg, 2005). The correlation between age and conscientiousness was confirmed in a study by Soto, Gosling, John and Potter (2011), which included over 1 million people aged between 10 and 65 years who completed a worldwide online personality survey (Big Five Inventory). They classified people aged between 18–25 years as emerging adults, 26–35 years as early adults and 36–50 years as middle-aged. Cosncientiousness scores had a curvilenier age trend with a pronounced positive trend into emerging adulthood. Jackson et. al. (2009) using self- and observer reports from a representative sample of 274 male and females aged between 19 and 94 years of age. Rather than one composite conscientiousness score the authors investigated facets of conscientiousness. They found age differences in industiousness, impulse control and reliability, showing that young adults (19–39 years) had lower levels of these conscientiouness facets than the middle-aged (40–59 years) and old age (60–94 years). Conscientiousness is negatively associated with risky behaviours like smoking, drug use and alcohol use, and positively associated with protective behaviours and physical activity (Conner & Norman, 2007; Skinner et al., 2002). In a review of conscientiousness and health behaviour research, Roberts, Walton and Bogg (2005) confirmed that conscientious people tend to avoid risky health behaviours and engage in activities that promote good health. The review did not identify any research with a focus specifically upon young adult men but presents age-associated increases in conscientiousness as one explanation for why health behaviour may become more protective and less risky with increased age. Roberts et al. (2005) also identify the need for research in this field to consider multiple behaviours, rather than the common approach of testing predictors of single behaviours. This thesis examined the associations for young adult men between conscientiousness and single and multiple health behaviours.

Sleep

Sleep has been found to be essential for the maintenance of health, allowing for optimal cognitive and physiology functioning (Frech, 2009; Kuriyama, Mishima, Suzuki, Aritake, & Uchiyama, 2008; Zee & Turek, 2006). Inadequate sleep has been associated with obesity and mental illness (Cappuccio et al., 2007; Knutson, Spiegel, Penev, & Van Cauter, 2007; Stang, Moebus, Mohlenkamp, Erbel, & Jockel, 2008). In a large study involving over 25,580 participants from seven European countries it was found that 11.7 % of 15–25-year-olds and 11.2% of 25–44-year-olds report having sleeping difficulties known as nonrestorative sleep (Ohayon, 2005). Sleep deprivation and nonrestorative sleep are associated with obesity, physical and mental illness (Ohayon, 2005), impaired cognitive function and decision-making abilities (Talbot, McGlinchey, Kaplan, Dahl, & Harvey, 2010), as well as heightened risk of harm from accidents, including motor vehicle accidents (Smolensky, Milia, Ohayon, & Philip, 2011). Young adult men have been found to function better and enjoy better health if they get at least six hours sleep per day (Steptoe, Peacey, & Wardle, 2006). There is debate about how much sleep is too much and whether 'oversleeping' or getting more than eight hours per night may be considered a health risk (Zee & Turek, 2006). Ohayon (2005) found that sleeping over nine hours per night increased the prevalence of nonrestorative sleep; however, Steptoe, Peacey and Wardle (2006) found no evidence that more than eight hours was detrimental to the health of young adults. The timing of sleep also has an impact upon health status and cognitive performance, with shift workers performing worse than nonshift workers (Rouch, Wild, Ansiau, & Marqui, 2005). Although there are no nationally endorsed guidelines, the research evidence suggests that between six and eight hours is optimal, less than six and more than eight hours per night can be considered a health risk behaviour (Chaput, 2010).

Teeth Brushing

Good dental health is important for general health and wellbeing. Establishing effective preventative habits in childhood, such as teeth brushing, contributes to better dental outcomes later in life. Poor oral health has far-reaching effects on a person's quality of life through influencing eating, sleep, work and social roles (NACOH, 2004). Australian-born young adult males living in nonurban areas who have poor oral health have been found to have poorer health status and engage in more risk-taking behaviour (Sanders, Spencer, & Stewart, 2005). Sanders et al. (2005) report that association between oral health, risk-taking behaviour and health status is stronger for young men who have lower levels of education and live in lower income households. Oral hygiene includes the regular brushing with a toothbrush and toothpaste to reduce the likelihood of tooth decay and ingestion of bacteria. Engaging in regular tooth brushing twice per day is recommended (Stewart & Roberts, 2008; The Royal Australian College of General Practitioners, 2011) but brushing once a day, if accompanied by a healthy diet, may be sufficient to avoid tooth decay and gingivitis (Sanders, Spencer, & Slade, 2006). It would therefore appear as if the behaviour of regular teeth brushing, at least once per day, but preferably two, is health-protective behaviour and less than once per day is health-risk behaviour.

Help Seeking

Help seeking involves a person communicating with an external source or person to collect information and comment about a matter of concern. Parental involvement throughout adolescence and during emerging adulthood, as role models and a source of financial and decision-making support, has been found to minimise the adoption of risk-taking behaviour (Roche, Ahmed, & Blume, 2008). But the extent of this parental mentoring of emerging adulthoods is variable, with evidence that young adult men, even those that remain living with their parents, do not readily seek help with health decision-

making (Price-Roberson, Smart, & Vassallo, 2009). Young adult men more often refer to peers and use informal methods of information collection, preferring to resolve their problem alone rather than consult with formal sources such as health services (Wimer & Levant, 2011). The behaviour choices of young adult men during emerging adulthood may therefore be related to their help seeking and access to informal or formal health support services.

The Challenge of Recruiting Men for Primary Health Care Research

The importance of men's health research is outlined in the first chapter of this thesis. Addressing the gap in knowledge about men's health relies on the practicalities of engaging and recruiting men and, more specifically, young adult men from the wider community. In mixed gender community-based health research, men are often underrepresented (Bartlett, 2006; Cheung, 2004) and recruitment difficulties may be one explanation. In male-specific studies, those aged 16 to 24 years are most difficult to recruit (Fletcher et al., 2002). The high rates of preventable deaths of young adult males living outside major Australian cities (AIHW, 2010) confirm they are at risk and worthy of specific health research and engagement efforts similar to other minority groups (Willis & Porche, 2006). To recruit a community-based sample of varied age and socioeconomic status creative recruitment strategies are required and may include community preparation, worksite visits and communication suited to the target group (Burroughs et al., 2003). Engaging young adult men for research via employers is effective; however, it is unclear from the literature whether worksite assessments are more frequently attended than off-site assessment (Barbeau, Hartman, Quinn, Stoddard, & Krieger, 2007). Recruitment of young adult men is challenging and using a range of strategies appears necessary to maximise both sample numbers and diversity in participant characteristics.

Summary

Young adult men, although diverse, are consistently associated with high-risk behaviours of drug use and excessive alcohol consumption. Results reported in Chapter 3 of this thesis suggests that age does account for some variation in health behaviour, with younger men engaging in more health-risk behaviour (excess drinking). However, many men aged between 16 and 44, not just the youngest ones, are drinking too much alcohol, not eating enough vegetables and are overweight. Physical activity remains at insufficient levels for most men, especially for men older than 30. This research builds upon this finding and explores a greater collection of key health behaviour, including help seeking for health decisions, teeth brushing, drug use, sleep, consumption of breakfast, driving safety for age. This follow-up study allows for the use of age as a continuous variable and inclusion of a broader range of predictor variables. Broad concepts such as cognitive function and demographic factors have been refined through an extensive literature review to identify specific constructs that may predict the health behaviours of young adult men.

Executive function—including planning, inhibition, interference control and verbal fluency—along with health literacy, are relatively new constructs in health behaviour research. Other psychological constructs, including conscientiousness, health behaviour values and sense of control are concepts that are included in popular health behaviour models. Diversity in terminology and measurement methods present barriers for interdisciplinary collaboration; however, collaborative strategic research is needed to better understand the predictors of health behaviour (Noar & Zimmerman, 2005b). This current research is significant as it tests relatively unknown psychological and public health constructs as potential predictors of behaviour. The key research question explores how these various constructs relate to the behaviour of young adult men. To answer this question, there are three objectives, firstly, to describe the behaviours and health status of

young adult men. Secondly, to establish if age is a significant predictor of behaviour and psychological function and thirdly, to compare the various psychological and public health constructs that are believed to predict health behaviour.

This fourth chapter provides a description of health behaviours as well as a cognitive and neuropsychological profile of a sample of regional and rural men aged between 16 and 40. Sufficient evidence indicates that cognitive, social and economic changes occur during emerging adulthood and age itself may account for a significant amount of variability in behaviour. Age and the pathway to adulthood may not easily be altered, but if age is a significant factor, adjustments to the scope of expectations and permitted responsibilities may be reviewed. Once the effect of age has been clarified, other factors, including cognitive abilities, which to some extent can be improved by rehabilitation interventions (Chan et al., 2008; Erickson et al., 2007; Jaeggi et al., 2008) may provide indications of which young adult men require support to manage their health behaviour.

Research Questions

Is there a relationship between age, executive function abilities, health literacy, intelligence, conscientiousness, health behaviour values and health behaviours of young adult men?

This broad research question will be examined by addressing the following specific questions:

1. Is age positively associated with the health behaviour of emerging and young adult men living in nonmetropolitan South Australia?
2. Is age positively associated with executive function of emerging and young adult men?

3. Is age positively associated with health literacy of emerging and young adult men?
4. Do psychological constructs, executive function, intelligence, behaviour values, sense of control, and conscientiousness have a positive effect on health behaviour of emerging and young adult men?
5. Does health literacy have a positive effect on health behaviour of emerging and young adult men?
6. Do executive functions moderate the relationship between health literacy and health behaviour?

Method

Approval for the research was obtained from the University of South Australia's Human Research Ethics Committee.

Participants

A sample of 102 men aged 16–40 years was recruited from the communities of Whyalla and the Barossa Valley in regional South Australia. Men from the two regional South Australian communities were engaged to provide information about the risky and protective behaviours. Men living in regional Australia, specifically young adults, are overrepresented in preventable death statistics and have been increasingly associated with risk-taking behaviour and chronic disease (AIHW, 2006, 2010). Men aged between 16 and 40 were included in the sample as this age range aligns with the previous study and is consistent with emerging adulthood literature that reports to span between late teens to late twenties and young adulthood that extends to the age of 39 years (Roberts, Walton, & Bogg, 2005). The mean age of the sample was M = 29.6, SD = 7.8). All relevant age

groups were represented with 29.4% aged between 16 and 24 years, 19.6% aged between 25 and 29, 14.7% aged between 30 and 34, and 36.3% aged between 35 and 40.

Sample Size Calculations

Research has shown (Hall, 2006) that partial correlations between executive function measures (Stroop test) and health outcomes (smoking, alcohol, sleep) range from $r = .2– .5$. According to Cohen (1992), this represents a medium to large effect. Therefore, to detect significant relationship between psychosocial predictor variables and health behaviour using multiple linear regression with an estimated power of .80 and p-value of .05 a sample size of84 participants allowed for inclusion of 4 predictors and 107 participants allow up to 8 predictors. A study of health literacy by von Wagner et al. (2007) in the UK found that 5.7% of people aged 18–44 had inadequate health literacy but Kutner et al. (2006) report that in 2003 some 10% of people living in America, aged 16–39, had below-standard health literacy. The Australian Health Literacy Study found that 30% of the Australian population have health literacy problems. In order to include adequate numbers of men with health literacy difficulties, as well as build on Hall's (2006) executive function and health behaviour, a sample of 102 men aged 16–40, from Whyalla and the Barossa Valley was deemed adequate.

A moderating effect indicates that a moderating variable has an effect on another variable, which causes the dependent variable to change (Aguinis & Gottfredson, 2010; Aguinis & Stone-Romero, 1997). The moderation model can be represented as; $Y_i = \beta I + X\beta_X + Z\beta Z + XZ\beta XZ + e$, where the variable Y is the dependent variable (health behaviour), variable X is the continuous predictor (health literacy), variable Z is the continuous moderator (executive function), XZ is the cross product term and *e* is the error term (Shieh, 2009). The statistical power for the test of moderation is partly attributed to extra variance of the product XY after controlling for the main effects of X and Z or the unique variation in XY that is not shared with either X or Z (McClelland & Judd, 1993).

Statistical power is enhanced when reliability is improved and this can be achieved by increasing the number of items used to measure the underlying construct, including additional significant predictors of the outcome variable in the model as covariates and by using continuous scales to measure the moderator and predictor variables to reduce measurement error (Frazier, Tix, & Barron, 2004). Moderation effect size should be estimated in order to calculate the power and sample size required to detect and moderator effect. While reported correlations between executive function and health behaviour equate to a medium to large effect (Hall, 2006) a small to medium relationship between health literacy and health behaviour (von Wagner, Knight, Steptoe, & Wardle, 2007) is expected. An extensive review of the literature by Frazer et al. (2004) and Aguinis, Beaty, Boik and Pierce (2005) found that effect size and power to test moderator effects are rarely reported, and were often small with the average effect size in tests of moderation only f^2=0.009. The most common measure of effect size in tests of moderation is f^2 (Aiken & West, 2001) which equals the unique variance explained by the interaction term divided by sum of the error and interaction variances. Cohen (1988) has suggested that f^2 effect sizes of 0.02, 0.15, and 0.35 are termed small, medium, and large, respectively. Sensitivity analysis using power estimation software (Faul, Erdfelder, Buchner & Lang, 2009) indicate that a moderated regression analysis with a sample size of 102, using two covariate and two predictor variables and a p-value of .05 provides power of .8 to detect a small to medium effect.

Procedures

Recruitment

Large employers, employment assistance services, sporting clubs, welfare and health services in Whyalla and the Barossa Valley were approached, told about the research and invited to disseminate information to their employees and customers. Where

possible, information was provided in hard copy and electronic newsletters, posters were displayed and professionally printed postcards, as shown in Appendix , were placed in staff in-trays. Worksite meetings were attended by the researcher as an opportunity for men to ask questions and arrange an appointment time. Eleven employers were contacted and nine agreed to disseminate research recruitment information within their worksite. Five worksites offered the use of a suitable private assessment room, two of these allowed assessment to occur in work time. Weekend and out of standard working hours assessments were offered to better engage employed and shift workers. Recruitment was also conducted in shopping malls, newspaper promotion, poster displays throughout a university campus and by word of mouth.

Recruitment was spread over an eight-month period between September 2009 and April 2010. Of the 129 men who provided contact details, 102 attended, 10 withdrew, 16 did not attend and 1 was excluded. This represents an indicative response rate of 79% and approximately 1% of men aged 16–24 and 25–69 years and 1.7% of men aged 35–39 years living in the Barossa Valley and Whyalla participated, as shown in Appendix 2. Fifty-four percent were recruited from worksites, 14% from shopping malls, 23% from contact with other participants or people known to the research team and 9% from publicity inviting the participant to initiate contact. Recruitment source details for age groups are shown in Table 4-1. All participants were provided with a letter confirming their scheduled appointment details and a copy of an information sheet, as shown in Appendix 3. In the last month of recruitment, participants who had failed to attend or had cancelled but not negotiated a replacement appointment were contacted by letter and then followed up by telephone. Seven participants were recruited in the second wave of recruitment.

Table 4-1 Recruitment source of participants by age group

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	%	Count	%	Count	%	Count	%	Count	%
Mode of recruitment	Worksite	25	(83.3)	10	(50.0)	9	(60.0)	15	(40.5)	**59**	**(57.8)**
	Known Contact	3	(10.0)	4	(20.0)	5	(33.3)	16	(43.2)	**28**	**(27.5)**
	Media Publicity	0	(0.0)	5	(25.0)	1	(6.7)	3	(8.1)	**9**	**(8.8)**
	Shopping Mall	2	(6.7)	1	(5.0)	0	(0.0)	3	(8.1)	**6**	**(5.9)**

Note. $n = 102$

Exclusion Criteria

Participants were excluded from participating if they had a history of serious neurological damage, current psychiatric symptoms, currently taking anxiety-reducing medication, had an intellectual disability or were a diagnosed alcoholic. These criteria were identified as likely to seriously confound the neuropsychological measures (Dewa et al., 2008; Gioia, Collins, & Isquith, 2008; Goudriaan et al., 2006; Ransom, 2008; Ratti et al., 2002). Exclusion criteria information was included in recruitment material and discussed over the telephone prior to negotiating assessment appointment details. One participant was excluded due to having a history of a severe brain injury.

Colour blindness is a common eye condition that makes it difficult to distinguish certain colours, which are usually yellow, red, blue or green (Ishihara, 2008). All participants were assessed for colour blindness ***using*** Ishihara colour blindness plates, which are a series of 12 plates that provide an assessment of the most common form of colour blindness (red–green). Individual plates were held by the researcher 75 cm from the participant's face, with the page at right angles to the plane of vision. Six participants were identified as likely to be colour blind and excluded from the Stroop Colour-Word test, but completed all other assessment tasks.

Location of Assessment

Assessments were conducted in Whyalla and the Barossa Valley. In Whyalla, a clinic room in the Health Research Unit at the University of South Australia and a similar room in located the Whyalla TAFE were used. In the Barossa Valley, three locations were used, a community health centre in Tanunda, a clinic room in the Angaston Hospital and a meeting room at the Nuriootpa TAFE. Participants were informed of the venue options and selected their preferred assessment location. All five rooms were comparable, approximately four metres square, quiet, plainly decorated, with one desk, two chairs and the measurement equipment used in the assessment.

Assessment Routine

All assessments were conducted by one researcher and a protocol guided the order and verbal instructions so that all participants received the same information in a consistent manner. Upon arrival to the appointment participants were seated in the clinic room, offered water, and a consent form, as shown in Appendix 4, was discussed and signed. Participants were then provided with four questionnaires to complete: The Health Behaviour and Personal Information Questionnaire (HBPIQ), shown in Appendix 5; the Conscientiousness subscale of the Neuroticism, Extraversion, Openness Personality Inventory Revised (NEO-Personality Inventory-Revised), shown in Appendix 6; a Kessler 10 questionnaire (K10), shown in Appendix 7 and a set of communicative and critical health literacy questions (CCHL) from Ishikawa et al. (2008), which is shown in Appendix 7. All participants had been given the option of receiving two questionnaires (HBPIQ and NEO-PI-R) by post or email prior to the assessment and bringing them completed to the appointment. A laminated information sheet was provided as a guide about standard alcoholic drinks and definitions of vigorous and moderate physical activity as relevant to item in the HBPIQ. The order of the assessment was consistent for all: completion of questionnaires, taking of blood pressure, anthropometric assessment followed by the administration of cognitive tests. All participants were told of the research objectives and signed a consent form indicating they had read and understood the information sheet and understood that they were aware of the privacy and confidentiality standards, could refrain from answering any aspect of assessment and were involved in a voluntary capacity.

An introductory statement informed the participant of the increasing difficulty of some of the tests and encouraged them to try their best and to feel free to request breaks at the end of any chosen task. Self-administered questionnaires were completed first, providing opportunity for quiet seated rest prior to the taking of blood pressure readings. The participants were asked to avoid standing during or after completing the

questionnaires, but to indicate verbally to the researcher in the room that they were complete. The taking of the blood pressure involved measuring the left upper arm with a tape to ensure the correct cuff size was selected. Two readings were taken, five minutes apart, and recorded on the score sheet. Shoes were then removed and weight and height were measured followed by three repeat waist and hip circumference measures with a metal tape deemed to stretch less, and provide greater accuracy. Once seated again, the functional health literacy tests, NVS and S-TOFHLA, were completed and then a test for colour blindness. The third phase of the assessment included the neuropsychological tests, which are named and listed in Table 4-2. Participants were offered tea or coffee and invited to have a break at the end of any task. At the completion of the assessment, participants were provided with a written copy of their anthropometrics, one $20 gift card, a health service contact details sheet, and asked if they would like to receive a copy of a report containing a summary of key research findings once the research is complete.

Human Research Ethics Approval

Approval was obtained to conduct this research from the University of South Australia's Human Research Ethics Committee (HREC) on 25th May 2009, protocol number P147/09.

Measures

Self-Report Versus Measured data

Health status and health behaviours can be assessed by self-report and objective measures. Self-report involves a person providing information about their perceived wellbeing and the presence of disease, and objective measures involve an independent person using measurable tools or clinical records to make a determination of health. An English study involving nearly 20,000 working-aged men found measures of physical and mental health, explained between 35 and 41% of the variance in self-reported health

(Singh-Manoux et al., 2006). This indicates that self-reported health does not provide a complete picture of health status, but that the common use of self-report measure of health is reasonable. Some researchers have gone as far as to say that self-rated mental health is inherently valid as the respondent is the best judge of his or her own perceptions (Goldney, Eckert, Hawthorne, & Taylor, 2012; McDonough, 2009; Singh-Manoux et. al., 2006). Height and weight data may be collected in surveys as measured or self-reported data. People tend to overestimate their height and underestimate their weight, leading to an underestimate of BMI. Thus, rates of overweight and obesity based on self-reported data are likely to be underestimates of the true rates, and should not be directly compared with rates based on measured data (Rohrer, Rush Pierce, & Blackburn, 2005). This research has included objective and self-report measures of health.

Twenty quantitative measures were compiled in the assessment battery and included a self-administered health behaviour questionnaire, personality and psychological distress measure, and a battery of tests of executive function and health literacy tests administered by the researcher. All of the tests had been published in peer-reviewed journals as validated measures, with the exception of the supplementary health behaviour questions, which were compiled for the purposes of this research. The order and instructions for each psychological and health literacy measure were consistent for each participant and these are shown in Table 4-2 .

Table 4-2 Order and details of health behaviour, health status and psycho-metrics

Order	Test / Equipment	Construct
1	Health Behaviour and Personal Information Questionnaire (HBPIQ) incorporating the International Health Behaviour Questionnaire (Wardle & Steptoe, 1991)	Demographics, Health Status Health behaviour, Sense of Control Health Behaviour Value
2	Conscientiousness Facets of the Neuroticism, Extraversion, Openness Personality Inventory Revised (NEO-PI-R) (Costa & McCrae, 1992)	Conscientiousness
3	Critical & Communicative Health Literacy Questions (Ishikawa & Yano, 2008)	Critical Health Literacy
4	Kessler 10 Questionnaire (AMHOCN, 2005)	Mental Health
5	Electronic sphygmomanometer	Blood Pressure
6	Mobile stadiometer and electronic scales	Height / Weight
7	Metal measuring tape	Hip and waist circumference
8	Ishihara plates (Ishihara, 2008)	Colour blindness
9	Shortened Test of Functional Health Literacy for Adults (S-TOFHLA; Parker, et al., 1995)	Functional Health Literacy
10	Newest Vital Signs (NVS; Weiss et al., 2005)	Functional Health Literacy
11	Letter Cancellation Task (Uttl & Pilkenton-Taylor, 2001)	Interference control
12	Tower Test (Delis, 2001)	Planning
13	Stroop Colour-Word Test (Dodrill, 1978)	Inhibition
14	Trail Making Test (Reitan, 1985)	Planning
15	Self Ordered Pointing Task (SOPT; Petrides & Milner, 1982)	Planning
16	Initial Letter Fluency Task (Lezak et al., 2004)	Verbal fluency
17	Matrix reasoning (Psychological Corporation, 1997)	Non-verbal intelligence
18	Zoo Map Test (Wilson, Burgess, & Emslie, 1996)	Planning
19	The Spot the Word Test (Baddeley et al., 1993)	Verbal intelligence

Demographic Information

Fourteen demographic questions were included in the HBPIQ. All questions were categorical, requiring the participant to tick one box per question on topics of age, location of residence, employment, current shift work, personal income, household income, personal financial status, family background, living arrangement, marital and family status.

Health Status

Health status was measured using self-reported tick box questions contained in the HBPIQ, as well as anthropometric measures including blood pressure, body mass index (BMI) and waist hip ratio (WHR). Mental health status was measured using the Kessler10 (K10). The Short Form of health perception (SF-1; Ware, 1993, 1995), is a one-item question requiring the participant to rate their health as *excellent, very good, good, fair* or *poor*. Satisfaction with life was similarly rated as *very satisfied, moderately satisfied, no feelings either way, moderately dissatisfied* or *very dissatisfied*. Perceived body weight status was categorised as *very overweight, slightly overweight, about right, slightly underweight* or *very underweight*. Participants were also asked to report if they had taken any over-the-counter or prescription medication in the previous four weeks and provided with the option or listing these medications.

Blood Pressure

An electronic Sphygmomanometer (Welch Allyn Spot Vital Signs 420 Series) with variable-sized cuffs was used to measure blood pressure. Systolic and diastolic blood pressures were taken after the participant had been seated and rested for 10 minutes. The procedure was repeated after a further five-minute rest. When the readings differed by more than 10%, a third measure was taken. The mean of the two readings or the median of three readings was calculated for both systolic and diastolic blood pressure.

Body Mass Index (BMI)

BMI was calculated from a measure of weight and height using the formula: weight (kg) divided by height (m) squared. Height was measured to the nearest 0.1 cm using a mobile stadiometer. Weight was measured to the nearest 0.1 kg using portable electronic scales (Tanita BF-681). Measurements of both height and weight were taken while the participant was dressed in light clothing, without shoes. Participants were classified according to the World Health Organization classifications: underweight = 18.5, normal = between 18.5 and 25, overweight = between 25 and 30 and obese = over 30.

Waist Hip Ratio (WHR)

Waist Hip Ratio (WHR) was measured using a metal measuring tape to measure the waist, at the narrowest point between the ribs and hips, and the hip at the fullest part of their buttock area. Waist circumference and hip circumference measures were repeated three times and averaged when differences were reported. The waist measure was divided by their hip measurement to produce a waist hip ratio.

Chronic Disease Score

Participants were asked to report any chronic diseases they were currently experiencing from a list including diabetes, asthma, cardiovascular disease, arthritis, hypertension and mental illness. One point was allocated to the incidence of each one of these, and then added together, providing a potential range of scores from zero to six. A score of zero indicates that a participant has no current conditions. Two mental illness questions were asked, one about anxiety and depression and another about having a current diagnosis of any other mental illness. These variables were combined and recoded so a person indicating they had both, would only score one mental ill-health point toward the chronic disease score.

Psychological Distress

Psychological distress was measured using the Kessler 10 (K10) (Andrews & Slade, 2001; Kessler & Mroczek, 1994). This is a 10-item self–report questionnaire intended to yield a global measure of nonspecific psychosocial distress based on questions about the level of nervousness, agitation, psychological fatigue and depression in the previous four weeks. Each item was scored between 1 and 5, from 1 = *none of the time* and 5 = *all of the time*. The scores for all 10 items were added together to produce a score range of 10–50. A K10-score of 10–19 = *low distress*, 20–24 = *moderate distress*, 25–29 = *high distress* and 30–50 = *very high distress* (Slade, 2001).

Prevalence estimates of psychological distress and mental health illness in young adult men may be underestimated as data collected often rely on self-report of a diagnosis and participation rates of people with mental illness are believed to be low (Haapea et al., 2008). To have been given a mental health diagnosis, a person must have been assessed and diagnosed by a qualified mental health professional. Diagnosis may be psychosis including schizophrenia, bipolar, or nonpsychotic affective disorders such as depression, anxiety and personality disorders (Dewa et al., 2008). A person with a current mental health diagnosis may report current symptoms of psychological distress, or they may be well managed, possibly involving drug therapy or psychotherapy and thus have few symptoms of psychological distress. Given this, a measure of current psychological distress must be interpreted differently to the commonly reported health status indicator of having a current mental health diagnosis. It has been argued that psychological distress is a more accurate indicator of current psychological health as opposed to having a mental health diagnosis (Andrews, Sanderson, & Beard, 1998), as young adult males who have symptoms may not yet have been given a diagnosis. Reliability and validity statistics for the K10 were outlined in Chapter 3.

Measures of Health Behaviour

Health behaviour information was collected using the HBPIQ, which is a modified version of the International Health Behaviour Survey (IHBS; Wardle & Steptoe, 1991). The IHBS is a self-administered questionnaire survey of health-related behaviour, risk awareness, attitudes and sociodemographic factors. The IHBS was developed and used to study the health behaviours of male and female university students and has been translated in to 18 languages (Dantzer, Wardle, Fuller, Pampalone, & Steptoe, 2006). Wardle and Steptoe (1991) conducted test–retest stability measures from a sample of 46 university students aged 18–30 years with an interval of 17 days. They report that a complete agreement between responses was given for frequency of brushing teeth, highly stable responses for individual behaviours indicated by a significant Goodman and Kruskal Lambda range of (λ = .60– .96) was observed for smoking, alcohol consumption, regularity of breakfast, dieting, perceived weight, seatbelt use, obedience to speed limits, access to doctor and nonprescribed medication use. Retest correlations were high and significant (r = .71– .99) for hours of sleeping, number of meals and snacks, The responses to alcohol consumption and exercise questions were less stable. When asked whether they had exercised over the last 14 days, 22% of the participants changed categories. However, among respondents who replied that they had exercised, the correlation between number of sessions reported on two occasions was satisfactory (r = .76). There was variation in the number of days over the past two weeks on which alcohol was drunk and the number of drinks consumed (r = .34). Wardle et al. (1991) attribute this variation to the likelihood of genuine variations in exercise and drinking patterns. The correlations between value ratings made on the two occasions were statistically significant for all items, with coefficients including r = .90 for never driving after drinking alcohol.

The Development of the Health Behaviour and Personal Information Questionnaire

One questionnaire was required to allow for the self-reporting of a range of personal, demographic, socioeconomic, health status and health behaviour. A literature search using EBSCO and Google Scholar was conducted with the aim of identifying existing questionnaires, ideally standardised and able to be self-administered within a 20-minute timeframe. The IHBS (Wardle & Steptoe, 1991) was identified and email permission from one of the authors, Professor Andrew Steptoe, was obtained. While the IHBS assessed the majority of the behaviours of interest, alcohol use, fruit and vegetable consumption and physical activity, other behaviours—namely drug use and excess drinking—were not included. Some of the IHBS questions were excluded, namely, female-specific questions relating to breast self-examinations and pap smear attendance and some food consumption questions. Supplementary questions, some based upon the South Australian Monitoring Surveillance System (SAMSS), were incorporated to produce a Health Behaviour and Personal Information Questionnaire (HBPIQ).

Consideration of the order of questions included putting more invasive questions at the end of the questionnaire to reduce noncompletion (IAC search and media, 2011; Rattray & Jones, 2007). As the HBPIQ included questions from different sources, question style and response categories were formatted to be consistent throughout the questionnaire. The first draft was tested on colleagues and corrections made. The piloting process included the gathering of comments from six men aged between 16 and 44 about the format, wording of questions, missing categories, age and gender appropriateness. Modifications were made at the end of each pilot consultation. Completion time was consistently 10–12 minutes. A copy of the final HBPIQ that was completed by all participants can be found in Appendix 5.

Composite Health Behaviour Score

The HBPIQ contained 28 questions about 10 behaviour groups that included alcohol use, smoking tobacco, physical activity, oral hygiene, consumption of fruit and vegetables, breakfast daily, help seeking, physiological self-care, driving and drug use. Sabia, Nabli, Kivimake, Shipley, Marmot and Manous (2009), in research investigating associations between health behaviour and executive function, reported a perceived importance for further research to consider the combined impact of health behaviours. In order to calculate a composite health behaviour score, individual health behaviour variables were recoded as dichotomous or trichotomous variables and scored as a zero, half or one point, reflecting the extent to which they conformed to guidelines that were outlined in Chapter 1. This scoring reflects the way in which health behaviour scores have been calculated and used in other research (Kvaavik, Batty, Ursin, Huxley, & Gale, 2010; Parekh, King, Owen, & Jamrozik, 2009). The use of composite scores as predictor and outcome variables in health behaviour research were outlined in Chapter 2. The most common approach in previous research was found to be the allocation and summation of points for healthy behaviours (Estaquio et al., 2008; Kvaavik et al., 2010; Mahalik et al., 2007; Meng et al., 1999; Willis & Porche, 2006). Behaviour groups contained a different number of variables with different values and therefore scores were weighted such that they added equally to the Health Behaviour Score. The points and weights allocated to each behaviour variable are shown in Table 4-3.

Two alcohol consumption variables were calculated and these were an estimate of the number of weekly alcoholic drinks consumed and an excess drinking classification of excess drinker, moderate drinker or nonexcess drinker. New alcohol consumption guidelines were released in 2009 and reported that more than four standard alcoholic drinks per session to be excessive and recommended two be the limit for both men and women (NHMRC, 2009). Nonexcess drinking was therefore categorised as the

consumption of two or less alcoholic drinks and allocated one health behaviour point, moderate drinking was the consumption of between three and four drinks and allocated half of one point, excess drinking was the consumption of five or more alcoholic drinks and allocated zero health behaviour score points. An estimate of weekly consumed alcoholic drinks was computed using ordinal categories. At the time of questionnaire development six or more drinks in any one occasion was considered binging (NHMRC, 2001). Response options in the HBPIQ identified the number of days in a week when more than six drinks per session were consumed, the number of days per week that less than six drinks were consumed and the number of drinks usually consumed per week. Median scores for these ordinal response categories were used to estimate the number of drinks consumed in a week. This continuous variable was reported as the weekly alcohol estimate. One health behaviour score point was allocated when a participant consumed 0–14 drinks per week (equivalent to two or less drinks per day), half of a point for consumption of 15–28 (equivalent to between two and four drinks per day) and zero points for consumption of more than 29 alcoholic drinks in a week.

Help seeking was measured by asking participants whether they seek help with their decision-making, problem-solving or planning in relation to their health and wellbeing. Participants were also required to identify their common sources of support. When a participant responded that they do not seek help with decision-making, but identified support people in the second help-seeking question, they were coded as being help seekers.

BMI and WHR can be used to indicate obesity and while they are not specific behaviours, they are indicative of a range of lifestyle behaviours (Mokdad, 2009). BMI and WHR were included in the health behaviour score calculation, replicating other research that has calculated a composite health behaviour score (Meng et al., 1999; Parekh, King, Owen, & Jamrozik, 2009; Tamakoshi et al., 2009). BMI, WHR and the number of hours of

daily sleep were grouped together as physiological self-care behaviours as literature suggests inadequate sleep and obesity are highly correlated (Knutson et al., 2007).

Table 4-3 Variable values and weights for the Health Behaviour Composite Scores

Subgroup	Variable	Value	Weighting
Physical activity	Exercise < 5 days per week	0	3
	Exercise >= 5 days per week	1	
Smoking	Current smoker–Yes	0	3
	Current smoker–No	1	
Alcohol Use	Excess drinking 4+drinks	0	1.5
	Moderate drinking 3–4 drinks	0.5	
	Non-excess drinking <= 2 drinks	1	
	29 + drinks per week	0	
	15–28 drinks per week	0.5	
	0–14 drinks per week	1	
Illicit drug use	Not currently using drugs	1.0	3.0
	Currently using drugs	0.0	
Help seeking for health decisions	Help seeking = Yes	1.0	3.0
	Help seeking = No	2.0	
Driving safety	Wears a seat belt = yes	1.0	1.0
	Wears a seat belt = No	0.0	
	Speeding never = Yes	1.0	
	Speeding never = No	0.0	
	Drink driving in past year = No	1.0	

Subgroup	Variable	Value	Weighting
Oral hygiene	Teeth brushed < once daily	0	3
	Teeth brushed once daily	0.5	
	Teeth brushed twice daily	1	
Food habits	Breakfast daily = No	0	1.5
	Breakfast daily = Yes	1	
Fruit and vegetable consumption	Fruit serves per day < 2	0	1.5
	Fruit serves per day >= 2	1	
	Vegetable serve per day < 4	0	
	Vegetable serves per day >= 4	1	
Physiological Self-Care	BMI 18.5–25	1.0	1.0
	BMI < 18.4 or > 25.1	0.0	
	HWR < = .950	1.0	
	HWR > .951	0.0	
	Sleep 6–8 hours daily	1.0	
	Sleep > 8 hours daily	0.5	
	Sleep < 5.9 hours daily	0.0	

Note. BMI = Body Mass Index; HWR = Hip Waist Ratio

Measures of Executive Function (EF)

Measures of executive function including tests of planning, inhibition and interference control and verbal fluency were identified for use in this study based on published literature (Lezak, Howieson, Loring, Hannay, & Fischer, 2004; Strauss & Spreen, 2006), and practical considerations including suitability for administration at various clinical/worksite settings located in excess of 400 km apart, as well as availability of limited research resources. Tests selection was therefore limited to manual rather than computerised versions that could be transported and set up by one person. Administration time was also a consideration given the number of predictor variables being measured in this research. A two-hour limit for the assessment interview was nominated, based upon ethical considerations (NHMRC, 2007) as well as the cognitive fatigue of the participants (van der Linden, Freses, & Meijman, 2003). The order of test administration was based on each test's verbal and nonverbal content and task difficulty to ensure that prior test performance did not interfere with later performance and that participants began and ended the session with less demanding tests.

Planning

Planning was measured using the Zoo Map Test (Wilson, Burgess, Emslie, & Evans, 1996), The Self-Ordered Pointing Test (SOPT; Petrides & Milner, 1982) and the Tower Test (Delis, 2001). The Zoo Map Test requires an ability to formulate and implement a plan that represents an effective route through a picture of a zoo. This test had two trials: the first involved the participant plotting a route around the zoo in accordance with rules that were provided to the participant in writing and also given orally by the administrator. There were three possible correct alternate routes. The second trial involved an identical map on which the participant marked out a route after being provided with written instructions that provided the correct route. The time for planning was recorded as well as the implementation time that was taken for the participant to draw route lines on

the zoo map in accordance with scoring instructions (Wilson, Burgess, & Emslie, 1996). A profile score was calculated based upon the successful implementation of the plan with deductions made for rule breaks and time taken to complete the test. Zoo Map is part of The Behavioural Assessment of the Dysexecutive Syndrome (BADS) and test–retest reliability (N = 29, Interval = 6–12 months) is reported as r = .39 (Wilson et al., 1996).

The Self-Ordered Pointing Test (Petrides & Milner, 1982; Shimamura & Jurica, 1994) requires self-monitoring and the capacity to regulate behaviour by using plans and strategies (Strauss, 2006). Participants were provided with a folder of plastic sleeves and in each sleeve was an A4 piece of paper on which was printed 16 abstract patterns in black and white. Turning one page at a time the participant was asked point to one abstract design, taking care not to point to one they had previously pointed to. The position of the abstract designs vary from trial to trial, requiring the monitoring of previous choices from memory. There were 16 patterns on each page, 16 pages in each set and the participant completed three identical sets producing part 1, part 2 and part 3 of the task. The number of times the participant pointed to the same pattern within a set was scored as a repeat error and these errors were added together to produce a total error score. Ross, Hanouskova, Calhoun and Tucker, (2007) reported a test–retest reliability (N = 93; M interval = 42.7 days) for SOPT total errors as r = .82, with a small practice effect (Cohen's d = .34). The authors found that SOPT scores correlated with planning but not cognitive flexibility or interference control as demonstrated by a nonsignificant correlation with Stroop Test°r°=°.14. A much lower test–retest reliability measure of r = .38, across three trials was reported by Bryan and Luszuz (2001) with low coefficients attributed to participants developing a strategy throughout the test.

For the Tower Test (Delis, Kaplan, & Kramer, 2001) participants were instructed to rearrange coloured rings from their initial position on three upright rods to an illustrated target position in the least number of moves. Nine test items of graded levels of difficulty

were scored based on the achievement of the minimum number of moves and three attempts were allowed for each problem (Lezak et al., 2004). There were three rules: to move only one disc at a time, use only one hand and never place a larger disc on top of a smaller disc. Nine towers were included in the task, if a tower was abandoned or incorrect the next tower in the book was shown and the test was discontinued after three consecutive failures. A tower failure was identified if the tower was different in shape or position to that illustrated or if a time limit had lapsed. Items 1–3 had a time limit of 30 seconds, item 4 a limit of 60 seconds, items 5–6 a limit of two minutes, item 7 a limit of three minutes and items 8–9 had a time limit of four minutes. The time between the picture being revealed and the movement of the first disc was recorded as the planning time for each of the nine items. An achievement score was calculated in accordance with the test instructions. Zero points were allocated when an incorrect tower was produced and between one and four points, dependent upon the number of moves taken to produce a correct tower. More points were allocated when fewer moves were taken. This test is from the Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001) and the test–retest reliability coefficients for the Tower Test achievement score for ages 20–49 years (N°= 30, interval 12 months) is r = .41. Standard error of measurement for the age ranges 16–19, 20–29 and 30–39 years were 1.89, 1.85 and 1.59 respectively.

A composite planning score was calculated by adding together the z-scores for the Zoo Map Test profile score, SOPT total errors (multiplied by -1 to reverse the score) and the Tower achievement score.

Inhibition

Inhibition was measured using the Trail Making Test (Reitan, 1985) and the Stroop Test (Dodrill, 1978). The Trail Making Test requires an ability to shift course and to attend to more than one stimulus at a time (Wecker et al., 2000). This test is from the Delis-Kaplan Executive Function System (D-KEFS; Delis, 2001) and requires the participant to

scan letters and numbers printed on a page and connect the numbers in ascending order (Trail A) and then switch between connecting alternate numbers and letters in ascending order (Trail B). The participants were instructed to move as quickly as they could, refrain from lifting their pen from the paper and ensure they connect each circle around the target number or letter. They were advised that neatness was less important and the focus was upon speed and accuracy. The time taken to complete Trail B, number–letter switching, was recorded, as well as the number of sequencing errors. Internal consistency values for age 16–19, 20–29 and 30–39 year olds is r = .69, r = .78 and r = .78, respectively. Test–retest for ages 20–49 is r =.64. Standard error of measurement was 1.66 for 16–19-year-olds and 1.41 for 20–39-year-olds (Delis et al, 2001)

The Stroop Test (Dodrill, 1978) was used to measure inhibition. The colour–word Stroop Test examines a person's ability to inhibit a learned verbal response (reading words) in order to generate a conflicting response of naming the dissonant ink colours in which the words are printed (Lezak et al., 2004; Phillips et al., 2002; Wecker et al., 2000). This test is part of the D-KEFS (Delis et al., 2001). The Stroop test required the participant to firstly read a full page of colour names printed in incongruous coloured ink as quickly as possible, ignoring the colour in which they were printed. The second trial required the participant to name the colours in which the words were printed, ignoring the words. The time taken to read words and name colours was recorded. An inference score was calculated by dividing trial one completion time with the completion time of trial two. Test–retest reliability coefficients for ages 20–49 years is r =.71. Standard error of measurement and confidence intervals 16–19, 20–29 and 30–39-year-olds is 1.50, 1.28 and 1.50, respectively (Delis et al., 2001).

A composite inhibition score was calculated by adding together the standardised z-score for the Stroop interference score and the standardised z-score for Trail Making Part B completion time, which had been multiplied by -1 to reverse score.

Interference Control

Interference control was measured by the Letter Cancellation Task (Lezak et al., 2004). This test consists of one page of 1440 random letters laid out in rows containing 32 letters with a single space between each letter. Participants were required to identify and circle as many of the target letters, the letters F and L, as they could in three minutes. The total number of targets correctly circled produce the letter cancellation score. Lezak reports the test–retest reliabilities of letter cancellation tests, of which there are many variations, to be around r = .84 – .97 (Lezak et al., 2004)

Verbal Fluency

The initial letter fluency task was used to measure verbal fluency. This test involved two trials timed for sixty seconds each. In the first trial, participants were required to produce as many words as possible beginning with the letter F and in the second trial, as many words as possible beginning with the letter S (Delis et al., 2001). The rules provided were that words produced could not be proper nouns, the words needed to have more than three letters and not be repeated words, including generated by simply adding a suffix. These tasks rely on strategic retrieval search from memory, as it is unlikely that words are stored in the lexicon based on their initial letter (Hughes & Bryan, 2002; Phillips et al., 2002). The numbers of correct words produced in both trials were summed to generate a correct word total (Bryan et al., 2001). The test–retest reliability of the Initial Letter Fluency Task is reported to be good to high with coefficients for ages 20–49 years of r°=°.76. The standard error of measurement derived with internal consistency coefficients for 16–19, 20–29 and 30–39-year-olds is 1.36, 1.16 and 0.97, respectively (Delis et al., 2001)

Composite Executive Function

Combining the four composite planning, inhibition, interference control and verbal fluency z-scores generated one executive function score. Composite executive function

scores have been used previously in research (Crane et al., 2008; Gibbons et al., 2012) and found to be better than individual composite items at assessing executive function. Gibbons et al. (2012) report that a composite EF score eliminates the need for selection of an individual component test, which can be problematic as executive function is a notably diverse construct. The authors also found that combining individual test scores that were commonly skewed produced normally distributed composite scores and improved statistical analysis options. The executive function composite score used in this research was generated by combining the z-scores for Zoo Map Test profile score, Self-Ordered Pointing Test (SOPT) total errors, Tower achievement score, Stroop interference score, Trail Maker completion time, Letter Cancellation Task total score and the Initial Letter correct word total score. Scores were converted to z-scores due to the varied unit of measurement of the seven tests including time in seconds, profile scores and correct responses. Outliers were adjusted as per Appendix 8, and scores were converted to standardised z-scores. The Zoo profile score, SOPT total errors (reverse scored) and Tower achievement z-scores were added together to form a planning z-score, The Stroop interference score and Trail B completion time (reverse scored) z-scores were combined to produce an inhibition z-score, Letter Cancellation Task total score represented interference control z-score and Initial Letter Word total represented verbal fluency z-score.

Measures of Intelligence

Verbal intelligence was measured by the Spot the Word test (Baddeley et al., 1993) and nonverbal intelligence was measured by the Matrix reasoning subtest of the WAIS III (Psychological Corporation, 1997). The Spot the Word test presents participants with pairs of items comprising one real word and one nonword (designed to appear like a real word) and requires the participants to identify the real word. For example ‘kitchen’ was paired with ‘harrick’, and kitchen is the correct response. Participants were provided with four

sheets containing 60 pairs of words and asked to circle the real words. If they were unsure about a correct response, they were asked to leave that item and go onto the next in order to reduce guessing. A score for this test was calculated by deducting incorrect word choices from correct word choices. The Spot the Word test has been found to correlate highly with other tests of vocabulary and fluid intelligence (Lucas, Carstairs, & Shores, 2003). Cronbach's alpha for the 60 items was .85 (95% confidence interval .87– .91) (Mackinnon & Christensen, 2007). Correlation between two forms of the Spot the Word test is reported to be r = .88 (Baddeley et al., 1993). A study involving 89 healthy New Zealand adults found strong correlations between the Spot the Word and WAIS III, r = .70 (Barker-Collo, Clarke, van Toledo, Bartle, Willetts, & Vykopal, 2008),

Matrix Reasoning is a measure of nonverbal intelligence and abstract reasoning (Wechsler, Coalson, & Raiford, 2008). This is a subtest of the Wechsler Adult Intelligence Scale of both version III and IV. Version III, which is different from the WAID IV version, was used in this research as at the time of data collection Version IV had only recently been released and was not as readily available. The Matrix Reasoning (WAIS III) test presents a series of 26 incomplete abstract patterns and participants were required to select one of five response options that completed the pattern. The Matrix Reasoning was not timed and participants were invited to pass on any item and turn the page at their own pace. Participants taking more than five minutes on one item were verbally encouraged to make their best guess and turn the page. The test was discontinued after four consecutive incorrect scores or four incorrect responses from five items. Scores reflect the total number of correct items. The WAIS III Matrix reasoning reliability coefficients range between .87 and .91 for people aged 16–44 (Axelrod, 2002; Garland, 2005).

Composite Intelligence Score

The Matrix Reasoning Score and Spot the Word test z-scores were added together to produce an intelligence score. The composite intelligence score therefore represents a measure of combined verbal and nonverbal intelligence.

Measure of Conscientiousness

The NEO Personality Inventory–Revised (NEO PI-R; Costa & McCrae 1992) is a measure of five domains of personality. The NEO Conscientiousness subscale was used in the current study and has six facets that are competence, order dutifulness, achievement striving, self-discipline and deliberation. The NEO PI-R has statements such as 'I am not a very methodical person', to which participants respond using a 5-point Likert scale (*strongly disagree* = 0, *disagree* = 1, *neutral* = 2, *agree* = 3 and *strongly disagree* = 4). The statements were scored to produce the six facet scores and these were combined to produce a Conscientiousness Score. Internal consistency coefficient alpha for the individual conscientiousness facet scales are: competence (.67– .73), order (.66– .71), dutifulness (.62– .70), achieving striving (.67– .70), self-discipline (.75– .82) and deliberation°(.71– °.73). The test–retest reliability coefficients for the NEO Conscientiousness subscale with an interval of three months is r =.83 (p < .001) and an interval of three years is r = .79 (Costa et al., 1992).

Measure of Sense of Control

Six sense of control questions from the International Health Behaviour Questionnaire (Steptoe, Wardle, Tsunda, & Tanaka, 2007; Grant, Wardle, & Steptoe, 2009) were used. The six questions were (1) 'There is little I can do to change many of the important things in my life', (2) 'I often feel helpless in dealing with the problems in my life' (3) 'Whether or not I am able to get what I want is in my own hands' (4) 'What happens to me in the future mostly depend on me' (5) 'I have little control over the things

that happen to me' (6) 'I can do just about anything I really set my mind to'. Participants responded using a 5-point Likert scale ranging from 1 = *disagree strongly* and 5 = *agree strongly*. Questions 1, 2 and 5 were reverse scored. Scores for each item were summed to provide a Sense of Control Score. Scores ranged from 6 to 30 with high scores indicating a strong sense of control. The sense of control questions have a Cronbach's alpha of .64 (Lachman & Weaver, 1998).

Measure of Health Behaviour Values

Health behaviour values were measured using 11 health behaviour value statements that were obtained from the IHBQ (Wardle & Steptoe, 1991) and included in the HBPIQ. Participants were asked to indicate what importance value they placed upon 10 specific behaviours using a 10-point Likert scale with 1 = *of very low importance* and 10 = o*f very high importance*. The 11 behaviour value statements included the importance of taking regular exercise, not to smoke tobacco, not to drink too much alcohol, to eat enough fruit, to keep your body weight within normal range, to get 7–8 hours of sleep on most nights, to brush teeth regularly, never drive after drinking alcohol, to wear a seatbelt when travelling in a car and to drive within the speed limit most of the time. Behaviour values for individual behaviours were used in analysis as well as a global health behaviour value score, which combined all 11 behaviour value scores.

Measures of Health Literacy

Functional Health Literacy

Functional Health Literacy (FHL) was measured using two tests, the shortened version of the Test of Functional Health Literacy (S-TOFHLA; Nurss, 2001) and the Newest Vital Signs (NVS; Weiss et al., 2005). The z-scores of both tests were added together to produce a composite functional health literacy measure to accommodate the variation that occurs between the two individual tests (Mancuso, 2009).

The Short Test of Functional Health Literacy in Adults (S-TOFHLA) is a measure of reading comprehension skills in the middle to low levels of literacy ability. The S-TOFHLA is one part of the Test of Functional Health Literacy in Adults (TOFHLA), excluding the numeracy components. The reading comprehension component of the S-TOFHLA includes some written passages of medical instructions that a person may encounter around a hospital. The sentences contain missing words for which four possible options are provided. The participant is asked to select one option in order to complete each sentence. The test is timed for a maximum of seven minutes and a raw score of between 0 and 36 is obtained by allocating one point for each correct response. Scores were classified as 0–16 = inadequate FHL, 17–22 = marginal functional health literacy and 23–36 = adequate functional health literacy. The S-TOFHLA has an excellent internal consistency of Cronbach's α = .97 and Spearman correlation with the full TOFHLA of *r*°=° .91 (Nurss, Parker, & Baker, 2008). Test–retest details are not available.

The Newest Vital Signs (NVS) measures a person's ability to read and comprehend an ice-cream container nutrition label. Participants were provided with an enlarged laminated copy of the nutrition label and asked to respond to six questions such as: 'If you eat the entire container, how many calories will you eat?' and 'If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?' One point was allocated to each correct response and these points were added together and categorised as 0–1 was equal to high likelihood of limited functional health literacy, 2–3 equal to possible limited functional health literacy and 4–6 was equal to adequate functional health literacy. The NVS has a reported reliability coefficient range of *r* = .64– .76 and good internal consistency with a Cronbach's α = .76 (Osborne et al., 2007; Weiss et al., 2005). There is a strong correlation between the NVS and the S-TOFHLA of *r* = .61 (Osborne et al., 2007); however, the two tests are believed to assess

different, but related constructs and have different cut-offs scores for poor health literacy (Barber, Staples, Osborne, Clerehan, Elder, & Buchbinder, 2009).

Communicative and Critical Health Literacy

Communicative and Critical Health Literacy (CCHL) was measured using five statements, each with a 5-item Likert scale response (Ishikawa, 2008). The self-administered tool asks the participant to rate their own abilities. The CCHL measure has two components, Communicative health literacy that was measured using three questions regarding the ability to obtain health related information: (1) 'I can collect health-related information from various sources' (2) 'I can extract the information I want' (3) 'I can understand and communicate the obtained information'. Critical health literacy was measured using two questions about the ability to critically apply information to personal circumstances: (4) 'I can interpret and judge the credibility of the information' (5) 'I can make decisions based on the information, relate it to my situation and health issues'. Participants were asked to rate their ability using a 5-point Likert scale response with 1 = *agree strongly* and 5 = *disagree strongly*. The combined CCHL score is a continuous score of between five and 25, with low scores indicating high communicative and critical health literacy and high scores indicating low communicative and critical health literacy.

Composite Health Literacy Score

Multi-item scales or composite scales allow for the assessment of complex constructs (Martinez-Martin, 2010). There are examples of both composite scales and single-item scales being used simultaneously in research (Sloan, Aaronson, Cappelleri, Fairclough, & Varricchio, 2002) and cognitive and executive function scales being combined to produce a composite score (Farooqi, Hagglof, & Serenius, 2013). Lee, Cornwell and Babiak, (2012) developed a measure of social impact of sport that included measures of functional, interactive and critical health literacy, which were combined to

produce one composite health literacy score. There are other examples of composite functional health literacy being generated by summing the responses to various Likert scales (Wynia & Osborne, 2010). In this research two composite health literacy scores were calculated, a Functional Health Literacy Score and a Health Literacy Score. The Functional Health Literacy Score combined z-scores for the NVS and S-TOFHLA test scores. The Health Literacy Score combined the z-scores for NVS, S-TOFHLA and the CCHL score. Outliers for each test variable were adjusted and as shown in Appendix 9.

Data Analysis

Scoring and Recoding of Variables

All tests were scored manually by two people, providing the opportunity for cross-checking. Data were inputted and analysed using Predictive Analytics Software (PASW) version 18 and Statistical Package for the Social Sciences (SPSS 17). A partnership entry system involved one person inputting half the variables and then a second person checking 100% first entry and entering the remaining variables. A third person reviewed every tenth case for accuracy, cross-checking raw and keyed date. All variables were examined using the Explore function and outliers were checked with the original raw data for accuracy of input.

Statistical Analysis

Age-group differences in health behaviour, executive function and health literacy were explored in two different ways. Variance between continuous variables were explored using multiple linear regression and reexamined using ANCOVA with age as a categorical variable, given the possibility of detecting nonlinear relationships. Plots using Loess smoothing fit lines (Jacoby, 2000) were inspected to further investigate nonlinear trends. Multiple regression allowed for the use of age as a continuous predictor variable for continuous and categorical health behaviour outcomes. Binary logistic regression was used

for binomial health behaviour outcome variables(physical activity in past two weeks, current smoker, excess alcohol drinker, wears a seatbelt when driving, drink driving in past 12 months, brushing teeth twice daily, 2+ serves of fruit daily, smoking). Linear regression was used for continuous health behaviour outcome variables (health behaviour score, weekly alcohol drink estimate, times exercised in past two weeks, daily hours of sleep) to predict health behaviour using linear combinations of predictor variables. ANCOVA was used to test whether age group means differed after the variance in health behaviour, explained by covariates income and education were removed.

The variance in health behaviour attributed to executive function and health literacy, after accounting for covariates income and education, were explored using multiple linear regressions. Moderated multiple regression was used to explore whether executive function moderates the relationship between health literacy and health behaviour.

Count and percentage results were reported in age groups for demographic, health status, health behaviour and psychological variables. Associations between age group and categorical sociodemographic and health status variables were analysed using Pearson chi square (χ^2). When cell counts were below an expected count of 5, as is the case for health status and alcohol drinking status, count numbers were combined.

Education and income were consistently included as ordinal covariates in the ANCOVA and multiple linear regression analysis. Given this, no categorical referents are reported in the regression results tables.

Principal component analysis was attempted to identify groups of executive function variables and health behaviour variables that cluster together for men of different ages (Field, 2005) The results were not interpretable and therefore multiple regression and ANCOVA were selected as the most accurate and reliable method of statistical analysis.

The factor structure of the EF components has previously been identified as problematic for factor analysis or principal component analysis (Salthouse, 2005).

Data Screening

Before analyses related to each research question were conducted, data were screened for missing data, outliers and the distribution of all the continuous variables. There were six cases of missing Stroop test data, due to nonadministration after colour blindness was identified. There was one case of missing data for the Zoo Map Test, attributed to researcher error and one case of a missing Sense of Control response. Expectation-maximization (EM) means were imputed for these continuous variables. Three categorical variables (smoking status, seatbelt use, teeth brushing) had between one and three cases of missing data. The median score was imputed for these missing scores. Five participants chose not to complete the illicit drug use questions and these cases were not included in the analyses involving the composite health behaviour score, but included in all other analyses.

The distribution and extreme scores of the continuous variables, age, chronic disease score, health behaviour score, alcohol use estimate, planning, inhibition, interference, verbal fluency, health literacy, intelligence, conscientiousness, sense of control and health behaviour values were investigated to determine the suitability of parametric tests. Firstly, outliers were identified and extreme low scores were adjusted to one unit below the next nearest nonoutliers and extreme high scores were adjusted to one unit above the nearest nonoutlier (Field, 2009). Nonoutliers were within three standard distributions scores of the mean and beyond the tail of the distribution as shown in a box plot. When an outlier was within one unit of the nearest nonoutlier, it was not adjusted. All regression and ANCOVA analyses included z-scores, with extreme outlier adjustment as shown in Appendix 9. All descriptive tables include results prior to outlier adjustment.

After outliers were adjusted, the distributions of all continuous variables were investigated using the Shapiro Wilk test statistic (W) and visual inspection of QQ-plots. As shown in Appendix 9, health behaviour score, executive function composite score, planning composite score, interference control score, verbal fluency score and global health behaviour value score were normally distributed. Age, composite health literacy score, composite intelligence score and sense of control scores were not normally distributed. Due to the limited range of chronic disease scores, the continuous measure of chronic disease was calculated by adding together the number of reported chronic diseases for each participant. This was recoded to produce a dichotomised categorical variable of nil chronic disease or one plus chronic disease.

Before interpreting the results of multiple linear regressions, assumption of normality, linearity and homoscedasticity of residuals were confirmed by inspection of a normal probability plot of standardised residuals and scatter-plots of standardised residuals against standardised predicted values. The Mahalanobis distance did not exceed the critical χ^2 of 12 for two degrees of freedom (*df*) (at $\alpha = .001$) (Barnett & Lewis, 1978) for any of the models, indicating multivariate outliers were not of concern. Correlations between predictors, also known as multicollinearity, and outcome variables were tested, as shown in Table 4-4. Significant correlations between predictors, age and income of $r = .55$, education and income $r = .58$ and executive function and health literacy $r = .47$ were noted. All predictors, however, had relatively high collinearity tolerances of greater than 0.2 and variance inflation factor (VIF) was less than 10, indicating the assumptions of multicollinearity were met.

Table 4-4 Inter-correlations for key predictor and outcome variables, age, education, income, health behaviour, executive function and health literacy

	Age	Education	Income	Health Behaviour Score	Executive Function	Health Literacy
Age	-	.42**	.55**	.27**	.12	.25*
Education	.42**	-	.58**	.25*	.33**	.36**
Income	.55**	.58**	-	.33**	.19	.21*
Health Behaviour Score	.27**	.25*	.33**	-	.13	.08
Executive Function	.12	.33**	.19	.13	-	.47**
Health Literacy	.25*	.36**	.21*	.08	.47**	-

*. Correlation is significant at the 0.05 level

**. Correlation is significant at the 0.01 level

Results

Demographic Descriptive Statistics

The sample included 102 men aged between 16 and 40, with a mean age of 29.6 years, standard deviation of 7.8. Demographic results are shown in Table 4-5. Slightly more than half of the sample lived or worked in Whyalla and the remainder lived in the Barossa Valley region. The majority were in full-time employment and nearly one quarter of the participants were current shift workers. Slightly more than one in three of the men were tertiary educated, with a similar number having achieved a trade or diploma qualification. The younger men aged 16 to 24 years of age were more likely to be students and less likely to be in full-time paid employment than the older aged groups.

Income was reported at an individual level and household level. Over half of the sample had a personal income of between AU$40,000 and $80,000 per annum. Personal income increased with age group. Household income was evenly distributed throughout the age groups. Two thirds of the sample had a household income of greater than $80,000 per annum, an equivalent proportion having a quite wealthy family background. Half of the sample was married, but this increased with age group seeing the younger age groups more likely to be single or in a noncohabitive relationship compared with the older age groups. Just under half of the whole sample had children, but this followed the similar age trend as marriage. Slightly over half of the men aged 16 to 24 years were living with their parents. The prevalence of living with parents reduced with age with 10% of 25 to 29-year-olds, none of the 30 to 34-year-olds, and 2.8% of males aged 35 to 40 years of age were living with their parents

Table 4-5 Demographic descriptive statistics by age group

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Age	Years	30	(29.4)	20	(19.6)	15	(14.7)	37	(36.3)	**102**	**(100)**
Location	Whyalla	18	(60.0)	11	(55.0)	9	(60.0)	18	(48.6)	**56**	**(54.9)**
	Barossa	12	(40.0)	9	(45.0)	6	(40.0)	19	(51.4)	**46**	**(45.1)**
Employment	Full-time	15	(50.0)	16	(80.0)	14	(93.3)	29	(78.4)	**74**	**(72.5)**
	Part-time	2	(6.7)	1	(5.0)	0	(0.0)	4	(10.8)	**7**	**(6.9)**
	Student with paid employment	5	(16.7)	1	(5.0)	0	(0.0)	0	(0.0)	**6**	**(5.9)**
	Student with no paid employment	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	**0**	**(0.0)**
	Unemployed	5	(16.7)	1	(5.0)	0	(0.0)	1	(2.7)	**7**	**(6.9)**
	Home duties or Other	3	(10.0)	1	(5.0)	1	(6.7)	3	(8.1)	**8**	**(7.8)**
Current shift work	Yes	6	(20.0)	2	(10.0)	4	(26.7)	12	(32.4)	**24**	**(23.5)**
	No	24	(80.0)	18	(90.0)	11	(73.3)	25	(67.6)	**78**	**(76.5)**

Table 4-5 Demographic descriptive statistics by age group

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Education	Some high school	6	(20.0)	1	(5.0)	2	(13.3)	5	(13.5)	**14**	**(13.7)**
	Completed high school	15	(50.0)	3	(15.0)	1	(6.7)	2	(5.4)	**21**	**(20.6)**
	Trade certificate/Diploma	7	(23.3)	5	(25.0)	7	(46.7)	12	(32.4)	**31**	**(30.4)**
	University/Tertiary or higher	2	(6.7)	11	(55.0)	5	(33.3)	18	(48.6)	**36**	**(35.3)**
Personal Income	Up to $12,000	8	(26.7)	1	(5.0)	0	(0.0)	1	(2.7)	**10**	**(9.8)**
	$12,001–$20,000	3	(10.0)	0	(0.0)	1	(6.7)	1	(2.7)	**5**	**(4.9)**
	$20,001–$40,000	6	(20.0)	2	(10.0)	1	(6.7)	2	(5.4)	**11**	**(10.8)**
	$40,001–$60,000	9	(30.0)	7	(35.0)	3	(20.0)	8	(21.6)	**27**	**(26.5)**
	$60,001–$80,000	4	(13.3)	5	(25.0)	5	(33.3)	9	(24.3)	**23**	**(22.5)**
	$80,001–$100,000	0	(0.0)	4	(20.0)	3	(20.0)	4	(10.8)	**11**	**(10.8)**
	$100,001–$150,000	0	(0.0)	1	(5.0)	2	(13.3)	8	(21.6)	**11**	**(10.8)**
	$150,000+	0	(0.0)	0	(0.0)	0	(0.0)	4	(10.8)	**4**	**(3.9)**

Table 4-5 Demographic descriptive statistics by age group

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Household income	$0–$12,000	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	**0**	**(0.0)**
	$12,001–$20,000	0	(0.0)	0	(0.0)	1	(6.7)	1	(2.8)	**2**	**92.1)**
	$20,001–$40,000	2	(7.4)	0	(0.0)	1	(6.7)	1	(2.8)	**4**	**(4.1)**
	$40,001–$60,000	3	(11.1)	2	(10.5)	2	(13.3)	1	(2.8)	**8**	**(8.2)**
	$60,001–$80,000	7	(25.9)	3	(15.8)	4	(26.7)	5	(13.9)	**19**	**(19.6)**
	$80,001–$100,000	6	(22.2)	5	(26.3)	2	(13.3)	7	(19.4)	**20**	**(20.6)**
	$100,001–$150,000	5	(18.5)	6	(31.6)	4	(26.7)	14	(38.9)	**29**	**(29.9)**
	$150,000+	4	(14.8)	3	(15.8)	1	(6.7)	7	(19.4)	**15**	**(15.5)**
Financial status	Spending more than income	5	(16.7)	0	(0.0)	0	(0.0)	1	(2.8)	**6**	**(5.9)**
	Just enough money to get through to the next pay	3	(10.0)	1	(5.0)	3	(20.0)	6	(16.7)	**13**	**(12.9)**
	Some money left over each week but spends it	3	(10.0)	2	(10.0)	3	(20.0)	5	(13.9)	**13**	**(12.9)**
	Saves a bit every now and then	14	(46.7)	15	(75.0)	4	(26.7)	18	(50.0)	**51**	**(50.5)**
	Saves a lot	5	(16.7)	2	(10.0)	5	(33.3)	6	(16.7)	**18**	**(17.8)**

Table 4-5 Demographic descriptive statistics by age group

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Family background	Quite poor	1	(3.4)	1	(5.0)	1	(6.7)	1	(2.8)	**4**	**(4.0)**
	Not very well off	8	(27.6)	5	(25.0)	5	(33.3)	9	(25.0)	**27**	**(27.0)**
	Quite well off	20	(69.0)	14	(70.0)	9	(60.0)	25	(69.4)	**68**	**(68.0)**
	Wealthy	0	(0.0)	0	(0.0)	0	(0.0)	1	(2.8)	**1**	**(1.0)**
Marital status	Married/Defacto	3	(10.3)	8	(40.0)	9	(60.0)	30	(81.1)	**50**	**(49.5)**
	In a relationship	10	(34.5)	6	(30.0)	3	(20.0)	3	(8.1)	**22**	**(21.8)**
	Single	16	(55.2)	6	(30.0)	3	(20.0)	4	(10.8)	**29**	**(28.7)**
Children	Yes	3	(10.0)	5	(25.0)	8	(53.3)	32	(86.5)	**48**	**(47.1)**
	No	27	(90.0)	15	(75.0)	7	(46.7)	5	(13.5)	**54**	**(52.9)**
Living with parents	Yes	17	(56.7)	2	(10.0)	0	(0.0)	1	(2.8)	**20**	**(20.0)**
	No	13	(43.3)	18	(90.0)	14	(100.0)	35	(97.2)	**80**	**(80.0)**

Note. $n = 102$

Health Status Descriptive Statistics

The majority of the men reported being in either very good or good health, as shown in Table 4-6. One in ten men described their health as excellent or fair with the majority describing their health as very good or good. There were no significant age group differences, χ^2 (6) = 6.68, $p > .05$, in reported health status. The majority of men were satisfied with their life but one in ten reported being neutral or moderately dissatisfied. The majority of the sample did not have any of the nominated chronic diseases. There was a significant association between age group and chronic disease score, χ^2 (6) = 12.55, $p = .05$, with the older men aged 35–40 years more likely to have two or more chronic diseases compared with the younger men. The most common condition was asthma followed by high blood pressure and high cholesterol. More than one in ten men had a mental health condition and this was more common for the men aged over 30 years of age, $\chi^2(3) = 8.69$, $p < .05$. This contrasts with K10 scores, which were higher for the younger men as shown in Table 4-7, $F(3, 97) = 4.14$, $p < .01$ ranging from a mean of 21.10 that is categorised as moderate psychological distress for the 16–24-year-olds, and a mean of 16.46, categorised as low psychological distress for the 35–40 age group. Just under half of the men were taking prescribed medication, including antidepressant medication but there were nonsignificant age group differences. Anthropometrics were continuous variables and ANOVA statistics comparing age group means are shown in Table 4-7. The mean systolic/diastolic blood pressure was $^{121}/_{74}$ mm Hg. WHR and diastolic blood pressure significantly increased with age group, but systolic blood pressure and BMI did not.

Table 4-6 Health Status descriptive statistics by age group

		Age Group										
		16–24		25–29		30–34		35–40		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	$\chi^2(df)$
Health status	Excellent	2	(6.7)	1	(5.0)	2	(13.3)	5	(13.5)	**10**	**(9.8)**	**6.68 (6)**
	Very Good	10	(33.3)	12	(60.0)	6	(40.0)	15	(40.5)	**43**	**(42.2)**	
	Good	16	(53.3)	6	(30.0)	4	(26.7)	13	(35.1)	**39**	**(38.2)**	
	Fair	2	(6.7)	1	(5.0)	3	(20.0)	4	(10.8)	**10**	**(9.8)**	
	Poor	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	**0**	**(0.0)**	
Life satisfaction	Very satisfied	10	(33.3)	3	(15.0)	6	(40.0)	10	(27.0)	**29**	**(28.4)**	-
	Moderately satisfied	16	(53.3)	15	(75.0)	8	(53.3)	22	(59.5)	**61**	**(59.8)**	
	Neutral	2	(6.7)	1	(5.0)	0	(0.0)	4	(10.8)	**7**	**(6.9)**	
	Moderately dissatisfied	2	(6.7)	1	(5.0)	1	(6.7)	1	(2.7)	**5**	**(4.9)**	
	Very dissatisfied	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	**0**	**(0.0)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	$\chi^2(df)$
Diabetes	No	29	(96.7)	20	(100.0)	14	(93.3)	36	(97.3)	**99**	**(97.1)**	-
	Yes	1	(3.3)	0	(0.0)	1	(6.7)	1	(2.7)	**3**	**(2.9)**	
Asthma	No	27	(90.0)	18	(90.0)	15	(100.0)	34	(91.9)	**94**	**(92.2)**	-
	Yes	3	(10.0)	2	(10.0)	0	(0.0)	3	(8.1)	**8**	**(7.8)**	
Cardiovascular disease	No	30	(100.0)	20	(100.0)	15	(100.0)	37	(100.0)	**102**	**(100.0)**	-
	Yes	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	**0**	**(0.0)**	
Arthritis	No	30	(100.0)	20	(100.0)	15	(100.0)	35	(94.6)	**100**	**(98.0)**	-
	Yes	0	(0.0)	0	(0.0)	0	(0.0)	2	(5.4)	**2**	**(2.0)**	
High blood pressure	No	29	(96.7)	20	(100.0)	13	(86.7)	34	(91.9)	**96**	**(94.1)**	-
	Yes	1	(3.3)	0	(0.0)	2	(13.3)	3	(8.1)	**6**	**(5.9)**	
High cholesterol	No	30	(100.0)	20	(100.0)	13	(86.7)	33	(89.2)	**96**	**(94.1)**	-
	Yes	0	(0.0)	0	(0.0)	2	(13.3)	4	(10.8)	**6**	**(5.9)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	$\chi^2(df)$
Mental health condition	No	28	(93.3)	20	(100.0)	11	(73.3)	28	(77.8)	**87**	**(86.1)**	**8.69 (3)***
	Yes	2	(6.7)	0	(0.0)	4	(26.7)	8	(22.2)	**14**	**(13.9)**	
Psychological distress	Low	16	(53.3)	16	(80.0)	11	(73.3)	28	(75.7)	**71**	**(69.6)**	**-**
	Moderate	7	(23.3)	2	(10.0)	3	(20.0)	7	(18.9)	**19**	**(18.6)**	
	High	1	(3.3)	1	(5.0)	1	(6.7)	2	(5.4)	**5**	**(4.9)**	
	Very high	6	(20.0)	1	(5.0)	0	(0.0)	0	(0.0)	**7**	**(6.9)**	
Taking medication	No	17	(70.8)	7	(53.8)	8	(61.5)	12	(40.0)	**44**	**(55.0)**	**5.39 (3)**
	Yes	7	(29.2)	6	(46.2)	5	(38.5)	18	(60.0)	**36**	**(45.0)**	
Chronic disease score	0	23	(76.7)	18	(90.0)	8	(53.3)	22	(61.1)	**71**	**(70.3)**	**12.55 (6)***
	1	7	(23.3)	2	(10.0)	5	(33.3)	8	(22.2)	**22**	**(21.8)**	
	2	0	(0.0)	0	(0.0)	2	(13.3)	5	(13.9)	**7**	**(6.9)**	
	3	0	(0.0)	0	(0.0)	0	(0.0)	1	(2.8)	**1**	**(1.0)**	

n=102

Table 4-7 ANOVA comparing age group means for health status variables

	Age Group										ANOVA
	16–24		25–29		30–34		35–40		Total		
	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	*F*(*df*)
Age	20	(3)	27	(1)	32	(1)	38	(1)	**30**	**(8)**	
Systolic BP	119	(11)	121	(8)	124	(12)	122	(12)	**121**	**(11)**	0.92 (3, 98)
Diastolic BP	69	(9)	73	(6)	78	(9)	78	(9)	**74**	**(9)**	6.55 (3, 98) **
BMI	25.5	(4.3)	27.0	(4.9)	27.4	(3.6)	27.7	(4.6)	**26.9**	**(4.4)**	1.54 (3, 98)
WHR	0.85	(0.1)	0.84	(0.1)	0.88	(0.1)	0.92	(0.1)	**.88**	**(0.1)**	14.66 (3, 98) **
K10 Score	21.10	(7.5)	17.60	(4.8)	17.27	(4.3)	16.46	(4.4)	**18.14**	**(5.8)**	4.14 (3, 97) **

Note. BP = blood pressure; BMI = body mass index; WHR = waist hip ratio; K10 = Kessler 10 item questionnaire; *n* = 102

Age and Health Behaviour

The first research question considered whether age is positively associated with the health behaviours of emerging and young adult men living in rural and regional South Australia. Descriptive statistics for individual health behaviours are shown in Table 4-8**.** Age differences between categorical health behaviour variables were explored using chi square (χ^2). Age group differences in health behaviour were further explored using ANOVA and ANCOVA. Finally, linear regression was used to explore the variance in health behaviour, both composite health behaviour and individual health behaviours, that is accounted for by age. Income and education were included in the regression model and the ANCOVA.

The majority of the men had exercised at least once in the previous two weeks with a over 30-year-olds less likely to have exercised $\chi^2(3) = 8.09$, $p < .05$. However, the amount of reported exercise in the previous two weeks did not significantly differ between the age groups with the 16–24-year-olds exercising on average 7.4 times and the 35–40-year-olds exercising 6.7 times, as shown in Table 4.8. Two out of every ten men aged 16 to 24 years reported smoking tobacco, and the percentage declined gradually with age with one in every ten men aged 35 to 40 currently smoking; however, the association between age group and tobacco smoking was nonsignificant $\chi^2(3) = 2.01$, $p > .05$.

Two alcohol use variables were used in the analysis; a weekly estimate of alcoholic drinks consumed and categorical excess drinking. The majority of the sample described themselves as occasional or regular drinkers of alcohol. No age differences were found for alcohol drink status. The vast majority of the sample in all age groups were categorised as excess drinkers, drinking more than four drinks per session on an occasion when they drink alcohol. The alcohol consumption estimate for the whole sample was 12 drinks per week, a median of seven, minimum of zero and maximum of 96. The mean number of weekly

alcoholic drinks was similar for all groups, confirmed by a nonsignificant ANOVA, with only the 25 to 29-year-olds reported drinking less. Nine cases of greater than 30 drinks per week were identified as extreme; four of these cases were in the 16 to 24 year age group, three in the 30 to 34 year age group and two in the 35 to 40 age group.

As shown in Table 4-8, of the 97 men who responded to the drug history questions, 62 had tried some type of recreational drug at least once in their life and seven were current marijuana users, one daily, one weekly and five monthly. Seven men were current drug users, and there was a nonsignificant association with current drug use and age group, χ^2 (3) = 6.21, $p > .05$. Fourteen men reported being past users of L*SD*, six trying only once. Nine men had once tried cocaine, 11 had tried Ecstasy once and six had reported being past users. Heroin had been tried by one man, and one reported to have been a past user, while nine men had tried speed or methamphetamine once and eight had been past users.

Less than half of the men reported seeking help with health decision-making from a range of sources including life partner, family, friends, GP and other health services. This remained consistent for all age groups, χ^2 (3) = 6.21, which was nonsignificant. The majority of the men, 91%, always wore a seat belt when travelling in a car. One quarter of the men reported always driving within the speed limit while the majority (70%) reported that they drive within the speed limit most of the time. Age group differences were confirmed by a statistically significant χ^2 (3) = 7.61, $p < .05$; however, all cells had small adjusted residuals with the exception of the four counts of 16–24-year-old men who were overrepresented in the response category of only sometimes travelling within the speed limit.

Oral hygiene, in the form of daily teeth brushing was reported by most of the men, but the younger age groups brushed their teeth less often χ^2(6) = 15.00, $p < .05$, with 16% of the 16 to 24-year-old men brushing their teeth less than once per day. Less than half of

the men were consuming the recommended two serves of fruit daily, and only one in ten men were eating four or more serves of vegetables daily. There were nonsignificant age group differences for fruit or vegetable consumption. The mean number of hours of sleep for the whole sample ranged from a minimum of two and a half hours to a maximum of nine hours per day, and the mean was seven hours. Sleep hours remained stable across age groups and was within the recommended six to eight hour sleep daily range.

The composite health behaviour scores ranged from a minimum of 7 and a maximum of 27, M = 17.87, SD = 4.00. Outlier adjusted health behaviour scores were used in analysis. As shown in Table 4-9, there was a significant difference between the age groups, $F(3,91) = 4.18$, $p = < .01$. The younger aged men, aged between 16 and 24, had a significantly lower score, M = 16.09, SD 3.5 (CI 14.7–17.4) when compared with the men aged between 35 and 40, M = 19.87, SD 3.82 (CI 17.9–20.7). The increase in scores was gradual and there was a small difference between the consecutive age groups that was nonsignificant. Posthoc analysis using Tukey HSD and Sidak indicate that the 16–24-year-age group and the 35–40 year age group are the only groups to differ significantly in health behaviour. ANCOVA was used to further test differences in health behaviour across age groups and whether age is positively associated with health behaviour of emerging and young adult men after controlling for the effect of income and education level. There was also a nonsignificant effect of age group on health behaviour after controlling for the level of education an income, F (3,89) = 1.62, $p > .05$. The results of an ANCOVA using five age groups rather than four produced very similar results. Loess curves were investigated and no significant trends were observed. Thus, although the ANOVA indicated health behaviour differences between the 16–24 and 35–40-year-olds, once education and income are accounted for, age is not positively associated with health behaviour.

The question of whether age would be positively associated with health behaviour, thus becoming more protective with increased age was further tested using multiple linear

regression analysis. This analysis was used to identify if the amount of variance in health behaviour score can be explained by age as a continuous variable, beyond the variance that is explained by covariates household income and education. As shown in Table 4-10, age, after accounting for income and education, is not a significant predictor of health behaviour. Age accounted for a nonsignificant 3% of the variance in health behaviour scores after education and income are considered, which when combined account for a significant 9.4% of variance. The model including age, income and education level accounted for 12.3% of variance in health behaviour scores.

Table 4-8 Health behaviour descriptive statistics by age group

		Age Group										
		16–24		25–29		30–34		35–40		Total		χ^2(df)
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Physical activity In past two weeks	Yes	28	(93.3)	19	(95.0)	10	(66.7)	29	(78.4)	**86**	**(84.3)**	**8.09 (3)***
	No	2	(6.7)	1	(5.0)	5	(33.3)	8	(21.6)	**16**	**(15.7)**	
Current smoker	Yes	6	(20.0)	3	(15.0)	2	(13.3)	3	(8.1)	**14**	**(13.7)**	**2.01 (3)**
	No	24	(80.0)	17	(85.0)	13	(86.7)	34	(91.9)	**88**	**(86.3)**	
Alcohol drinker status	Non drinker	1	(3.3)	1	(5.0)	1	(6.7)	1	(2.7)	**4**	**(3.9)**	**11.52 (6)**
	Special occasions	5	(16.7)	3	(15.0)	0	(0.0)	5	(13.5)	**13**	**(12.7)**	
	Occasional	18	(60.0)	9	(45.0)	8	(53.3)	10	(27.0)	**45**	**(44.1)**	
	Regular drinker	6	(20.0)	7	(35.0)	6	(40.0)	21	(56.8)	**40**	**(39.2)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		χ^2(df)
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Binge drinker status	Non Binger	4	(13.3)	3	(15.0)	3	(20.0)	10	(27.0)	**20**	**(19.6)**	**5.59 (6)**
	Moderate Binger	0	(0.0)	1	(5.0)	0	(0.0)	1	(2.7)	**2**	**(2.0)**	
Ever used recreational drugs	Yes	15	(50.0)	11	(61.1)	10	(66.7)	26	(76.5)	**62**	**(63.9)**	
	No	15	(50.0)	7	(38.9)	5	(33.3)	8	(23.5	**35**	**(36.1)**	
Current drug user	Yes	5	(16.7)	0	(0.0)	1	(6.7)	1	(3.0)	**7**	**(7.3)**	**6.21 (3)**
	No	25	(83.3)	18	(100.0)	14	(93.3)	32	(97.0)	**89**	**(92.7)**	
Health decision help seeker	No	21	(70.0)	14	(70.0)	11	(73.3)	17	(45.9)	**63**	**(61.8)**	**6.21 (3)**
	Yes	9	(30.0)	6	(30.0)	4	(26.7)	20	(54.1)	**39**	**(38.2)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		χ^2(df)
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Wear seatbelt	Some of the time	5	(16.7)	2	(10.0)	1	(6.7)	1	(2.7)	**9**	**(8.8)**	**4.14 (3)**
	All of the time	25	(83.3)	18	(90.0)	14	(93.3)	36	(97.3)	**93**	**(91.2)**	
Travels within the speed limit	Some of the time	4	(13.3)	0	(0.0)	1	(6.7)	0	(0.0)	**5**	**(4.9)**	**7.61 (3)***
	Most of the time	17	(56.7)	16	(80.0)	9	(60.0)	29	(78.4)	**71**	**(69.6)**	
	All of the time	9	(30.0)	4	(20.0)	5	(33.3)	8	(21.6)	**26**	**(25.5)**	
Drink driving in past year	Yes	11	(36.7)	2	(10.0)	5	(33.3)	12	(33.3)	**30**	**(29.7)**	**4.74 (3)**
	No	19	(63.3)	18	(90.0)	10	(66.7)	24	(66.7)	**71**	**(70.3)**	
Teeth brushing	Less than daily	5	(16.7)	1	(5.0)	0	(0.0)	0	(0.0)	**6**	**(5.9)**	**15.0 (6) ***
	Daily	16	(53.3)	10	(50.0)	4	(26.7)	17	(45.9)	**47**	**(46.1)**	
	Twice daily	9	(30.0)	9	(45.0)	11	(73.3)	20	(54.1)	**49**	**(48.0)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		χ^2(df)
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Fruit consumption	Does not eat	2	(6.7)	0	(0.0)	2	(13.3)	2	(5.4)	**6**	**(5.9)**	**4.51 (6)**
	1 serve daily	18	(60.0)	10	(50.0)	7	(46.7)	17	(45.9)	**52**	**(51.0)**	
	2+ serves daily	10	(33.3)	10	(50.0)	6	(40.0)	18	(48.6)	**44**	**(43.1)**	
Vegetable consumption	One serve or less daily	10	(33.3)	4	(20.0)	5	(33.3)	7	(18.9)	**26**	**(25.5)**	**2.46 (3)**
	2–3 serves daily	18	(60.0)	15	(75.0)	8	(53.3)	24	(64.9)	**65**	**(63.7)**	
	4–5 serves daily	2	(6.7)	0	(0.0)	2	(13.3)	5	(13.5)	**9**	**(8.8)**	
	6+ serves daily	0	(0.0)	1	(5.0)	0	(0.0)	1	(2.7)	**2**	**(2.0)**	

		Age Group										
		16–24		25–29		30–34		35–40		Total		χ^2(df)
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	
Breakfast consumption	Every day	13	(43.3)	13	(65.0)	8	(53.3)	26	(70.3)	**60**	**(58.8)**	**5.48 (3)**
	Most days	8	(26.7)	2	(10.0)	4	(26.7)	6	(16.2)	**20**	**(19.6)**	
	Rarely or Never	9	(30.0)	5	(25.0)	3	(20.0)	5	(13.5)	**22**	**(21.6)**	
Sleep	<6 hours daily	6	(20)	2	(10)	0	(0)	2	(5)	**10**	**(10)**	**-**
	6–8 hours daily	2	(7)	4	(20)	1	(7)	1	(3)	**8**	**(8)**	
	8 + hours daily	22	(73)	14	(70)	14	(93)	34	(92)	**84**	**(82)**	

Note. $n = 102$

Table 4-9 Mean, ANOVA and ANCOVA statistics for continuous variables; health behaviour score, weekly alcohol consumption estimate and physical activity in the past two weeks by age group

	Age Group										ANOVA	ANCOVA
	16–24		25–29		30–34		35–40		Total		*F*(*df*)	*F*(*df*)
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*		
Health Behaviour Score [a]	16.1	(3.5)	18.60	(3.6)	17.6	(3.7)	19.3	(3.8)	**17.9**	**(4.0)**	4.39 (3, 91)**	1.62 (3, 89)
Weekly alcoholic drinks estimate	14.4	(21.9)	6.98	(6.7)	14.8	(17.9)	11.9	(13.2)	**12.1**	**(16.2)**	1.12 (3, 98)	2.09 (3, 96)
Times exercised in past two weeks	7.4	(5.1)	8.10	(5.5)	4.5	(4.0)	6.7	(5.9)	**6.9**	**(5.4)**	1.4 (3,97)	0.93 (3, 95)
Sleep daily	6.8	(1.4)	7.3	(1.1)	6.9	(0.8)	7.0	(0.9)	**7.0**	**(1.1)**	0.93 (3, 98)	0.83 (3, 96)

Note. [a] $n = 95$
* $p < .05$
** $p < .01$

Table 4-10 Regression coefficients for household income, education and age as predictors of health behaviour score

		B	SE B	β	R^2	ΔR^2
					0.09*	
Step 1	Education	0.74	0.38	0.20		
	Household Income	0.47	0.27	0.18		
Step 2					0.12*	0.03
	Education	0.45	0.41	0.12		
	Household Income	0.46	0.27	0.18		
	Age	0.09	0.05	0.19		

Note: B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2
n = 102
* $p < .05$

Age and Executive Function

The second research question considers whether age is positively associated with executive function of emerging and young adult men. Seven tests were used to measure four executive function components and these were planning, inhibition, interference control and verbal fluency. A composite executive function score combined z-scores for all four components. Test scores, ANOVA and ANCOVA statistics are reported in Table 4-11. There were no statistically significant age group differences in any of the executive function tests. The majority of the scores fluctuated with age group, rather than having a gradual trend line as expected. The Zoo Map Test scores appeared to decrease with age group and the number of SOPT errors increased, but these changes were nonsignificant. The Trail B errors ranged from zero to five with most men making no errors. The mean errors appeared to decline with age group, but these too were nonsignificant. A mean Stroop interference score of .05 was recorded for all age groups, indicating that most men were taking twice as long to complete the second part of the test where they were required to read a word and ignore the colour print. The Letter Cancellation Task was used to measure interference control and scores were similar for all age groups. Verbal fluency was measured using the Initial Letter Fluency Task. Words generated for the whole sample ranged from a minimum of 10 to a maximum of 45. The 16 to 24-year-old group generated slightly fewer words than the older age groups, but this was not statistically significant.

ANCOVA and multiple linear regression were both used to test whether executive function altered with age after controlling for income and education level. The was also a nonsignificant effect of age group on health behaviour after controlling for the level of education an income, $F = (3.\ 96) = .48$, $p > .05$. This nonsignificant association was confirmed as shown in Table 4-12 as age accounted for a nonsignificant 1% of variance. In the composite executive function z-score, after the effect of education and household

income were accounted for age did not predict planning, inhibition, interference control or verbal fluency. Individual regression models were analysed and results are shown in Table 4-12. Education was the most predictive of the variables, accounting for a significant, although small, amount of variance in planning, inhibition and verbal fluency. For every increase in education level, there was a one third of a z-score increase in verbal fluency.

Table 4-11 Descriptive statistics of measures of Executive Function; Planning, Inhibition, Interference Control and Verbal Fluency

		Age Group										ANOVA
		16–24 (*n* = 30)		25–29 (*n* = 20)		30–34 (*n* = 15)		35–40 (*n* = 37)		Total (*N* = 102)		
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	
Planning	Zoo Map Test profile score	2.9	(0.9)	2.9	(0.6)	2.3	(1.0)	2.5	(0.9)	**2.7**	**(0.9)**	2.39 (3,98)
	SOPT total errors	7.6	(3.0)	5.7	(2.6)	6.3	(3.1)	6.0	(3.2)	**6.5**	**(3.1)**	2.17 (3,98)
	Tower achievement score	17.4	(4.0)	18.6	(3.3)	17.2	(3.2)	18.8	(3.4)	**18.1**	**(3.6)**	1.41 (3,98)
	Planning composite z-score[#]	-0.3	(1.9)	0.6	(1.6)	-0.6	(2.3)	0.2	(1.9)	**0.0**	**(1.9)**	1.52 (3,98)
Inhibition	Stroop interference score	0.5	(0.1)	0.5	(0.1)	0.5	(0.1)	0.5	(0.1)	**0.5**	**(0.1)**	2.30 (3,98)
	Trail B completion time	58.4	(18.5)	54.8	(16.6)	55.1	(26.0)	53.2	(17.6)	**55.3**	**(18.9)**	0.52 (3,98)
	Inhibition composite z-score [#]	-0.2	(1.4)	0.5	(1.3)	-0.2	(1.8)	0.0	(1.7)	**0.0**	**(1.6)**	0.96 (3,98)
Interference Control	Letter Cancellation Task total	74.6	(17.2)	75.7	(11.2)	73.5	(14.3)	75.2	(13.4)	**74.9**	**(14.2)**	0.08 (3,98)
	Interference Control z-score[#]	0.0	(1.2)	0.1	(0.8)	-0.1	(1.0)	0.0	(0.9)	**0.0**	**(1.0)**	0.08 (3,98)

		Age Group										ANOVA
		16–24 (*n* = 30)		25–29 (*n* = 20)		30–34 (*n* = 15)		35–40 (*n* = 37)		Total (*N* = 102)		
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	
Verbal fluency	Initial letter words total	22.6	(6.8)	24.7	(7.2)	26.9	(6.9)	25.4	(8.1)	**24.6**	**(7.4)**	1.38 (3,98)
	Verbal Fluency z-score[b]	-0.3	(0.9)	0.0	(1.0)	0.3	(0.9)	0.1	(1.1)	**0.0**	**(1.0)**	1.38 (3,98)
Executive Function	**planning + inhibition + interference control + verbal fluency z-scores[#]**	-0.8	(3.6)	1.2	(3.3)	-0.6	(4.5)	0.3	(3.5)	**0.0**	**(3.7)**	1.40 (3,98)

Note. *n* = 102. [b] z scores were combined after outliers adjusted

Table 4-12 Linear regression coefficients showing variance in executive function, planning, inhibition, interference control, verbal fluency accounted for by education, income and age

			B	SE B	B	R^2	ΔR^2
Executive Function Composite	Step 1					0.12*	
		Education	1.03	0.34	0.29		
		Household Income	0.31	0.25	0.12		
	Step 2					0.12	0.00
		Education	1.07	0.38	0.31*		
		Household Income	0.31	0.25	0.12		
		Age	-0.01	0.05	-0.03		
Planning	Step 1					0.12*	
		Education	0.28	0.18	0.16		
		Household Income	0.35	0.13	0.26*		
	Step 2					0.12*	0.00
		Education	0.34	0.20	0.19		
		Household Income	0.35	0.13	0.26*		
		Age	-0.02	0.03	-0.07		

			B	SE B	B	R^2	ΔR^2
Inhibition	Step 1					0.06*	
		Education	0.33	0.15	0.22*		
		Household Income	0.08	0.11	0.07		
	Step 2					0.06	0.00
		Education	0.36	0.17	0.24*		
		Household Income	0.08	0.11	0.08		
		Age	-0.01	0.02	-0.05		
Interference Control	Step 1					0.01	
		Education	0.08	0.10	0.09		
		Household Income	-0.01	0.07	-0.01		
	Step 2					0.01	0.00
		Education	0.07	0.11	0.08		
		Age	0.00	0.01	0.03		
Verbal Fluency	Step 1					0.12*	
		Education	0.33	0.09	0.35*		
		Household Income	-0.11	0.07	-0.16		
	Step 2					0.13	0.01
		Education	0.30	0.10	0.31*		
		Household Income	-0.11	0.07	-0.16		
		Age	0.01	0.01	0.10		

Note. B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2
n = 102
* $p < .05$

Age and Intelligence, Behaviour Values, Sense of Control and Conscientiousness

The third research question relates to whether psychological constructs in addition to executive function—namely, intelligence, behaviour values, sense of control or conscientiousness—have a positive effect on health behaviour of emerging and young adult men. The descriptive statistics for measures of these constructs and ANOVA statistics for age group differences are shown in Table 4-13. The Matrix Reasoning scores for the whole sample ranged between 6 and 26 and mean scores were consistent across age groups. Spot the Word scores ranged from 0 to 53 and the older men identified more correct English words than the younger men. A statistically significant difference in Spot the Word scores between age group indicates that the older men had higher verbal intelligence. The composite intelligence score also increased significantly with age group, with lowest score reported for the 16–24-year-olds and a plateau of scores maintained from the age of 25 years, as tested by ANCOVA planned contrasts. This result indicates that age differences in the composite intelligence score were due to age differences in verbal intelligence. Conscientiousness score for the whole sample ranged from a minimum score of 61and maximum score of 180. Mean scores for each age group were lowest for the 16 to 24-year-olds and then remained stable for the remaining older age groups. Sense of control scores did not change significantly with age group.

Health values for 10 specific behaviours were measured with lower scores indicating the behaviour is of lower importance. Significant age group differences were noted for smoking, not drinking too much alcohol, getting adequate sleep, having breakfast daily and teeth brushing regularly, with the younger groups reporting these behaviours as less important than the older age groups. When all health values were combined, there was a significant age group difference, with mean values scores of men aged 16 to 24, M = 78.7 SD 10.8, being significantly lower from the men aged 35 to 40, M = 89.5 SD 12.3.

Table 4-13 Descriptive statistics of measures of Intelligence, Personality, Sense of Control and Health Behaviour Value

		Age Group									
		16–24 (n = 30)		25–29 (n = 20)		30–34 (n = 15)		35–40 (n = 37)		Total (n = 102)	ANOVA
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean (*SD*)	*F*(*df*)
Intelligence	Matrix reasoning	18.6	(4.3)	19.9	(4.0)	19.2	(4.9)	18.4	(5.2)	**18.9 (4.6)**	**0.50 (3,98)**
	Spot the word	27.5	(11.8)	35.3	(10.9)	37.6	(11.2)	37.8	(7.1)	**34.2 (10.8)**	**6.85 (3,98)***
	Composite Intelligence	-0.7	(1.6)	0.3	-(1.1)	0.4	(1.7)	0.2	(1.3)	**0.0 -(1.5)**	**3.19 (3,98)***
Conscientiousness	NEO – PI- R (C-facets)	107.5	(18.9)	120.8	(15.9)	122.3	(20.0)	0.0	(23.6)	**116.8 (21.0)**	**2.92 (3,98)***
Health Behaviour value	To take regular exercise	7.6	(2.2)	7.8	(2.0)	7.1	(2.3)	7.9	(2.0)	**7.7 (2.1)**	**0.62 (3,98)**
	Not to smoke	6.8	(3.3)	8.6	(2.8)	8.7	(2.6)	8.6	(3.0)	**8.1 (3.1)**	**2.59 (3,98)***
	Not to drink too much alcohol	5.7	(2.3)	6.5	(2.2)	6.9	(2.9)	6.8	(2.2)	**6.4 (2.4)**	**1.54 (3,98)***

		Age Group										
		16–24 (n = 30)		25–29 (n = 20)		30–34 (n = 15)		35–40 (n = 37)		Total (n = 102)		ANOVA
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	*F*(*df*)
Health Behaviour value (continued)	To eat enough fruit	5.7	(2.1)	7.2	(1.5)	6.9	(2.1)	6.5	(2.2)	**6.5**	**(2.1)**	**2.42 (3,98)**
	To keep your body weight within normal range	6.7	(2.2)	7.3	(2.2)	7.7	(1.8)	7.5	(2.4)	**7.2**	**(2.2)**	**1.05 (3,98)**
	To get 7–8 hours sleep on most nights	6.5	(2.6)	8.3	(2.1)	7.5	(2.9)	8.2	(1.8)	**7.6**	**(2.4)**	**3.89 (3,98)****
	To brush your teeth regularly	7.6	(2.1)	7.9	(2.0)	9.0	(1.5)	9.2	(1.1)	**8.4**	**(1.8)**	**6.38 (3, 40)****
	Never to drive after drinking alcohol	8.3	(2.5)	8.3	(1.8)	8.9	(1.4)	8.5	(1.8)	**8.5**	**(2.0)**	**1.54 (3,98)**
	To wear a seatbelt when travelling in a car	9.2	(1.4)	8.7	(2.1)	9.7	(0.9)	9.4	(1.3)	**9.2**	**(1.5)**	**0.90 (3,98)**

		Age Group										
		16–24 (n = 30)		25–29 (n = 20)		30–34 (n = 15)		35–40 (n = 37)		Total (n = 102)		ANOVA
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	*F*(*df*)
Health Behaviour value (continued)	To drive within the speed limit most of the time	7.8	(2.0)	8.0	(1.8)	8.1	(1.9)	8.2	(1.9)	**8.0**	**(1.9)**	**0.28 (3,98)**
	To eat breakfast almost every day	6.5	(3.2)	7.3	(3.0)	7.1	(3.1)	8.5	(2.5)	**7.5**	**(3.0)**	**2.67 (3,98)***
Combined health behaviour value		78.7	(10.8)	85.6	(11.7)	87.6	(13.4)	89.5	(12.3)	**85.3**	**(12.6)**	**4.63 (3,96)****

Note. NEO-PI-R (c facets) = Neuroticism, Extraversion, openness personality inventory revised (conscientiousness facets); SOC = Sense of control;
n = 102
* *p* < .05. ** *p* < .01

After accounting for education level and household income, age contributed to the predictive linear regression model for one psychological construct included in this research and that is health behaviour values, with a significant 7% of variance being accounted for by age, as shown in Table 4-14. Age did not account for significant variance in composite intelligence above that accounted for by education and income. However, as a predictor variable, age was significant ($\beta = 0.21$) indicating that for every *SD* increase year in age, there was a 0.2 *SD* increase in intelligence z-scores, which is similar to the effect education has upon intelligence scores. Verbal intelligence did vary with age, $F(3, 91) = 5.10$, $p = <°.01$ $\eta^2 = .14$ with the men over 30 having significant different scores to the men under 30 years of age. There were no age differences in nonverbal intelligence. Education and income significantly accounted for 10% of variance in intelligence, 17% of variance in conscientiousness and 8% of variance in health behaviour values. The variance in sense of control was not accounted for by income, education or age.

Table 4-14 Multiple linear regression showing variance in intelligence, sense of control, conscientiousness and health behaviour value accounted for by education, income and age .

			B	SE B	β	R^2	ΔR^2
Intelligence	Step 1					0.10*	
		Education	0.40	0.14	0.28*		
		Household Income	0.09	0.10	0.09		
	Step 2					0.14*	0.04
		Education	0.27	0.15	0.19		
		Household Income	0.09	0.10	0.09		
		Age	0.04	0.02	0.21*		
Sense of control	Step 1					0.03	
		Education	0.17	0.34	0.05		
		Household Income	0.37	0.25	0.16		
	Step 2					0.04	0.01
		Education	0.29	0.38	0.09		
		Household Income	0.38	0.25	0.16		
		Age	-0.04	0.05	-0.09		

			B	SE B	β	R^2	ΔR^2
Conscientiousness	Step 1					0.17*	
		Education	7.58	1.89	0.38*		
		Household Income	1.18	1.35	0.08		
	Step 2					0.18*	0.01
		Education	6,96	2.06	0.35*		
		Household Income	1.15	1.35	0.08		
		Age	0.20	0.27	0.08		
Behaviour values combined	Step 1					0.08*	
		Education	3.57	1.25	0.29*		
		Household Income	-0.52	0.87	-0.06		
	Step 2					0.15*	0.07*
		Education	2.01	1.33	0.17		
		Household Income	-0.53	0.85	-0.06		
		Age	0.47	0.17	0.29		

Note: B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2
n = 101
* $p < .05$

Age and Health Literacy

The third question answered in this research relates to whether age is positively associated with health literacy of emerging and young adult men. After controlling for education and income, age was not a significant predictor of functional health literacy, communicative and critical health literacy or health literacy score.

Functional Health Literacy was measured by two tests, the S-TOFHLA and NVS that were combined to produce a composite functional health literacy score. Critical and communicative health literacy (CCHL) scores and composite functional health literacy scores were combined to produce a Health Literacy Score. Mean scores for all health literacy measures, ANOVA and ANCOVA statistics for age group differences are shown in

Table 4-15.

Functional Health Literacy scores were categorised in line with test instructions as adequate, marginal or inadequate, and are shown in **Error! Reference source not found.**. The median S-TOFHLA score was 36 and the median NVS score was 6, indicating that most participants answered all questions correctly and thus had adequate health literacy. However, there were participants who were identified as having inadequate functional health literacy. The results varied between the two tests with the S-TOFHLA classifying 3.9% of the participants as having inadequate functional health literacy and the NVS classifying 12.9% as having limited functional health literacy. When the NVS scores were categorised as adequate or limited functional health literacy, nearly one quarter of the 16 to 24-year-olds were identified as having limited health literacy, but this could not be tested statistically due to low numbers. Mean S-TOFHLA and NVS scores, thus functional health literacy, were consistent across all age groups.

The CCHL scores ranged between 12 and 25 for the complete sample. The scores increased gradually with increased age group and this was statistically significant. This indicates that perceived critical communicative health literacy skills were better for the men in the older age groups.

The composite Health Literacy Score, an indication of combined functional, communicative and critical health literacy, increased with age group. The results of the separate functional and critical health literacy measures indicate that the age differences in health literacy are due to difference in critical health literacy only. The 16–24-year-olds had the lowest z-scores with a mean of -0.9 and the 25–29-year-olds and 35–40-year-olds had a mean score of 0.5. ANCOVA was used to test whether health literacy altered with age after controlling for income and education level. The covariates income was not significantly related to health literacy, $F(1, 95) = .15$, $p > .05$ but education was significantly related $F(1, 95) = 7.39$ $p < .01$. There was a nonsignificant effect of age group on health literacy after controlling for the level of education an income, $F(3, 95) = .88$, $p > .05$. Linear regression model results are shown in Table 4-17. Education was the most influential predictor with one *SD* increase associated with an increase of one third of a *SD* in health literacy. Education and income together accounted for 14% of the variance in Health Literacy Score.

Table 4-15 Health Literacy descriptive statistics by age group

		Age Group										ANOVA
		16–24 (*n* = 30)		25–29 (*n* = 20)		30–34 (*n* = 15)		35–40 (*n* = 37)		Total (*N* = 102)		
		Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	Mean	(*SD*)	*F*(*df*)
Functional HL	S-TOFHLA	34.1	(6.5)	35.2	(1.4)	30.7	(12.5)	35.2	(1.8)	**34.2**	**(6.1)**	0.92 (3, 40)
	NVS	4.7	(1.3)	5.6	(0.7)	5.0	(1.7)	5.2	(1.2)	**5.1**	**(1.2)**	2.10 (3, 98)
Composite FHL score	NVS + S-TOFHLA	38.8	(6.8)	40.7	(1.7)	35.7	(14.1)	40.5	(2.6)	**39.3**	**(6.9)**	1.3 (3, 44)
CCHL	CCHL	18.1	(3.7)	19.7	(2.6)	20.6	(3.4)	20.5	(3.2)	**19.7**	**(3.4)**	3.28 (3,97)*
Health Literacy Score	NVS + S-TOFHLA + CCHL[b]	-0.9	(2.0)	0.5	(1.1)	-0.3	(3.8)	0.5	(1.7)	**0.0**	**(2.2)**	3.62 (3, 42)*

Note. HL = Health Literacy; S-TOFHLA = Shortened test of functional health literacy for adults; NVS = Newest Vital Sign; CCHLHL = Critical and communicative health literacy; *n*=102. b = z scores were combined after outliers were adjusted; * $p < .05$;

Table 4-16 Functional Health Literacy classifications by age group.

		Age Group									
		16–24		25–29		30–34		35–40		Total	
		Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
S-TOFHLA category	Inadequate	1	(3.3)	0	(0)	2	(13.3)	1	(2.7)	**4**	**(3.9)**
	Marginal	0	(0)	0	(0)	0	(0)	0	(0)	**0**	**(0)**
	Adequate	29	(96.7)	20	(100)	13	(86.7)	36	(97.3)	**98**	**(96.1)**
Newest Vital Signs Health Literacy Status	Limited Health Literacy	0	(0)	0	(0)	2	(13.3)	0	(0)	**2**	**(2.0)**
	Possible limited HL	7	(23.3)	0	(0)	0	(0)	4	(11.1)	**11**	**(10.9)**
	Adequate HL	23	(76.7)	20	(100)	13	(86.7)	32	(88.9)	**88**	**(87.1)**

Note. HL = Health Literacy; S-TOFHLA = Shortened test of functional health literacy for adults; NVS = Newest Vital Sign; CCHLHL = Critical and communicative health literacy

n = 102

Table 4-17 Multiple linear regression showing the amount of variance in Health Literacy scores accounted for by education, income and age [a]

			B	SE B	β	R^2	ΔR^2
Communicative and Critical Health Literacy Score	Step 1					0.11*	
		Education	1.09	0.32	0.33**		
		Household Income	-0.07	0.24	-0.03		
	Step 2					0.13*	0.03
		Education	0.85	0.35	0.26*		
		Household Income	-0.09	0.23	-0.04		
		Age	0.08	0.05	0.18		
Functional Health Literacy	Step 1					0.10*	
		Education	0.36	0.16	0.22*		
		Household Income	0.19	0.12	0.17		
	Step 2					0.10*	0.00
		Education	0.33	0.18	0.21		
		Household Income	0.19	0.12	0.16		
		Age	0.01	0.02	0.04		

Health Literacy Score	Step 1				0.14*	
		Education	0.69	0.21	0.33**	
		Household Income	0.16	0.15	0.11	
	Step 2				0.15*	0.01
		Education	0.59	0.22	0.28*	
		Household Income	0.15	0.15	0.10	
		Age	0.03	0.03	0.12	

Note. B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2
n = 100;
* $p < .05$,
** $p < .01$

Executive Function, Intelligence, Behaviour Value, Sense of Control, Conscientiousness and Health Behaviour

The fourth research question answered in this research relates to whether executive function, intelligence, behaviour value, sense of control or conscientiousness have a positive effect on the health behaviours of emerging and young adult men. Conscientiousness and combined health behaviour values were the only psychological constructs that significantly predicted health behaviour score. As shown in Table 4-19 and Table 4-20, income and education level combined accounted for 9% of health behaviour and planning, inhibition, interference control and verbal fluency, intelligence, and sense of control accounted for small nonsignificant amount of variance. Regression models were run for each psychological construct individually after controlling for education and household income and neither planning, inhibition, interference control or verbal fluency predicted health behaviour score. The regression model that included income, education and health behaviour and composite behaviour value accounted for 34% of variance in health behaviour scores, with health behaviour values contributing 25% of variance when added to the model. A positive $\beta = 0.5$ indicates that for every *SD* increase in health behaviour value unit there was a one half *SD* increase in health behaviour.

Values of specific individual behaviours and the effect these have upon individual behaviours were examined using logistic regression. The results are shown in Table 4-20 and indicate that values accounted for a significant amount of variance in all related individual behaviours, except having a healthy weight as measured by body mass index (BMI). Over 50% of the variance in excessive alcohol consumption was accounted for by the value of not drinking too much alcohol. Men who value responsible drinking were 2.8 times more likely to not excess drink. The value allocated to the behaviour of daily

breakfast consumption was also large, with people who value breakfast consumption 2.3 times more likely to report eating breakfast every day,

Table 4-18 Multiple linear regression models showing amount of variance in health behaviour accounted for by executive function composite, planning, inhibition, interference control and verbal fluency

		B	SE B	β	R^2	ΔR^2
Step 1					0.09*	
	Education	0.78	0.41	0.21		
	Household Income	0.45	0.28	0.17		
Step 2	Education	0.77	0.43	0.20		
	Household Income	0.45	0.28	0.17		
	Executive Function Composite	0.03	0.11	0.03	0.09*	0.00
Step 2						
	Education	0.77	0.43	0.20		
	Household Income	0.44	0.29	0.17		
	Planning	0.06	0.22	0.03	0.09*	0.00
Step 2						
	Education	0.82	0.42	0.21		
	Household Income	0.46	0.28	0.18*		
	Inhibition	-0.13	0.27	-0.05	0.09*	0.00

		B	SE B	β	R^2	ΔR^2
Step 2						
	Education	0.79	0.42	0.21		
	Household Income	0.45	0.28	0.17		
	Interference Control	0.17	0.41	0.04	0.09*	0.00
Step 2						
	Education	0.71	0.43	0.18		
	Household Income	0.49	0.29	0.19		
	Verbal Fluency	0.30	0.43	0.07	0.10*	0.01

Table 4-19 Multiple linear regression models showing amount of variance in health behaviour accounted for by intelligence, sense of control, conscientiousness and behaviour values

		B	SE B	B	R^2	ΔR^2
Step 1						
	Education	0.70	0.38	0.19		
	Household Income	0.47	0.27	0.18		
Step 2						
	Education	0.79	0.40	0.21*		
	Household Income	0.48	0.27	0.18		
	Intelligence	-0.20	0.27	-0.08	0.10*	0.01
Step 2						
	Education	0.67	0.38	0.18		
	Household Income	0.40	0.27	0.15		
	Sense of Control	0.17	0.12	0.15	0.11*	0.02
Step 2						
	Education	0.39	0.40	0.11		
	Household Income	0.40	0.27	0.15		
	Conscientiousness	0.04	0.21	0.23*	0.13*	0.04*

		B	SE B	B	R^2	ΔR^2
Step 2						
	Education	0.10	0.35	0.03		
	Household Income	0.56	0.23	0.21*		
	Behaviour Values	0.16	0.03	0.53*	0.34*	0.25*

Note: B = un-standardised regression coefficient, β = standardised regression coefficients; ΔR^2= change in R^2

n = 90

* $p < .05$

Table 4-20 Logistic regression with the value of a behaviour, education and household income as predictors of the related individual behaviour.

	Odds Ratio			χ^2	R_N^2
	Education	Income	Value of specific behaviour		
Regular physical activity	0.90	0.92	1.35*	7.37	0.10
Not smoking	0.95	1.34	1.40**	17.41	0.29
No drinking too much alcohol	0.77	1.14	2.77**	39.85**	0.52
Wearing a seatbelt	0.67	2.32*	3.98**	31.35**	0.59
Not drink driving	1.04	1.10	1.78**	22.29**	0.29
Brushing teeth twice daily	1.07	1.10	1.85**	21.45**	0.26
Fruit consumption	1.06	1.03	1.59**	16.47**	0.20
Breakfast daily	1.33	0.91	2.32**	68.93**	0.66
Sleeping at least 6 hours daily	0.98	1.50	1.49*	10.16*	0.20
Having a healthy weight	0.98	1.00	1.10	0.47	0.01

Note. χ^2 = Chi squared; R_N^2 = Nagelkerke's R^2
n= 102
$p < .05$. **$p < .01$

Health Literacy and Health Behaviour

The fifth question answered in this research relates to whether health literacy has a positive effect on health behaviour of emerging and young adult men. Health literacy score, communicative and critical health literacy and functional health literacy scores did not significantly predict health behaviour score after household income and education had been accounted for. Individual regression models are shown in Table 4-21. Chi-square tests were used to test the association between NVS category (adequate or limited/possibly limited) and individual behaviours that had been categorised as adequate or inadequate. As shown in Table 4-22, the only behaviour that was significantly associated with functional health literacy was eating breakfast daily.

Executive Function, Health Literacy and Health Behaviour

In order to answer the sixth research question and whether executive functions moderate the relationship between functional, critical, communicative or composite health literacy and health behaviour, multiple linear regression was used and results are shown in Table 4-23. Multiple regression is commonly used method to test moderator effects when the predictor and moderator variables are measured on a continuous scale (Cohen, Kasen, Chen, Harmark, & Gordon, 2003; Shieh, 2010). As already reported, after accounting for education and income, neither health literacy nor executive function account for any significant variance in health behaviour. Furthermore, no significant interaction effects were found between health literacy and executive function. This indicates that executive functions do not necessarily modify the relationship between health literacy and health behaviour.

Table 4-21 Multiple regression models showing variance in health behaviour accounted for by CCHL, FHL and Health Literacy.

		B	SE B	β	R^2	ΔR^2
Step 1					0.09*	0.00
	Education	0.78	0.40	0.21*		
	Household Income	0.51	0.28	0.19		
Step 2	Communicative & Critical Health Literacy (CCHL)	0.06	0.12	0.05	0.09*	0.00
Step 2	Functional Health Literacy (FHL)	-0.20	0.24	-0.09	0.09*	0.00
Step 2	Health Literacy	-0.08	0.19	-0.05	0.09*	0.00

Note: B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2
n = 93

Table 4-22 Chi-square ($\chi 2$) for adequate functional health literacy and individual health behaviours

Behaviour	Functional Health Literacy [a] χ^2 (*df*)
Physical activity	0.10 (1)
Smoking	0.03 (1)
Binge drinker status	0.38 (2)
Current drug user	0.05 (1)
Help seeking	1.46 (1)
Wear seatbelt	0.03 (1)
Travels within the speed limit	0.24 (1)
Drink driving in past year	0.55 (1)
Teeth brushing	2.55 (2)
Breakfast daily	4.70 (1) *
Fruit consumption	1.01 (2)
Vegetable consumption	6.6 (3)
BMI	1.35 (1)
WHR	0.03 (1)
Sleep daily	1.81 (2)

Note: BMI = Body Mass Index, WHR = Waist Hip Ratio; [a] NVS category dichotomised as adequate or likely to be inadequate; * $p < .05$

Table 4-23 Multiple linear regression models showing absence of moderator effect of Executive Function between Health Literacy and Health Behaviour

		B	SE B	β	R^2	ΔR^2
Step 1					0.09*	
	Household Income	0.49	0.28	0.19		
	Education	0.68	0.39	0.19		
Step 2	Health Literacy	-0.12	0.21	-0.07	0.09*	0.00
Step 3	Executive Function	0.06	0.12	0.05	0.09	0.00
Step 4	EF*HL	0.01	0.04	0.04	0.09	0.00

Note: B = unstandardised regression coefficient, β = standardised regression coefficients, ΔR^2= change in R^2

n = 93

Discussion

This research set out to investigate whether age and a range of psychological constructs are associated with the health behaviours of young adult men. Existing literature indicates that there are cognitive, social and behavioural differences between adolescents and older aged men (Claude et al., 2002; Arnett, 2001; Caspi & Shiner, 2005; Cohen et al., 2003), but little is known about the transition period referred to as emerging and young adulthood. Firstly, associations between age and an extensive range of variables identified in the literature as likely to be influential predictors of young adult health behaviour were explored. The significance of this analysis was to identify at what age cognitive functions peaked and also whether the younger men's behaviour was riskier than the older men. Secondly, relationships between public health and psychological constructs and health behaviour were investigated. Multidisciplinary constructs, many not previously considered in relation to young adult men, were included in regression models. The significance of this is that some of these constructs, including executive function and health literacy are believed to be modifiable, and if influential during a period of continued development, may offer an intervention option for health behaviour change (Gazmararian, Jacobson, Pan, Schmotzer, & Kripalani, 2010; Jaeggi et al., 2008).

The lack of age group differences in executive function or health behaviour of men in the period of emerging and young adulthood is contributes to the public debate regarding the age of decision-making independence (Arshagouni, 2006; Department of Planning, Transport and Infrastructure; Dunlevy, 2012; Massoglia & Uggen, 2010). Study one and study two produced unexpected and contradictory results with regard to the relationship between age and health behaviour. In study 1 the older men had lower composite health scores indicating more risk and less protective behaviour. In study 2 it was the younger men who scored lower. The small although significant differences in

composite health scores were present when the very youngest and the very oldest age groups were compared and not when comparing consecutive age groups. The two studies have methodological differences that may account for this. Study two includes more health behaviours thus producing health behaviour scores that range from 7 and 27 with M = 17.9 *SD* 4.0. In comparison, the health behaviour scores in study one range from 0 and 5 with M°= 2.22, *SD* 1.1. Study two had fewer participants, n = 102, compared with study 1 with 3,209 participants. Differences were also found between tests that assume a linear relationship, ANCOVA and multiple regressions, and ANOVA which assumes nonlinear relationships. ANCOVA and multiple regression allowed for the controlling of covariates, income and education, which was considered important as these have been shown repeatedly in the literature to be significant predictors of health behaviour. The results, however, suggest that the relationship between age and health behaviour may be nonlinear.

The mid-20s have been identified as a milestone age for behaviour change (Arnett, 2007; Galambos et al., 2005) but I found only a few examples of age-related changes behaviour. Help seeking with decision-making and teeth brushing were the only protective behaviours that increased with age. All other individual behaviours, including smoking, alcohol consumption, drug use, fruit and vegetable consumption and driving safely remained stable across all age groups. Interestingly, the composite health behaviour score did increase with age group, but once education and household income and extreme outlier scores were adjusted, no significant age effects were found. Research involving more men reporting more types of health behaviour is needed to confirm this finding. This suggests that the men in their late 30s are behaving similarly to the men in their late teens and early 20s. The hypothesis that behaviour would become less risk taking and more health protective with age was not supported by the results of this research. What might be concluded from this research is that there appears to be little difference in health behaviour across emerging and young adulthood.

Some age differences were found in some of the psychological constructs that were included in this study. Verbal intelligence, conscientiousness and the value allocated to many of health behaviours were higher for the older men when compared with the younger men. This finding is consistent with a large Australian longitudinal study by Windsor and Anstey (2008), which reported that verbal intelligence was shown to improve between the ages of 20 and 40 years. The value attributed to protective behaviours of not smoking, not drinking too much alcohol, getting enough sleep, having breakfast daily and brushing teeth regularly were also higher for the older men. This provides some evidence that cognitive and psychological development does occur during emerging adulthood.

Unexpectedly, other cognitive abilities, including executive function, did not differ with respect to age. Neither planning, inhibition or interference control differed significantly with age. This finding remained the same irrespective of the use of single EF components or composite EF. There is a noted absence of research that has considered age differences of executive function during young and emerging adulthood of males. This research set out to address the gap. My finding aligns with reports that inhibition (Dumas & Hartman, 2008), interference control (Rolan-Tapia et al., 2012) and verbal fluency (Matute et al., 2004; Regard et al., 1982) do not change in a mixed gender samples during emerging and young adulthood, but mature prior to the age of 18. Longitudinal data is required to more thoroughly examine this. The hypothesis that age would be positively associated with executive function was therefore not supported, but other psychological constructs, namely verbal intelligence, conscientiousness and health values were positively associated with age.

I was concerned with the use of the overarching construct of executive function in studies reporting single components. Thus, rather than single tests I used a collection of tests, some involving repetition with the potential of practice effect and also tests requiring processing speed. I found that younger men were often faster, but made more mistakes in

many of the tests, which is consistent with other research (Wecker, 2000). The calculation of overall performance scores as per test instructions and composite scores accommodated for this.

The Health Literacy and Health Action Framework, which provided a multidisciplinary framework for this research, depicts psychological, cognitive and socioeconomic factors, as well as health literacy as influential to health behaviour (Wagner et al., 2009). I focused specifically on young adult men and found partial support for this model. Health values were the only psychological construct that was significantly associated with health behaviour. Although executive function has been found to be related to health behaviour, my findings do not support this association. Neither planning, inhibition, interference control nor verbal fluency accounted for variance in collective health behaviour or individual health behaviours. While there are similarities, there are also some methodological differences between our study and the two cited studies that report associations between executive function and health behaviour. Hall et al. (2006) reported executive function, measured using one test of inhibition, the Stroop colour interference task, that contributed 2% to the variance in alcohol consumption, 5% of variance in sleep difficulties and 30% of variance in smoking behaviour. I included the Stroop colour interference task as a measure; however, Hall et al. (2006) reported errors made in 120 seconds and I reported interference ratios that account for performance time and corrected errors. Similar to my study, Wong et al. (2009) included the Tower task as a measure of planning, reported individual planning time, errors and excess moves. Wong found that the tower planning time, but not errors, predicted breakfast consumption. I calculated the recommended tower achievement score, which incorporates all of these three variables, planning time, errors and excess moves.

Health behaviours of young adult men have been recognised as ill-fitting to generic health behaviour models and therefore research investigating predictors of this behaviour

may also need to be specific to young men (Renner, Spivak, Kwon, & Schwarzer, 2007). Neither the Hall's nor Wong and Mullen's research was specific to young adult men. The 216 people included in the Hall et al. (2006) study were older than this study's sample, with a mean age of 54.9 years, ranging from 20 to 100 years and 46% female. The participant ages and sample size of the Wong and Mullen study are comparable to this one, with a mean of 19.5 years ranging from 11 to 30 years; however, no reference is made to the gender profile of the 96 participants, so assumptions are made that the sample is mixed gender. The health behaviours reported in both the Hall et al. (2006) and Wong et al. (2009) varied to those reported in this research. Hall's reported four behaviours, namely the presence of alcohol problems, variance in cigarettes consumed, number of times exercised per week and the presence of sleep difficulties. I classified behaviour in regard to recommended consumption guidelines, consistent with other health behaviour literature (Parekh, King, Owen, & Jamrozik, 2009). Hall made a quantitative distinction between the numbers of cigarettes smoked and I identified any consumption of cigarettes as a health risk, as per public health literature (Bergen & Caporaso, 1999; Pasupathi, Bakthavathsalam, Rao, & Farook, 2009). Wong reported only one specific health behaviour in terms of a person's intention and consumption of breakfast, a behaviour included in my analyses.

There is an absence of research that examines health literacy of young adults or developmental trajectories, I set out to see if health literacy was positively associated with age and health behaviour looked at both associations between age and health behaviour of men during emerging adulthood. Debate is still ongoing about the internal and external validity of the health literacy construct (Baker, 2006; Mancuso, 2009; Nutbeam, 2008) and existing tools do not adequately measure the full spectrum of health literacy definitions, which also lack consistency. This research uniquely used three health literacy tools to provide a measure that is more representative of the Nutbeam and Kickbusch (2000) three-

tier definition of health literacy. To allow for comparison with existing health literacy literature, I also reported functional health literacy, in addition to the composite health literacy measure.

As many as 13% of the sample may have limited functional health literacy, and the younger age groups had count values that were greater than the older men. However, neither functional health literacy nor the composite health literacy scores were statistically associated with age. This is surprising as age differences were found for verbal intelligence, indicating the older aged men may find it easier to comprehend health-related information. However, the hypothesis that health literacy would be positively associated with age was not supported. Somewhat surprisingly, I also found no association with composite health literacy or functional health literacy and health behaviour. Further research with a larger sample size of young adult men is required to further explore health literacy and the associations this has with health the behaviour.

The relationship between health literacy, executive function and health behaviour was explored and the results provide no evidence of an interaction. The HLHA Framework depicts health literacy as a central influence on behaviour and that a person may or may not engage executive function such as planning to bring about the health behaviour. Executive function is more likely to be employed for behaviour that is unfamiliar or occurs within changing circumstances (Miyake et al., 2000). I did not collect information about how novel or challenging behaviours were to participants. Further research might explore this more rigorously by including a measure of behaviour familiarity or habit and whether novel behaviours engage executive function.

Cognitive epidemiology is concerned with understanding the impact cognitive ability has upon health outcomes. Hultsch et al. (1993) identify cross-sectional research as providing limited explanation of relationships between cognitive ability and health

behaviour, as associations do not allow for the identification of what are predictor and outcome variables. This issue was also considered by Salthouse (2012) who describes the emerging subdiscipline of cognitive epidemiology as being concerned with the impact of cognitive ability on health outcomes where cognition is viewed as an antecedent, or predictor variable instead of a consequence or outcome variable. According to Salthouse, the primary question is about interrelationships between variables. Furthermore, Salthouse identifies interpretative differences with regard to the age of participants involved in cognitive research. He writes that when the assessment of cognition occurs in old age, of relevance to the work of Hultsch et al. (1993), it is difficult to rule out reverse causality in which health problems contribute to low levels of cognition. In contrast, interpretations are less ambiguous when cognition is assessed at young ages. This thesis, in the tradition of cognitive epidemiology and consistent with the work of Salthouse (2012), has explored associations between cognitive function and health behaviour outcomes, proposing that low levels of cognitive ability would predict poor health behaviour outcomes. I, however, found that cognitive ability, in the form of executive function or intelligence is not a significant predictor of health behaviour of young adult men.

This research has identified education and the value placed upon health behaviour as important inclusions in a model of young adult men's health behaviour. If a man thinks something is important they appear more likely to do it. An implication of this is that health-promotion activities must not only to consider the provision of health education, but also values-based rationale. Thus, the common practice of providing health information in the form of a brochure or website facts may be more effective in the modification of health behaviour of young adult men when complemented by more personalised health promotion strategies. A better understanding of how values are formed, what the influential factors are and how young adult men can be empowered to self-direct their behaviour toward health promoting and away from health risk behaviour is required.

The finding that values are associated with health behaviour represents an argument of potential circularity. The proposal that values predict behaviour may also be presented by the reverse relationship depicting behaviour as an influence upon values. Research in the area of habits and health behaviour decision-making has demonstrated a link between behaviour and values. Habits are past behaviours that involve less deliberative choice (Norman & Conner, 2007). Habits were used to provide justification for and further influence the health behaviour choices of 16 adults aged 25 to 50 years interviewed in one qualitative study (Lindbladh & Lyttkens, 2002). The authors reported that habit was a stronger determinant of health behaviour of people from low socioeconomic status. The issue of circularity has relevance as habit is presented as a type of value. Thus, a behaviour that is habitual can be valued not only for the behaviour itself, but also because it represents something that is comforting, which generates an additional predictor of behaviour. To further depict the complexity of the seemingly simple relationship between values and behaviour, is the work of Aspden, Ingledew and Parkinson (2010), who describe health values as a type of dispositional motive for health behaviour. The authors make a distinction between dispositional motives, which are the basis of life goals that include values and participatory motives that are more specific and mediate the relationship between dispositional motives (values) and behaviour. In a cross-sectional study involving 243 males and females aged 18–38 years, the authors report that dispositional motives can influence more than one health-related behaviour and that health-promoting interventions require a greater understanding what a person's values, dispositional motives and to a less extent, participatory motives are. It is evident that the relationships between predictor variables and health behaviour are complex and that cross-sectional methods partially explain these. It is also evident that an associate between values and the health behaviour of young adult men is likely to be important factor to include in male-targeted health behaviour models.

This research indicates that other factors, other than age, conscientiousness and cognitive ability are influencing health behaviour and may include negative life events, which were not measured in this research but have been identified as influential to decision-making (Bruin, Parker, & Fischhoff, 2007). Individual experiences are likely to influence a person's motivation, which is a variable that is both difficult to define and measure (Brown, 1961; Xu, 2009). The Health Literacy and Health Action Framework (von Wagner et al., 2009) identifies motivators as predictors of health behaviour. There is a paucity of research exploring how motivation translates to health action (Sheeran et al., 2007) but motivation appears often to be associated with sense of control, mental health and values (Clarke, 2004; Richards, 1988; Sirois, Davis & Morgan, 2006). These three constructs were included in this research as an indication of motivation, and values were identified as being associated with the health behaviour of emerging and young adult men. Future research might consider motivation more specifically as a predictor of health behaviour using recently published measures (Xu, 2009).

There are limitations that need to be considered. Firstly, the sample size is relatively small. Although recruitment of young adult men for health research is notably difficult, this research included more young and emerging adult men than have been included in previous published literature. Although sample size and power calculations that were reported in this chapter indicate that 102 participants is an inadequate sample size for the regression analysis used in this research, some would argue this is insufficient (Knofczynski & Mundfrom, 2008; Maxwell, 2000).

The recruitment of a convenience sample, which allowed for the use of diverse and personalised strategies, as recommended for minority group recruitment (Barbeau et al., 2007; Jones, Steeves, & Williams, 2009; Stoddart et al., 2000; UyBico, Pavel, & Gross, 2007), is also potentially more biased than other more random recruitment methods. This research recruited only men living in regional, nonmetropolitan South Australia, and while

this is a strength given that little research has been done with this population, it also limits the generalisability.

The measures of behaviour were adopted from a validated International Health Behaviour Questionnaire (Wardle & Steptoe, 1991) and there are reported limitations, particularly with regard to the reliability of alcohol and physical activity. Cross-sectional, self-report measures of behaviour are commonly used (Glasgow, Ory, Klesges, Cifuentes, Fernald, & Green, 2005) they are less reliable than measures that require longitudinal reporting such as alcohol consumption and daily exercise diaries.

5. General Discussion

Young adult men across the western world are increasingly being diagnosed with lifestyle related chronic diseases and dying prematurely from preventable risk-taking behaviour (AIHW, 2006). The aim of this research was to better understand why young adult men behave the way they do. A review of existing literature indicate that age, socioeconomic, cognitive abilities and attitudinal factors are likely to be useful in understanding why young adult men reportedly behave in a health damaging way. Two studies were conducted; study one utilised a randomly selected dataset of over 5,000 men aged between 16 and 44 years, South Australia-wide. This study aimed to describe the health behaviour of emerging adulthood males and test associations between this behaviour, age and socioeconomic factors. Study two advanced these aims by examining psychosocial factors (including age, executive function abilities, health literacy, intelligence, conscientiousness and health behaviour values) using an extensive range of tests in a smaller sample of men of a similar age, from two distinct nonmetropolitan regions in South Australia. A wide selection of health behaviours were considered individually as well as a health behaviour composite to provide a broader, more holistic perspective to health behaviour.

A Model of Health Behaviour for Men During Emerging Adulthood

The theoretical framework that underpins this body of work is a multidisciplinary model of behaviour referred to as the Health Literacy and Health Action Framework (von Wagner et al., 2009). This model is a theoretical representation of factors that influence behaviour including cognitive abilities, health literacy, action control, external influences, and sociocognitive and psychological determinants. Some, but not all, of these factors have been included in other popular health behaviour models and these were described in Chapter 2 of this thesis. I am not aware of any

research that has examined the relevance of the factors contained in the Health Literacy and Health Action Framework to the health behaviours of young males during the emerging adulthood transition.

This research has identifed factors that are associated with the health behaviour of young adult men. These include education and income, health status including level of psychological distress and the presence of a chronic disease, verbal intelligence and the value a man attributes to a health behaviour. It is therefore expected that a young adult man who is identified as having a combination of low level of education; low income; poor health status which may, but not necessarily be the result of a chronic disease or high levels of psychological distress; low levels of verbal intelligence and attribute low value to health behaviours in relation to their impact to personal wellbeing; is likely to require health behaviour support.

Effect of Age During Emerging Adulthood

Age and Socioeconomics

Emerging adulthood is a period of transition between adolescence and young adulthood, which is estimated for many to span from the late teens to the late 20s (Arnett, 2001) and young adulthood has been defined as extending to the age of 39 years (Roberts, Walton, & Bogg, 2005). I examined whether health behaviours and predictive psychosocial factors varied for men during emerging and young adulthood. As per life-course literature (Lynch, Kaplan, & Salonen, 1997; Hewitt, Baxter, & Western, 2006; Kubzansky, Martin, & Buka, 2009), changing socioeconomic status of men was expected to influence the age-associated transition toward more protective health behaviour (Arnett, 2001; Cohen et al., 2003). I expected socioeconomic factors, household income and education that are associated with better health status and health

behaviours (Allison, Adlaf, Lalomiteanu, & Rehm, 1999; Ferre & Palmer, 2004) to increase with age. I found, however, little support for an association between age and improved socioeconomic status. In fact, the younger men reported higher education levels and while the men in their late 30s reported slightly greater personal income, they reported poor capacity to save money.

Age and Health Behaviour

The hypothesis that men in the later stage of emerging adulthood would engage in more protective and less risk-taking behaviour, when compared with younger adult men, was not supported in this research. Study one found that men in the later stages of young adulthood were engaging in less protective and more risk-taking behaviour than the younger men and study two found no age effect once education and income were accounted for. Individual behaviours such as smoking tobacco and alcohol use were found to be more prevalent for the younger men. However, many older men were also drinking at levels that exceeded the recommended consumption guidelines, thus engaging in risk-taking behaviour. The lack of age differences is in opposition to some literature reporting positive behaviour change with increased age (de Visser et al., 2006b; Frech, 2009), but my findings are consistent with research that has found some men do not necessarily alter their behaviour with age (O'Brien et al., 2009).

Adulthood can be defined in terms of chronological age as well as social achievements including marriage, being responsible for a family and attaining financial independence (Erikson, 1975; Furstenberg, Kennedy, McLoyd, Rumbaut, & Settersten, 2004). Adulthood can also be considered in terms of psychological maturity and taking self-responsibility for all aspects of life (Blatterer, 2003, 2007). Increasingly people are delaying marriage, abandoning parenthood and extending the number of years in education and travel and seemingly extending the period of financial dependence (Quill,

2011). The Society for the Study of Emerging Adulthood (SSEA), of which Arnett is a founding member (SSEA, 2011), view this phenomenon as evidence of a delay in adulthood. An alternative view is that more people are taking an alternative path to adulthood (Settersten, Furstenberg. & Rumbaut, 2007). This thesis contributes to the adulthood debate by considering protective health behaviour as a demonstration of self-responsibility and thus a marker for adulthood. My finding that chronological age is not strongly associated with protective health behaviour posits doubts about the existence of emerging adulthood (Arnett, 2007) and the viewpoint that men in their late teens and early 20s are not achieving adulthood. A contemporary definition of adulthood might include the extent to which a person recognises a relationship between their behaviour and health outcomes and furthermore, how their behaviour values impact upon their ability manage their health. It would be unreasonable to suggest that the attainment of this insight is not completely independent of age, but future research may consider the importance of exposure to health attitudes, health experiences, negative life experiences and education, irrespective of age.

Age and Executive Function

Not only did I expect executive function (Hall et al., 2008; Wong & Mullen, 2009) and health literacy (Ishikawa & Yano, 2008; von Wagner et al., 2007) to have a significant relationship with health behaviour, but I expected these abilities to increase throughout the late teens and early 20s, further influencing health behaviour outcomes (Anderson, Anderson, Northam, Jacobs, & Catroppa, 2001; Huizinga, Dolan, & van der Molen, 2006; Romine & Reynolds, 2005). This research did not identify a milestone age for executive function maturity and found no support for an association between age and executive function during emerging adulthood. This is consistent with previous research that claims executive function peaks by the late teens (Matute, Rosselli, Ardila,

& Morales, 2004; Regard, Strauss, & Knapp, 1982), indicating that the sample of men involved in this research may have achieved cognitive maturity. Comparing the executive function abilities of men of different ages is, however, limiting as it does not account for the influence of individual factors that influence cognitive function. A longitudinal design involving the same sample of men would provide a more rigorous exploration of executive function change in individuals over time. Enquiries were made with numerous cohorts throughout the world—including ALSPAC (Avon Longitudinal Study of Parents and Children), NWAHS (North West Adelaide Health Study) and PATH (Path through life project)—for opportunities to work with participants with longitudinal behaviour and cognitive data. Prospects were limited in some cohorts by an absence of baseline executive function data and in others by concern from chief investigators that young adult men in the existing cohorts were difficult to retain thus necessitating restricted research burden of additional assessments.

Socioeconomics and Health Behaviour

Education, income and to a lesser extent, intelligence, have a long history of being linked to health behaviour (Boyce & Dax, 1974; Allison, Adlaf, Lalomiteanu, & Rehm, 1999; Glanz, Lewis, & Rimer, 2002). People with more years of formal education, higher income and higher levels of intelligence are often found to engage in more protective behaviours (Adams et al., 2009; Deary, 2005; Pomerleau, Pederson, Ostbye, Speechley, & Speechley, 1997). Formal education promotes literacy and numeracy skills and these abilities are believed to promote the attainment of health literacy, health knowledge and higher paid employment. Higher paid employment results in greater socioeconomic status and this is a mechanism for greater access to fresh healthy food, better housing and environmental conditions, more health services

for the prevention and timely treatment of health problems. All of these internal and external factors promote a person engaging in more protective and less health risk-taking behaviour (von Wagner et al., 2009). Higher socioeconomic status further increases access to schools that reduce the distraction of poor performing students, promote advancement in education and attendance to university (Kraus, Piff, & Keltner, 2009; Sealey, 2011). Thus, the health disparity widens, with the wealthy becoming wealthier and healthier and the poorer having fewer intellectual and physical resources to improve their health (Hammond, 2003; Marmot, 2010).

It was expected that higher socioeconomic status, represented by household income and education would, be associated with better health behaviour of young adult men. The possible exception was young adults still living with their parents, as they have been found to engage in more risk-taking behaviour, irrespective of socioeconomic status (Berry, 2008; Mulder & Clark, 2002). Household income and education level were both associated with more protective health behaviour and less risk-taking behaviour in both study one and study two. I found that the young men who remained living with a parent or related family member were much less likely to know their household income than men not living with their parents, indicating reduced responsibility for financial management and financial awareness. However, the health behaviour of these young adults who still lived at home with parents was no different to the other young adult men of the sample.

Health Status and Behaviour

Exposure to examples of behaviour related to positive health outcomes, either to oneself or a loved one can motivate a person to engage in healthy behaviours (Deci & Ryan, 2000; O'Donnell, 2009; Paterson, 2001). Reporting a poor health status is an

example of personal exposure to a poor health outcome, which according to social cognitive models of health behaviour may therefore be expected to motivate a person to adopt more protective behaviours (Abraham & Sheeran, 2007; O'Brien, Hunt, & Hart, 2009). The findings contradict this, as the men with poor health status or chronic disease reported less protective and more risky behaviour. This is consistent with reports that people who experience a health scare and poor health status may persist with associated health risk behaviour (Butler, Rayens, Zhang, & Hahn, 2011; Hawkins et al., 2010; Sullivan, Smith, Bottorff, & Robinson, 2010; Zanjani, Schaie & Willis, 2006). Thus, for young men, the experience of poor health appear not to be a motivator to engage in protective behaviours. Instead, other factors, such as psychological and physical impairment or economic limitations produced by poor health may have a greater influence on health behaviour. Health status may therefore be an important factor to include in a health model of young adult men, as the findings of this thesis indicate poor health status may be a predictor of poor health behaviour.

Mental Health, Gender Roles and Health Behaviour

Men's health literature describes changing social circumstances as leading to the disrupted development of masculine identity and confusion about their purpose in society (David & Chris, 2001; Hugh, 2001). Clarity of role and masculine ideology has been found to relate differently to health behaviour of young adult men (Levant, Wimer, Williams, Smalley, & Noronia, 2009). The perceived pressure to conform to a masculine ideology and social expectations of behaviour, which include avoidance of help seeking, is associated with heightened levels of risk-taking behaviour (Wimer & Levant, 2011). In contrast, however, when a man reports confidence in their masculinity and gender role confidence they have lower levels of psychological distress (Ollife et

al., 2010) and engage in more protective health behaviours (Levant et al., 2009). The effect of fatherhood upon health behaviour may be considered in future research. Fewer men in Australia are becoming fathers and, if they do, fewer remain living with their children full time and men are reporting confusion about social expectations for them to achieve work–family balance amidst increased workplace demands, divorce and shared domestic two-income families (Holter, 2007; Rhea, 2011; Thorn & Gilbert, 1998). While fatherhood was not specifically considered in this research however poorer health status, including mental health status, was associated with more risky and less preventative health behaviour. The associations between these worsening mental health outcomes and age may be attributable to increased incidence of divorce, fractured families, confusion about allocation of domestic and income-earning tasks and general role clarity. Changing socioeconomic circumstances of many men in Australia and throughout the western world, which according to this research is not age related, may in some way explain my finding of higher than expected health risk behaviours extending past the period of emerging adulthood. Future research may consider the effect divorce and fatherhood upon socioeconomic status, health status and implications for protective behaviours of men.

Intelligence and Health Behaviour

Education and income provided a benchmark to compare the relationship of health literacy and intelligence with the health behaviour of young adult men. This research did not set out to further unravel the complex relationship between socioeconomic status and health behaviour, instead acknowledged that in accordance with the literature household income and education is associated with health behaviour. After controlling for income and education, I was then able to examine other less

known variables, health literacy and intelligence that have been implicated with socioeconomic status and health behaviour, but had not been examined in reference to men during emerging adulthood. While education level in both studies one and study two was consistently positively associated with protective health behaviour, intelligence made up of both verbal and nonverbal intelligence was not. This indicates that education and intelligence are not interchangeable as predictors of health behaviour. The research findings indicate similarities between education level and verbal intelligence, with both being associated with health behaviour; unlike nonverbal intelligence, which was not associated with health behaviour. Further exploration of the relationship between formal education and intelligence indicates that most formal schooling promote verbal intelligence, more so than other types of intelligence (Riccio, Rodriguez, Valle, & Lee, 2005).

Health Literacy and Health Behaviour

While it is increasingly acknowledged that health literacy is more than just an ability to read and write (Chinn, 2011; Nutbeam, 2008), Nutbeam et al. (2000) report that in order for a person to be able to operate in a complex health system and have adequate health literacy they need functional, communicative and critical health literacy. This provided a rationale for producing a composite health literacy measure used in the data analysis of this research. What the results have highlighted is that functional health literacy may develop differently to communicative/critical health literacy. The research findings indicate age differences for critical and communicative literacy, but not functional health literacy. The use of a composite measure may be justified in broadly screening for inadequate health literacy; however, a clinician would

be advised to assess the separate elements of functional, communicative and critical health literacy in order to target and customise remedial and support interventions.

Even though 13% of the sample may have limited functional health literacy the absence of association between health literacy and health behaviour may be attributed to a limited range of health literacy scores, as the majority of the sample reported adequate health literacy. It may also indicate that the link between health literacy, as per existing definitions and measures, is not relevant to emerging and young adult men. There is no literature with which to compare the finding due to health literacy research being restricted to groups of out-patients with specific chronic disease (Powell, Hill, & Clancy, 2007), or general community samples that include older participants (von Wagner, Knight, Steptoe, & Wardle, 2007), rather than relatively healthy young adult males. The majority of the sample reported no chronic disease and reported not to be taking prescription medication. This is indicative of a sample that is unlikely to need to interact with or understand health care system related information. It may be that health knowledge (Macek et al., 2010; Mahalik & Burns, 2011) is of more relevance to young and emerging adult men, and more predictive of their health behaviour than health literacy. The relevance of health literacy for emerging and young adult men and any association this has with their health behaviour will require a larger sample with greater variation in health literacy and health behaviour than were reported in this research.

Executive Function and Health Behaviour

Executive function, including the ability to be adaptive yet remain focused on a health-related goal, plan to have access to adequate resources, and communicate these goals, were expected to have a clear relationship with health behaviour. The finding that executive functions were not associated with health behaviour partially support the

work of Wong and Mullen (2009) who found no association with inhibition and only weak associations with planning and health behaviour, but contradict the work of Hall, Elias and Crossely (2006). Within the neuropsychological literature there is a range of executive function measures reported and this variation makes comparisons difficult. The measures used in this research are recognised executive function measures and were reported in accordance with administration instructions (Lesak, Howieson, Loring, Hannay, & Fischer, 2004). I used four measures of executive function and when considered individually—as planning, inhibition, interference control and verbal fluency—and also combined to produce a composite executive function score, neither was associated with the health behaviours of young adult men. A global measure of health behaviour was included as well as a large number of individual behaviours and a specific focus upon emerging and young adult males. After considering the methodological difference with past work and the rigours of this research, I have found no evidence to support the association between executive function collectively or individually and the health behaviours of young adult men. My findings concur with other research that has found that cognitive functions are not strongly related to health behaviour (Gottfredson, 2004) and that smart people often do not so smart things (Robert, 2006).

Behaviour Values and Health Behaviour

This research confirms the presence of a relationship between values and health behaviour (Abella & Heslin, 1984; Steptoe & Wardle, 2001; Wardle & Steptoe, 1991) and the importance of this psychological construct to the health behaviours of young adult men. The value placed upon health behaviours predicts health behaviour and therefore it may follow that a person will only be influenced by health behaviour

messages if they align with the person's values. Thus, simply providing health information in a generic format, one size fits all, may be economical but less effective than an individual approach that considers attitudes and personal consequences of an operating value system. Motivational interviewing is a counselling approach with origins in cognitive behaviour therapy (Freeman, 2005; Shawe-Taylor & Rigby, 1999) and promotes discussion about values, the exploration of thoughts and actions and how these may conflict with or support health goals (Rotgers, 2005). Motivational interviewing has been shown to be effective in the adoption of protective health behaviours (Beckham, 2007; Hanewinkel, Wewel, Stephan, Isensee, & Wiborg, 2006). Furthermore, young adults appear to respond to values-based motivational interviewing with reduced consumption of tobacco (Mulligan, 2008) and alcohol use (Scholl & Schmitt, 2009). The introduction of self-reflection and discourse about values with young adult males is likely to require the health practitioner to have specific counselling skills (Mesters, 2009) in addition to their ability to discuss evidence-based health information. This research indicates that individual health counselling that considers health values as well as socioeconomic and health status barriers may effectively assist young adult men adopt protective health behaviours.

An area not so well considered is the effect of conflicting behaviour values on health behaviour. Health is identified as having relevance to the value of personal security, but it also may be unique to the 19 individual personal values (Schwatz et al., 2012). Further research may consider the implications for this, such as a man valuing the consumption of moderate alcohol, but also valuing the social connectedness perceivably produced by group of friends consuming excessive alcohol. Conflicting behaviour values may require a man to consider and prioritise values aligned with personal care, social roles, family welfare and masculine identity. 'Value negotiation'

involves the process by which values are managed by prioritisation and balancing to suit a persons' health needs and situation (Hassan, 2011). How a person accommodates conflicting values and the relationships this process has with health behaviour is identified by Hassan as being largely unexplored. An exploration of interactions between different health behaviour values and how conflicting values are accommodated may contribute to understanding how values influence behaviour.

Research Participation and Men's Health

Evidence-based health policy and clinical practice rely upon research that involves people who are affected by the policies (Beasley, Starfield, van Weel, Rosser, & Haq, 2007; Straus, Tetroe, & Graham, 2009; Van Der Weyden, 2008). There are concerns that men, particularly young men, do not sufficiently participate in health research (Abbott, Bickerton, Daly, & Procter, 2008; Bower et al., 2009; Malcher, 2009). Nonparticipation in the information gathering phase of decision-making represents the real potential for the needs and issues of young men being overlooked and not considered in funding allocations and the establishment of gender and age-appropriate services (Van Der Weyden, 2008). Recruitment of men for health-related research is difficult (Bowen, Halbert, Robinson, & Boehmer, 2010; Graffy et al., 2009) when compared with young adult females or older people and not much is known about the reason for this nonparticipation (Bower et al., 2009). In both study one and study two of this research, fewer men in the 24–29-year-old age bracket participated, followed closely by the 30–35-year-old men. Recruitment peaked for the over 35-year-olds in both studies. Further research might consider participation rates and barriers to recruiting men aged 24 to 34 years to ensure that issues relevant to their health are identified.

While a thorough exploration of research recruitment issues of young adult men is outside of the scope of this research, I was able to report how different recruitment sources compared in regards to the actual attendance to the research assessment. Worksites proved to be a more effective recruitment medium compared with shopping centres, community advertising or a university campus. Worksites have been used previously as mediums for health information dissemination (Aoun & Johnson, 2002; Bize & Plotnikoff, 2009; Markkanen et al., 2006), health assessments and research recruitment (Bize & Plotnikoff, 2009; Ishikawa & Yano, 2008). The partnership between employment and personal care represents a convenient and time-efficient scenario, which is likely to appeal to men who report feeling stressed by conflicting commitments (Andrija, 2006; Grzywacz & Almeida, 2008; Rhea, 2009). The use of worksites as vehicles for health care provision has the potential to offer men a more suitable health care option that may be more male friendly and less alienating than many health service waiting rooms (Malcher, 2009). Similarly, health research that is affiliated with worksites may increase the credibility of health research, providing implied employer recognition of employee health and critiqued endorsement that might be attained from the knowledge that an employer and preconsidered and approved the intervention (Elisabeth, Claudia, & Harald, 2010; Okie, 2007; Patricelli & Lee, 1996). There may, however, be some limitations to worksites as sources of research data as some employers may not want health-related research done if it potentially highlights occupational health and safety legislation issues (Abbott et al., 2008; Johnson, Dale, Strickland, Venditti, & Evanoff, 2008). This in turn may represent a barrier to engaging some men and also introduce doubts about the reliability of the information collected in case details are modified to be more workplace positive. Worksites do not provide access to all client groups, namely lower socioeconomic and unemployed men. Given

these limitations, however, the engagement of workplaces may provide avenue for health service provision, education and health research that may result in improved health behaviour outcomes for working age men.

Limitations

A review of the large body of health behaviour model literature resulted in the identification of a list of factors including age, household income, education level, planning, inhibition, interference control and functional health literacy, critical and communicative health literacy and intelligence, sense of control, conscientiousness and behaviour values. The inclusion of such a large number of factors is consistent with the opinion that research progress can be maximised when all hypotheses about associations with health outcomes are considered and tested by a multidisciplinary team (Deary, 2005). A difficulty with testing a large number of multidisciplinary factors is that existing measures do not always clearly align with constructs, raising some reliability and validity concerns. A single measure of motivation, for example, a factor included in Health Literacy and Health Action Framework (von Wagner et al., 2009), was not identified, but was measured using scales for sense of control (Lachman & Weaver, 1998), health behaviour value (Scioli, Biller, Rossi, & Riebe, 2009) and health status (Ho, Davidson, & Ghea, 2005). Additionally, the need to limit the time obligation asked of participants requires the identification of the most critical and, in the case of quantitative research, the most measurable factors.

This research included two studies that were both cross-sectional. A longitudinal study, requiring more resources than were available would have allowed for a more rigorous examination of changes in health behaviour and predictors during the period of emerging adulthood. A longitudinal design would also have allowed for the

identification of directional associations. Although power analyses to identify a medium effect were conducted prior to recruitment for study two, the limited range in health literacy scores may indicate a need for a larger sample size or more selective recruitment to better explore associations between health behaviour and the important but ill-defined construct of health literacy. With these limitations in mind, this research represents a unique example of investigations into the predictors of health behaviour in men during the emerging adulthood transition, testing relationships among variables that are derived from contemporary and long standing models of health behaviour.

Conclusion

This research addresses the gender and age imbalance in health research by focusing on the predictors of health behaviour in men during emerging adulthood and contributes to a body of knowledge that is necessary to address the community concern relating to the health behaviour of young adult men. Theoretical health behaviour models have been developed predominantly with nonspecific populations or older people who volunteer more readily for research. Providing a focus on young adult men provides knowledge that is specific and recognises the importance men's health has to our community. This research has provided evidence that age during emerging adulthood is not clearly associated with health behaviour, and that all men, not just the younger men, should be supported to value their behaviours that are linked to positive and negative health outcomes. The absence of age effects may be a consequence of heightened socioeconomic status of younger men. Further explanation for the unsuccessful socioeconomic transition of men with increased age is required, but may be attributed to more younger aged men having tertiary qualifications thus potentially gaining higher paid employment and the social phenomenon of men deferring or

abandoning full-time fatherhood. Further research is required to explore personal perspectives and explanations for what appears to be continued risk-taking behaviour outside the age parameters of emerging adulthood. The importance of health behaviour values and strategies that promote the review of these may hold a key to a greater understanding of the psychological and attitudinal motives for health management. This thesis has confirmed the relevance of education to health behaviour, but indicated that health literacy and intelligence are not interchangeable for years of formal schooling. Men's health is a social and economic resource imperative for the current and future health of society. Efforts to engage young adult men in primary health and primary health research must persist. This research contributes to what is known about the psychological and socioeconomic predictors of behaviour, one element of men's health.

6. References

Aaron, D. J., Dearwater, S. R., et al. (1995). Physical activity and the initiation of high-risk health behaviors in adolescents. *Medicine & Science in Sports & Exercise, 27*(12), 1639–1645.

Abbott, S., Bickerton, J., Daly, M.-L., & Procter, S. (2008). Evidence-based primary health care and local research: A necessary but problematic partnership. Primary *Health Care Research and Development, 9*(3), 191–198.

Abella, R., & Heslin, R. (1984). Health, sense of control, values and the behaviour of families and friends. An integrated approach to understanding preventative health behaviour. *Basic and Applied Social Psychology, 5*, 283–293.

Abraham, C., & Sheeran, P. (2007). The Health Belief Model. In M. Conner & P. Norman (Eds.), *Predicting health behaviour: Research and practice with social cognition models* (2nd ed.; pp. 28-80. New York: Open University Press.

Abraham, C., Sheeran, P., Norman, P., Conner, M., de Vries, N., & Otten, W. (1999). When good intentions are not enough: Modelling post decisional cognitive correlates of condom use. *Journal of Applied Social Psychology, 29*(12), 2591–2612.

Abroms, L., Jorgensen, C. M., Southwell, B. G., Geller, A. C., & Emmons, K. M. (2003). Gender differences in young adults beliefs about sunscreen use. *Health Education & Behavior, 30*(1), 29–43.

Adams, R. J., Appleton, S. L., Hill, C. L., Dodd, M., Findlay, C., & Wilson, D. H. (2009). Risks associated with low functional health literacy in an Australian population. *Medical Journal of Australia, 191*(10), 530–534.

Adams, R. J., Appleton, S. L., Hill, C. L., Ruffin, R. E., & Wilson, D. H. (2009). Inadequate health literacy is associated with increased asthma morbidity in a

population sample. *Journal of Allergy & Clinical Immunology*, *124*(3), 601–603.

Adams, R., Howard, N., Tucker, G., Appleton, S., Taylor, A., Chittleborough, C. (2009). Effects of area deprivation on health risks and outcomes: a multilevel, cross-sectional, Australian population study. *International Journal of Public Health*, *54*(3), 183–192.

Addis, M. E., & Mahalik, J. R. (2003). Men, masculinity, and the contexts of help seeking. *American Psychologist*, *58*(1), 5–14.

Aguinis, H., Beaty, J. C., Boik, R. J., & Pierce, C. A. (2005). Effect size and power in assessing moderating effects of categorical variables using multiple regression. *Journal of Applied Psychology*, *90*(1), 94–107.

Aguinis, H., & Gottfredson, R. K. (2010). Best-practice recommendations for estimating interaction effects using moderated multiple regression. *Journal of Organizational Behavior*, *31*(6), 776–786.

Ahlgren, C., Novak, M., & Hammarstram, A. (2006). A life-course approach in explaining social inequity in obesity among young adult men and women. *International Journal of Obesity*, *30*(1), 191–200.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes 50*(2), 179–211.

Ajzen, I., & Madden, T. J. (1986). Predictions of goal directed behavior: attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology*, *22*, 453–474.

Ajzen, I., & Tinmko, C. (1986). Correspondence between health attitudes and behavior. *Journal of Basic and Applied Psychology*, *42*, 426–435.

Allain, P., Nicoleau, S., Pinon, K., Etcharry-Bouyx, F., Barré, J., Berrut, G., et al. (2005). Executive functioning in normal aging: A study of action planning using the Zoo Map Test. *Brain and Cognition*, *57*(1), 4–7.

Allicock, M., Sandelowski, M., DeVellis, B., & Campbell, M. (2008). Variations in meanings of the personal core value 'health'. *Patient Education and Counselling*, *73*, 347–353.

Allison, K. R., Adlaf, E. M., Ialomiteanu, A., & Rehm, J. (1999). Predictors of health risk behaviours among young adults: Analysis of the national population health survey. *Canadian Journal of Public Health*, *90*(2), 85–89.

Alvarez, J., & Emory, E. (2006). Executive function and the frontal lobes: A meta-analytic review. *Neuropsychology Review*, *16*(1), 17–42.

Australian Mental Health Outcomes and Classification Network. (2005). *Kessler–10 Training Manual* (1st ed.). Canberra, Commonwealth of Australia & NSW Institute of Psychiatry: Author.

Andersen, B., Astergaard, L., Maller, J. K., & Olesen, F. (2001). Effectiveness of a mass media campaign to recruit young adults for testing of Chlamydia trachomatis by use of home obtained and mailed samples. *Sexually transmitted infections, 77*(6), 416–418.

Anderson, V. A., Anderson, P., Northam, E., Jacobs, R., & Catroppa, C. (2001). Development of executive functions through late childhood and adolescence in an Australian sample. *Developmental Neuropsychology, 20*(1), 385–406.

Andrews, G., & Slade, T. (2001). Interpreting scores on the K10. *Australian and New Zealand Journal of Public Health*, *25*(494–497).

Andrews, G., Sanderson, K., & Beard, J. (1998). Burden of disease–methods of calculating disability from mental disorder. *British Journal of Psychiatry*, *173*(123–131).

Andrija, M. (2006). Recreational programmes for adult men based on cluster analysis of survey indictors. *Kinesiology*, *38*(2), 193–208.

Anne-Claude, B., Shana, N., Jose, B., Russell, S., Gordon, L., & Rosemary, T. (2002). The development of selective inhibitory control across the life span. *Developmental Neuropsychology*, *21*(1), 93–111.

Anstey, K., Windsor, T. D., Rodgers, B., Jorm, A., & Christensen, H. (2005). Lower cognitive test scores observed in alcohol abstainers are associated with demographic, personality, and biological factors: The PATH Through Life Project. *Addiction (Abingdon, England) 100*(9), 1291–1301.

Aoun, S., & Johnson, L. (2002). Diabetes education and screening in worksites in rural Western Australia. *Health Promotion Journal of Australia*, *13*(1), 65–68.

Aoun, S., Osseiran-Moisson, R., Collins, F., Newton, R., & Newton, M. (2009). A self-management concept for men at the community level: The 'Waist' Disposal Challenge. *Journal of Health Psychology*, *14*(5), 663–674.

Appleton, S., Wilson, D., Tucker, G., Ruffin, R., Taylor, A., Adams, R., et al. (2008). Sex differences in asthma morbidity associated with obesity in a representative population sample. *Journal of Allergy & Clinical Immunology*, *121*(5), 1285–1287, e1281.

Apollonio, D. E., & Malone, R. E. (2009). Turning negative into positive: public health mass media campaigns and negative advertising. *Health Education Research, 24*(3), 483–495.

Apter, A. J., Cheng, J., Small, D., Bennett, I. M., Albert, C., Fein, D. G., et al. (2006). Asthma numeracy skill and health literacy. *The Journal of Asthma, 43*(9), 705–705.

Arbuckle, T. Y., Chaikelson, J. S., & Gold, D. P. (1994). Social drinking and cognitive functioning revisited: The role of intellectual endowment and psychological distress. *Journal of Studies on Alcohol, 55*(3), 352–361.

Ardila, A., Pineda, D., & Rosselli, M. (2000). Correlation between intelligence test scores and executive function measures. *Archives of Clinical Neuropsychology*, *15*(1), 31–36.

Arffa, S. (2007). The relationship of intelligence to executive function and non-executive function measures in a sample of average, above average, and gifted youth. *Archives of Clinical Neuropsychology*, *22*(8), 969–978.

Armitage, C. J., & Conner, M. (2000). Social cognitive models and health behaviour: A structured review. *Psychology & Health, 15*(2), 173.

Armstong, T., Bauman, A., & Davies, J. (2000). *Physical activity patterns of Australian adults–results of the 1999 National Physical Activity Survey*. Canberra, Australia: Australian Institute of Health and Welfare.

Arnett, J. (2007). Suffering, selfish, slackers? Myths and reality about emerging adults. *Journal of Youth and Adolescence*, *36*(1), 23–29.

Arnett, J. J. (2001). Conceptions of the transition to adulthood: perspectives from adolescence to midlife. *Journal of Adult Development, 8,* 133–143.

Arnett, J. J. (2006). Emerging adulthood in Europe: A response to Bynner. *Journal of Youth Studies*, *9*(1), 111–123.

Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives*, *1*(2), 68–73.

Arshagouni, P. (2006). “But I’m an adult now ... sort of”: Adolescent consent in health care decision-making and the adolescent brain. *Journal of Health Care Law & Policy, 9*(2), 315.

Asztalos, M., K. Wijndaele, et al. (2009). Specific associations between types of physical activity and components of mental health. *Journal of Science & Medicine in Sport 12*(4), 468–474.

Australasian Men’s Health Forum. (2007). Conference proceedings: 7th National Men's Health Conference 2007. Adelaide: Australasian Men's Health Forum.

Australian Bureau of Statistics. (2003). *Information paper :Use of the Kessler Psychological Distress Scales in ABS health surveys*, Australia, 2001. Canberra, Commonwealth of Australia: Author.

Australian Bureau of Statistics. (2006). *Health literacy, Australia* (Cat. No. 4883.0). Canberra, Australia: Author.

Australian Bureau of Statistics. (2008). *National survey of mental health and wellbeing: Summary of results*. Canberra, Australia: Author.

Australian Bureau of Statistics. (2009). *Australian Social Trends–Home and Away: the living arrangments of young people*. From http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/LookupAttach/4102.0Publication30.06.096/$File/41020_Homeandaway.pdf.

Australian Bureau of Statistics. (2010a). *2007–08 National Health Survey*. Canberra, Australia: Author.

Australian Bureau of Statistics. (2010b). *AUSstats explanatory Notes*. Retrieved from http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4326.0Explanatory%20Notes12007?OpenDocument

Australian Bureau of Statistics. (2011). *Physical activity in Australia: A snapshot, 2007–08.* Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/4835.0.55.001

Australian Bureau of Statistics. (2011b). *Overweight and obesity in adults in Australia: a snapshot 2007–2008*. Canberra, Australia: Author.

Australian Bureau of Statistics. (2012). *Gender indicators, Australia*. Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2005). *Statistics on drug use in Australia 2004* (Cat no. PHC 62). Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2006). *Australia's Health 2006: The tenth biennial health report of the Australian Institute of Health and Welfare* (Cat no. AUS 73). Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2007). *Statistics on drug use in Australia 2006*. Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2008). *2007 National Drug Strategy household survey: Detailed findings* (Cat. no. PHE 107). Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2008). *Australia's Health 2008*. Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2010). *A snapshot of men's health in regional and remote Australia* (Rural health series no. 11). Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2011). *2010 National Drug Strategy Household Survey report* (Drug statistics series no. 25. Cat. no. PHE 145). Canberra, Australia: Author.

Australian Government Department of Health and Ageing. (2008). *Development of a national men's health policy–summary of men's health issues.* Canberra, Australia: Author.

Australian Government Department of Health and Ageing. (2010). *National Male Health Policy: Building on the strengths of Australian males.* Canberra, Australia: Author. Retrieved from http://www.health.gov.au/malehealthpolicy.

Australian Institute of Health and Welfare. (2008). *2007 National Drug Strategy Household Survey: first results.* Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2012). *National Health Data Dictionary*. Version 16 (Cat. no. HWI 119). Canberra, Australia: Author.

AustRoads. (2005). *Road Facts 2005*. Sydney: Australia: Author.

Axelrod, B. N. (2002). Validity of the Wechsler abbreviated scale of intelligence and other very short forms of estimating intellectual functioning. *Assessment, 9*(1), 17–23.

Baddedley, A., Della Sala, S., Papagno, C., & Spinnler, H. (1997). Dual-task performance in dysexecutive and nondysexecutive patients with a frontal lesion. *Neuropsychology*, *11*(2 April), 187–194.

Baddeley, A., Emslie, H., & Nimmo-Smith, I. (1993). The Spot-the-Word test: A robust estimate of verbal intelligence based on lexical decision. *British Journal of Clinical Psychology*, *32*(1), 55–65.

Baker, D. W. (2006). The meaning and the measure of health literacy. *JGIM: Journal of General Internal Medicine*, *21*(8), 878–883.

Balamurugan, A., Hall-Barrow, J., Blevins, M. A., Brech, D., Phillips, M., Holley, E., et al. (2009). A pilot study of diabetes education via telemedicine in a rural

underserved community–opportunities and challenges a continuous quality improvement process. *The Diabetes Educator, 35*(1), 147–154.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, New Jersey, Prentice-Hall.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, CA: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143–164.

Barbalat, G., Domenech, P., Vernet, M., & Fourneret, P. (2010). Risk-taking in adolescence: A neuroeconomics approach. *Encephale*, *36*(2), 147–154.

Barbeau, M., Hartman, C., Quinn, M. M., Stoddard, A. M., & Krieger, N. (2007). Methods for recruiting White, Black, and Hispanic working-class women and men to a study of physical and social hazards at work: the United for Health study. *International Journal of Health Services*, *37*(1), 127–144.

Barber, M. N., Staples, M., Osborne, R. H., Clerehan, R., Elder, C., & Buchbinder, R. (2009). Up to a quarter of the Australian population may have suboptimal health literacy depending upon the measurement tool: Results from a population-based survey. *Health Promotion International*, *24*(3), 252–261.

Barker-Collo, S., Bartle, H., Clarke, A., van Toledo, A., Vykopal, H., & Willetts, A. (2008). Accuracy of the National Adult Reading Test and Spot the Word estimates of premorbid intelligence in a non-clinical New Zealand sample. *New Zealand Journal of Psychology*, *37*(3), 53–61.

Barreto, S. M., Passos, V., Azeredo, M., & Giatti, L.. (2009). Healthy behavior among Brazilian young adults. *Revista de Saúde Pública*, *43*(Suppl 2), 9–17.

Bartlett, H. T., Catherine. Cartwright, Colleen. Smith, Norman. (2006). Mental health literacy in rural Queensland results of a community survey. *Australian and New Zealand Journal of Psychiatry*, *40*, 783–789.

Bartzokis, G., Beckson, M., Lu, P., Nuechterlein, K., Edwards, N., & Mintz, J. (2001). Age-related changes in frontal and temporal lobe volumes in men. *Archives of General Psychiatry*, *58*(May), 461–465.

Batty, G. D., Der, G., Macintyre, S., & Deary, I. J. (2006). Does IQ explain socioeconomic inequalities in health? Evidence from a population based cohort study in the west of Scotland. *BMJ: British Medical Journal*, 332(7541), 580–584.

Batty, G. D., Shipley, M. J., Mortensen, L. H., Boyle, S. H., Barefoot, J., (2008). IQ in late adolescence/early adulthood, risk factors in middle age and later all-cause mortality in men: The Vietnam experience study. *Journal of Epidemiology and Community Health*, *62*(6), 522–531.

Bauman, A., & Owen, N. (1999). Physical activity of adult Australians: Epidemiological evidence and potential strategies for health gain. Journal *of Science and Medicine in Sport*, *2*(1), 30–41.

Beasley, J. W., Starfield, B., van Weel, C., Rosser, W. W., & Haq, C. L. (2007). Global health and primary care research. *Journal of the American Board of Family Medicine*, *20*(6), 518–526.

Beaujot, R., & Kerr, D. (2007). Emerging youth transition patterns in Canada: Opportunities and risks. *PSC Discussion Paper Series*, *21*(5), 1–43.

Becker, M. H. E. (1974). *The health belief model and personal health behaviour*. Thorofare, New Jersey: Charles B Slack.

Beckham, N. (2007). Motivational interviewing with hazardous drinkers. *Journal of the American Academy of Nurse Practitioners*, *19*(2), 103–110.

Bei, W., Goins, R. T., Laditka, J. N., Ignatenko, V., & Goedereis, E. (2009). Gender differences in views about cognitive health and healthy lifestyle behaviors among rural older adults. *Gerontologist*, *49*, S72–S78.

Beier, M. E., & Ackerman, P. L. (2003). Determinants of health knowledge: an investigation of age, gender, abilities, personality, and interests: An Investigation of Age, Gender, Abilities, Personality, and Interests. *Journal of Personality and Social Psychology*, *84*(2), 439–448.

Bell, E., & Orpin, P. (2006). Self-management of chronic conditions: implications for rural physicians of a demonstration project Down Under. *Canadian Journal of Rural Medicine*, *11*(1), 33–40.

Bennett, C. M. B., & Baird, A. A. (2006). Anatomical changes in the emerging adult brain: a voxel-based morphometry study. *Human Brain Mapping*, *27*, 766–777.

Bennett, I. M. (2009). The contribution of health literacy to disparities in self-rated health status and preventive health behaviors in older adults. *Annals of Family Medicine*, *7*(3), 204–211.

Ben-Shlomo, Y., & Kuh, D. (2002). A life-course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *International Journal of Epidemiology*, *31*(2), 285–293.

Benton, A. L., & Hamsher, K. (1989). *Multilingual aphasia examination*. Iowa City, IA: AJA Associates.

Berg, E. A. (1948). A simple objective technique for measuring flexibility in thinking. *Journal of General Psychology*, *39*, 15–22.

Bergen, A. W., & Caporaso, N. (1999). Cigarette smoking. *Journal of the National Cancer Institute, 91*(16), 1365–1375.

Bergman, H., G. Axelsson, et al. (1983). Alcohol consumption, neuropsychological status and computer-tomographic findings in a random sample of men and women from the general population. *Pharmacology, Biochemistry & Behaviour, 18*(Suppl 1), 501–505.

Bermudez, J. (1999). Personality and health protective behavior. *European Journal of Personality*, *13*, 83–103.

Beuther, D. A., Weiss, S. T., & Sutherland, E. R. (2006). Obesity and asthma. *American Journal of Respiratory and Critical Care Medicine, 174*(2), 112–119.

Bhopal, R. (2002). *Concepts of epidemiology: An integrated introduction to the ideas, theories, principles and methods of epidemiology*. Oxford, UK: Oxford University Press.

Binder, L. M., Iverson, G. L., & Brooks, B. L. (2009). To err is human: "Abnormal" neuropsychological scores and variability are common in healthy adults. *Archives of Clinical Neuropsychology, 24*(1), 31–46.

Birkimer, J., Druen-Perri, B., Holland, J. W., & Zingman, M. (1996). Predictors of health behavior from a behavior-analytic orientation. *Journal of Social Psychology, 136*(2), 181–189.

Bissett, P. G., Nee, D., & Jonides, J. (2009). Dissociating interference-control processes between memory and response. *Journal of Experimental Psychology: Learning, Memory, And Cognition, 35*(5), 1306–1316. doi:10.1037/a0016537

Bize, R., & Plotnikoff, R. C. (2009). The relationship between a short measure of health status and physical activity in a workplace population. *Psychology Health & Medicine, 14*(1), 53–61.

Blair, C. (2006). How similar are fluid cognition and general intelligence? A developmental neuroscience perspective on fluid cognition as an aspect of human cognition ability. *Behavioral and Brain Sciences*, *29*, 109–160.

Blatterer, H. (2003). Arrested adulthood: The changing nature of maturity and identity, *Journal of sociology*, (39), 308–312.

Blatterer, H. (2007). Contemporary adulthood. *Current Sociology*, *55*(6), 771–792.

Blomquist, K. B. (2006). Health, education, work, and independence of young adults with disabilities. *Orthopaedic Nursing*, *25*(3), 168–187.

Bogg, T., & Roberts, B. W. (2004). Conscientiousness and health related behaviours: a meta analysis of the leading behavioural contributions to mortality. *Psychological Bulletin*, *130*, 887–919.

Booth-Kewley, S., & Vickers, R. R. Jr. (1994). Associations between major domains of personality and health behavior. *Journal of Personality*, *62*(3), 281–298.

Bosworth, H. B., Olsen, M. K., Grubber, J. M., Neary, A. M., Orr, M. M., Powers, B. J., et al. (2009). Two self-management interventions to improve hypertension control: A randomized trial. *Annals of Internal Medicine, 51*(10):687-95. doi: 10.7326/0003-4819-151-10-200911170-00148.

Botting, N. (2005). Non-verbal cognitive development and language impairment. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 46(3), 317–326.

Bowen, D. J., Halbert, C. H., Robinson, A., & Boehmer, U. (2010). Gender diverse recruitment to research projects. In J.C. Chrisler, & D.R. McCreary (Eds.) ,*Handbook of Gender Research in Psychology* (pp. 179–190). New York: Springer.

Bower, P., Wallace, P., Ward, E., Graffy, J., Miller, J., Delaney, B., et al. (2009). Improving recruitment to health research in primary care. *Family Practice, 26*(5), 391–397.

Boyce, L., & Dax, E. C. (1974). Driving behaviour as differentiated by the Tasmanian Ten-Year-Old Intelligence Test: I. The types and varieties of traffic offences committed by young men of lower intelligence: II. The effect of driver education on the traffic offences committed by young men of lower intelligence. *Australian Journal of Mental Retardation*, *3*(2), 40–48.

Bradley, G., & Wildman, K. (2002). Psychosocial predictors of emerging adults' risk and reckless behaviors. *Journal of Youth and Adolescence*, *31*(4), 253–265.

Brown, J. M., Miller, W. R., & Lawendowski, L. A. (1999). The self regulation questionnaire. In L. VandeCreek & T. L. Jackson (Eds.), *Innovations in clinical practice: a sourcebook* (Vol. 17). Sarasota, FL: Professional Resource Press/Professional Resource Exchange.

Brown, J. S. (1961). *The motivation of behavior*. New York: McGraw-Hill.

Brown, J. W., Braver, T. S., et al. (2009). Executive function and higher-order cognition: computational models. *Encyclopedia of Neuroscience*. Oxford: Academic Press.

Bruin, B. D., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. Journal of Personality and Social Psychology, *92*(5), 938–956.

Bryan, J., Luszcz, M. A., & Crawford, J. R. (1997). Verbal knowledge and speed of information processing as mediators of age differences in verbal fluency performance in older adults. *Psychology and Aging*, *12*, 473–478.

Bryan, J., & Luszcz, M. A. (2001). Adult age differences in Self-Ordered Pointing Task performance: Contributions from working memory, executive function and speed of information processing. *Journal of Clinical and Experimental Neuropsychology, 23*, 608–619.

Buchanan, C. M., Eccles, J. S., & Becker, J. B. (1992). Are adolescents the victims of raging hormones? Evidence for activational effects of hormones on moods and behavior at adolescence. *Psychological Bulletin, 111*(1), 62–107.

Burgess, P. W. (2000). Strategy application disorder: the role of the frontal lobes in human multi-tasking. *Psychological Research, 63*(3/4), 279–288.

Burke, V., Beilin, L. J., Dunbar, D., & Kevan, M. (2004). Changes in health-related behaviours and cardiovascular risk factors in young adults: associations with living with a partner. *Preventive Medicine, 39*(4), 722–730.

Burke, V., Beilin, L. J., Dunbar, D., & Kevan, M. (2004). Changes in health-related behaviours and cardiovascular risk factors in young adults: associations with living with a partner. *Preventive Medicine, 39*(4), 722–730.

Burke, V., Milligan, R. A. K., Beilin, L. J., Dunbar, D., Spencer, M., Balde, E., et al. (1997). Clustering of health-related behaviors among 18-year-old Australians. *Preventive Medicine, 26* (5, pt. 1), 724–733.

Burroughs, A. R., Visscher, W. A., Haney, T. L., Efland, J. R., Barefoot, J. C., Williams, J. R. B., et al. (2003). Community recruitment process by race, gender, and SES gradient: Lessons learned from the Community Health and Stress Evaluation (CHASE) Study experience. *Journal of Community Health, 28*(6), 421–437.

Butler, K. M., Rayens, M. K., Zhang, M., & Hahn, E. J. (2011). Motivation to quit smoking among relatives of lung cancer patients. *Public Health Nursing*, *28*(1), 43–50.

Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin*, *125*(3), 367–383.

Caldwell, T. M., Jorm A. F., & Dear, K.B. (2004). Suicide and mental health in rural, remote and metropolitan areas in Australia. *Medical Journal of Australia*, *181*(7 Supp), S10–14.

Caldwell, T. M., Rodgers, B., Jorm, A. F., Christensen, H., Jacomb, P. A., Korten, A. E., et al. (2002). Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction*, *97*, 583–594.

Cameron, L. D., & Leventhal, H. (2003). *The self regulation of health and illness behaviour*. New York, NY: Routledge.

Cansino, S. (2011). Effects of aging on interference control in selective attending and working memory. *Memory Cognition*, *39*, 1409–1422.

Cappuccio, F. P., Stranges, S., Kandala, N.-B., Miller, M. A., Taggart, F. M., Kumari, M., (2007). Gender-Specific associations of short sleep duration with prevalent and incident hypertension: The Whitehall II Study. *Hypertension, 50*(4), 693–700.

Carey, K.B, Neal, D.J., Collins, S.E., (2004) A psychometric analysis of the self-regulation questionnaire. *Addictive Behaviours, 29*(2):253–260.

Carmona, R. H. (2006). Healthliteracy: A national priority. *JGIM: Journal of General Internal Medicine*, *21*(8), 803–803.

Caspi, A., B. R., & Shiner, R. L. (2005). Personality development: stability and change. *Annual Review of Psychology*, *56*, 453–484.

Caspi, A., Begg, D., Dickson, N., Harrington, H., Langley, J., Moffitt, T. E., et al. (1997). Personality differences predict health-risk behaviors in young adulthood: Evidence from a longitudinal study. *Journal of Personality and Social Psychology*, *73*(5), 1052–1063.

Centers for Disease Control and Prevention. (2010). Vital signs: current cigarette smoking among adults aged 18 years in the United States, 2009. *MMWR: Morbidity & Mortality Weekly Report*, *59*(35), 1135–1140.

Cervone, D., Shadel, W. G., Smith, R. E., & Fiori, M. (2006). Self-regulation: Reminders and suggestions from personality science. *Applied Psychology: An International Review*, *55*, 333–385.

Chambers, R. A., & Potenza, M. N. (2003). Neurodevelopment, Impulsivity, and Adolescent Gambling. *Journal of Gambling Studies*, *19*(1), 53–84.

Chan, R. C. K., Shum, D., Toulopoulou, T., Chen, E. Y. H. (2008). Assessment of executive functions: Review of instruments and identification of critical issues. *Archives of Clinical Neuropsychology*, *23*(2), 201–216.

Chaput, J.-P. (2010). A good night's sleep for a healthier population. *American Journal of Preventive Medicine*, *38*(3), 349–349.

Cheung, A. M. M., & E M. Mitsis, & Halperin, J M. (2004). The relationship of behavioral inhibition to executive functions in young adults. *Journal of Clinical & Experimental Neuropsychology*, *26*(3), 393–404.

Chinn, D. (2011). Critical health literacy: A review and critical analysis. *Social Science & Medicine, 73*(1):60-7. doi: 10.1016/j.socscimed.2011.04.004. Epub 2011 May 12.

Chlipala, M. L. (2010). *Organized semantic fluency and executive functioning in an adult clinical sample and a community sample* (Unpublished Dissertation/Thesis). University of North Texas.

Chittleborough, C., Taylor, A., Baum, F., & Hiller, J. (2009). Monitoring inequities in self-rated health over the life-course in population surveillance systems. *American Journal of Public Health, 99*(4), 680–689.

Chittleborough, C., Taylor, A., Dal Grande, E., Gill, T., Grant, J., Adams, R., et al. (2010). Gender differences in asthma prevalence: variations with socioeconomic disadvantage. *Respirology*, *15*(1), 107–114.

Chittleborough, C., Winefield, H., Gill, T., Koster, C., & Taylor, A. (2010). Age differences in associations between psychological distress and chronic conditions. *International Journal of Public Health*, *56*(1):71-80. doi: 10.1007/s00038-010-0197-5. Epub 2010 Oct 1.

Clarke, D. (2004). Impulsiveness, sense of control, motivation and problem gambling. *Journal of Gambling Studies*, *20*(4), 319–345.

Cohen, J. (1968). Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological Bulletin, 70*(4), 213–220.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155–159.

Cohen, P., Kasen, S., Chen, H., Hartmark, C., & Gordon, K. (2003). Variations in patterns of developmental transmissions in the emerging adulthood period. *Developmental Psychology*, *39*(4), 657–669.

Coid, J., & Yang, M. (2010). Violence and delayed social independence among young adult British men. *Social Psychiatry and Psychiatric Epidemiology*, *45*(3), 301–308.

Collins, V., McLachlan, R. I., & Holden, C. A. (2011). Tackling inequities in men's health: a reflective lens on the National Male Health Policy. *Medical Journal of Australia*, *194*(2), 62–64.

Computer Assisted Telephone Interviewing Technical Reference Group. (2003). *Populations health monitoring and surveillance: Question development background paper – Alcohol consumption in Australia*. Canberra, Australia: Australian Institute of Health & Welfare.

Conner, M. and P. Norman (2007). *Predicting health behaviour: Research and practice with social cognition models* (2nd ed.). New York: Open University Press.

Conrad, H. S., Jones, H. E., et al. (1940). A second study of familial resemblance in intelligence: Environmental and genetic implications of parent-child and sibling correlations in the total sample. In I. Bloomington (Ed.), *The thirty-ninth yearbook of the National Society for the Study of Education: Intelligence: Its nature and nurture, Part II, Original studies and experiments* (pp. 97–141). IL, Public School Publishing Co.

Cook, R., & Schlenger, W. (2002). Prevention of substance abuse in the workplace: Review of research on the delivery of services. *The Journal of Primary Prevention*, *23*(1), 115–142.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory and five-factor inventory professional manual*. Odessa, FL: Psychological Assessment Resources.

Costello, D. M., Dierker, L. C., Jones, B. L., & Rose, J. S. (2008). Trajectories of smoking from adolescence to early adulthood and their psychosocial risk factors. *Health Psychology*, *27*(6), 811–818.

Cottrell, R. R., Girvan, J. T., & McKenzie, J. F. (2009). *Principles and foundations of health promotion and education* (4th ed.). San Francisco, CA: Benjamin Cummings.

Coulson, C. E., Williams, L. J., et al. (2010). Patterns of alcohol use and associated physical and lifestyle characteristics according to new Australian guidelines. *Australian & New Zealand Journal of Psychiatry*, *44*(10), 946–951.

Courneya, K. S., Bobnick, T. M., & Schinke, R. J. (1999). Does the theory of planned behaviour mediate the relation between personality and exercise behaviour? *Basic and Applied Social Psychology*, *21*(4), 317–324.

Courtenay, W. H. (2000). Engendering health: A social constructionist examination of men's health beliefs and behaviors. *Psychology of Men & Masculinity*, *1*(1), 4–15.

Courtney, K. E., & Polich, J. (2009). Binge drinking in young adults: Data, definitions, and determinants. *Psychological Bulletin*, *135*(1), 142–156.

Crane, P. K., Narasimhalu, K., Gibbons, L. E., Pedraza, O., Mehta, K. M., Tang, Y., et al. (2008). Composite scores for executive function items: demographic heterogeneity and relationships with quantitative magnetic resonance imaging. *Journal of the International Neuropsychological Society*, *14*(5), 746–759.

Cranford, J. A., McCabe, S. E., & Boyd, C. J. (2006). A new measure of binge drinking: Prevalence and correlates in a probability sample of undergraduates. *Alcoholism: Clinical & Experimental Research*, *30*(11), 1896–1905.

Crews, F. T., & Boettiger, C. A. (2009). Impulsivity, frontal lobes and risk for addiction. *Pharmacology Biochemistry and Behavior*, *93*(3), 237–247.

Croghan, I. T., Bronars, C., Patten, C. A., Schroeder, D. R., Nirelli, L. M., Thomas, J. L., et al. (2006). Is smoking related to body image satisfaction, stress, and self-esteem in young adults? *American Journal of Health Behavior*, *30*(3), 322–333.

Cronbach, L. J., & Meehl, P. C. (1955). Construct validity in psychological tests. *Psychological Bulletin*, *52*, 281–302.

Dal Grande, E., & Taylor, A. (2010). Sampling and coverage issues of telephone surveys used for collecting health information in Australia: results from a face-to-face survey from 1999 to 2008. *BMC Medical Research Methodolology*, *10*, 77.

Dal Grande, E., Fullerton, S., & Taylor, A. W. (2012). Reliability of self-reported health risk factors and chronic conditions questions collected using the telephone in South Australia, Australia. *BMC Medical Research Methodolology*, *12*(1), 108–108.

Dal Grande, E., Taylor, A., & Wilson. D. (2002). *South Australian Health and Wellbeing Survey, December 2000.* Adelaide, Australia: Population Research and Outcome Studies Unit, Department of Health, South Australia. Retrieved from http://health.adelaide.edu.au/pros/docs/reports/br200214_k10.pdf

Dannefer, D., & Uhlenberg, P. (1999). Paths of a life-course: A typology. In V. L. Bebtson & K. W. Schaie (Eds.), *Handbook of theories of aging* (pp. 306–326). New York: Springer.

Dantzer, C., Wardle, J., Fuller, R., Pampalone, S. Z., & Steptoe, A. (2006). International study of heavy drinking: Attitudes and sociodemographic factors in university students. *Journal of American college Health, 55*(2), 83–90.

Das, A. K., Corrado, O. J., Kyerematen, E., Smithson, J. A. J., & West, R. M. (2009). Do doctors understand alcohol units? *Clinical Medicine, Journal of the Royal College of* Physicians, *9*(6), 525–525.

David, G. K., David, G, Ajdacic, V., Gergen, P., J. , & Hasler, G. (2005). Asthma and panic in young adults: A 20-year prospective community study. *American Journal of Respiratory and Critical Care Medicine, 171*(11), 1224–1230.

David, J. E., & Chris, K. (2001). Does fatherhood matter for men? *Journal of Marriage and the Family, 63*(2), 381–393.

Davidson, K. W., Trudeau, K. J., van Roosmalen, E., Stewart, M., & Kirkland, S. (2006). Perspective: Gender as a health determinant and implications for health education. *Health Education & Behavior, 33*(6), 731–743.

Davies, J. A., Shen-Miller, D. S., & Isacco, A. (2010).The men's center approach to addressing the health crisis of college men. *Professional Psychology: Research and Practice, 41*(4), 347–354.

Davis, T. C., Long, S., Jackson, R., Mayeux, E., George, R., & Murphy, P. (1993). Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Family Medicine, 25*, 391–395.

Day, A., Whetham, P., & Whetham, L. (Eds.). (2004). *Psychology: Key ideas. SACE stage 1*. Adelaide, Australia: Adelaide Tuition Centre.

de Bruijn, G., Brug, J., & Van Lenthe, F. J. (2009). Neuroticism, conscientiousness and fruit consumption: Exploring mediator and moderator effects in the theory of planned behaviour. *Psychology & Health, 24*(9), 1051–1069.

de Kretser, D. M., Cock, M., & Holden, C. (2006). The men in Australia Telephone Survey (MATeS)–lessons for all. *Medical Journal of Australia, 185*(8), 412–413.

de Luca, C. R., Wood, S. J., Anderson, V., Buchanan, J.-A., Proffitt, T. M., Mahony, K., et al. (2003). Normative data from the Cantab. I: Development of executive function over the lifespan. *Journal of Clinical and Experimental Neuropsychology*, *25*(2), 242–254.

de Ridder, D., Geenen, R., Kuijer, R., & van Middendorp, H. (2008). Psychological adjustment to chronic disease. *Lancet*, *372*(9634), 246–255.

de Visser, R., Rissel, C., Smith., A & Richters, J. (2006). Sociodemographic correlates of selected health risk behaviors in a representative sample of Australian young people. *International Journal of Behavioral Medicine*, *13*(2), 153–162.

de Visser, R. O., & Smith, J. A. (2007). Young men's ambivalence toward alcohol. *Social Science & Medicine*, *64*(2), 350–362.

DeVol, R., & Bedroussian, A. (2007). *An unhealthy America: The economic burden of chronic disease–charting a new course to save lives and increase productivity and economic growth*. Santa Monica, CA: Milken Institute.

De Vries, H., Kremers, S., et al. (2008). Clustering of diet, physical activity and smoking and a general willingness to change. *Psychology & Health*, *23*(3), 265–278.

Dean W., & Beebe, D. G. (2002). Obstructive sleep apnea and the prefrontal cortex: Towards a comprehensive model linking nocturnal upper airway obstruction to daytime cognitive and behavioral deficits. *Journal of Sleep Research*, *11*(1), 1–16.

Dear, K., Henderson, S., & Korten, A. (2002). Well-being in Australia: Findings from the National Survey of Mental Health and Well-being. *Social Psychiatry & Psychiatric Epidemiology*, *37*(11), 503–509.

Deary, I. J. (2005). Intelligence, health and death. *Psychologist*, *18*(10), 610–613.

Deci, E. L., & Ryan, R. M. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–54.

Delis, D. C., Kaplan, E. K., & Kramer, J H. (2001). *Delis-Kaplan executive function system*. San Antonio,TX: The Psychological Corporation.

Delucchi, K. L., Matzger, H., & Weisner, C. (2008). Alcohol in emerging adulthood: 7-year study of problem and dependent drinkers. *Addictive Behaviors*, *33*(1), 134–142.

Denton, M., Prus, S., & Walters, V. (2004). Gender differences in health: A Canadian study of the psychosocial, structural and behavioural determinants of health. *Social Science & Medicine*, *58*(12), 2585–2600.

Department of Health. (2004). *Risky drinking in South Australia: Brief Report*. Adelaide. 2004–11. Adelaide, South Australia: Author.

Department of Health and Ageing. (2011). *Physical activity–Research and statistics. Better health and active ageing for all Australians* Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-active-evidence.htm

Department of Health and Aged Care. (2005). *An active way to better health: National physical activity guidelines for adults*. Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/Content/BC3101B1FF200CA4CA256F9700154958/$File/adults_phys.pdf

Department of Health and Ageing. (2012). *The Australian Standard Drink*. Retrieved from http://www.alcohol.gov.au/internet/alcohol/publishing.nsf/Content/standard. Department of Health and Ageing

Department of Health and Human Services. (2010). *Healthy People 2010.* Washington, DC.: US Government Printing Office.

Department of Planning Transport and Infrastructure. (2012). *South Australia's Graduated Licensing Scheme. Initiatives to protect young drivers–Outcomes from the public consultation.* Adelaide, South Australia: Department of Planning, Transport and Infrastructure. Retrieved from http://www.towardszerotogether.com.au/__data/assets/pdf_file/0006/83922/public_consult_report_GLS_august_2012.pdf

DeVellis, B. M., & McConkie-Rosell, A. (2000). Threat to parental role: A possible mechanism of altered self-concept related to carrier knowledge. *Journal of Genetic Counseling*, *9*(4), 285–302.

Devine, E. B., Hakim, Z., et al. (2005). A Systematic Review of Patient-Reported Outcome Instruments Measuring Sleep Dysfunction in Adults. *PharmacoEconomics, 23*(9), 889–912.

Dewa, C. S., Zipursky, R. P., Durbin, J., Chau, N., Goering, P., Aubry, T., et al. (2008). A Brief report on the characteristics of young male adults experiencing their first episodes of psychosis: Implications for developing specialized first episode programs. *Internet Journal of Mental Health, 5*(1), 3–3. doi: 10.5580/98c

Diamond, A. (2008, June 4). Is EF the new IQ. *Newsweek.*

Dodrill, C. B. (1978). A neuropsychological battery for epilepsy. *Epilepsia, 19,* 611–623.

Dogra S, Kuk JL, Baker J, Jamnik V. (2011). Exercise is associated with improved asthma control in adults. *European Respiratory Journal*, 37, 318–23

Donaldson, C. (2008). Marketing health, influencing behaviour. *The Journal of The Royal Society for the Promotion of Health, 128*(4), 152–153.

Donders, J., Tulsky, D. S., & Zhu, J. (2001). Criterion validity of new WAIS-II subtest scores after traumatic brain injury. *Journal of the International Neuropsychological Society, 7*(7), 892–898.

Duff, C. (2005). Party drugs and party people: examining the normalization' of recreational drug use in Melbourne, Australia. *International Journal of Drug Policy, 16*(3), 161–170.

Dumas, A. J., & Hartman, M. (2008). Adult age differences in the access and deletion functions of inhibition. *Aging, Neuropsychology, and Cognition, 15*, 330–357.

Duncan, J., Emslie, H., Williams, P., Johnson, R., & Freer, C. (1996). Intelligence and the frontal lobe: The organization of goal-directed behavior. *Cognitive Psychology, 30*(3), 257–303.

Dunlevy, S. (2012). Raise drinking age to 25, says top doc. *NTnews*. Retrieved from http://www.ntnews.com.au/article/2012/09/20/313723_lifestyle.html

Dunn, A. L., & Jewell, J. S. (2010). The effect of exercise on mental health. *Current Sports Medicine Reports, 9*(4), 202–207.

Ebrahim, S., Haines, A., Epping-Jordan, J., Kidd, M., Patel, V., Beaglehole, R., et al. (2008). Alma-Ata: Rebirth and revision 3–Improving the prevention and management of chronic disease in low-income and middle-income countries: a priority for primary health care. *Lancet*, *372*(9642), 940–949.

Eccles, J. T., J. Barber, B. Stone, M. (2003). Adolescence and emerging adulthood: The critical passage ways to adulthood. In *Well-being: Positive development across the life-course*. M. H. D. Bornstein, L. Keyes, C. L. M. Moore, Kristin. A. , Lawrence Erlbaum Associates Publishers: p 601.

Eizenman, D. R., Nesselroade, J. R., Featherman, D. L., & Rowe, J. W. (1997). Intra Individual variability in perceived control in an older sample: The MacArthur successful aging studies. *Psychology and Aging, 12*, 489–502.

Elisabeth, N. H., Claudia, S., & Harald, S. (2010). Determinants of employee participation in workplace health promotion. *International Journal of Workplace Health Management, 3*(2), 97–110.

Erickson, K. I., Colcombe, S. J., Wadhwa, R., Bherer, L., Peterson, M. S., Scalf, P. E., et al. (2007). Training-Induced functional activation changes in dual-task processing: An fMRI Study. *Cerebral Cortex, 17*(1), 192–204.

Erickson, P., Kendall, E. A., Anderson, J. P., & Kaplan, R. M. (1989). Using composite health status measures to assess the nation's health. *Medical Care, 27*(3), S66–S76.

Erikson, E. (1975). What is an adult? *Pediatrics, 55*(6), 768.

Eslinger P. J., Grattan L. M., Geder, L. (1996). Neurologic and neuropsycholoigical aspects of frontal lobe impairments in postconcussion syndrome. In M. Rizzo & D. Tranel (Eds.), *Head injury and post concussion syndrome* (pp. 415–440). New York: Churchill Livingstone.

Estaquio, C., Castetbon, K., Kesse-Guyot, E., Bertrais, S., Deschamps, V., Dauchet, L., et al. (2008). The French National Nutrition and Health Program Score Is Associated with Nutritional Status and Risk of Major Chronic Diseases. *Journal of Nutrition, 138*(5), 946–953.

Farooqi, A., Hägglöf, B., & Serenius, F. (2013). Behaviors related to executive functions and learning skills at 11 years of age after extremely preterm birth: A Swedish national prospective follow-up study. *Acta Paediatrica, 102*(6):625–634. doi: 10.1111/apa.12219. Epub 2013 Mar 26.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41, 1149-1160

Fayers, P. M., & Sprangers, M. A. G. (2002). Understanding self-rated health. *Lancet, 359*(9302), 187–188.

Ferrer, R. L., & Carrasco, A. V. (2010). Capability and clinical success. *Annals of Family Medicine, 8*(5), 454–460.

Ferrer, R. L., & Palmer, R. (2004). Variations in health status within and between socioeconomic strata. *Journal of Epidemiology and Community Health, 58*(5), 381–387.

Field, A. (2005*). Discovering statistics using SPSS* (2nd ed.). London: SAGE Publications.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: SAGE Publications.

Fishbein, D. H., Hyde, C., Eldreth, D., Paschall, M. J., Hubal, R., Das, A., et al. (2006). Neurocognitive skills moderate urban male adolescents' responses to preventive intervention materials. *Drug & Alcohol Dependence, 82*(1), 47–60.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Fiske, S. T., & Taylo,r S. E. (1991). *Social cognition* (2nd ed.). New York, NY, McGraw-Hill.

Fletcher, R. J., Higginbotham, N., & Dobson, A. (2002). Men's perceived health needs. *Journal of Health Psychology, 7*(3), 233–241.

Flouri, E., Hickey, J., Mavroveli, S., & Hurry, J. (2011). Adversity, emotional arousal, and problem behaviour in adolescence: The role of non verbal cognitive ability as a resilience promoting factor. *Child and Adolescent Mental Health, 16*(1), 22–29.

Floyd, R. G., Bergeron, R., Hamilton, G., & Parra, G. P. (2010). How do executive functions fit with the Cattell-Horn-Carroll Model? Some evidence from a joint factor analysis of the Delis-Kaplin Executive Function System and the Woodcodk-Johnson III tests of cognitive abilities. *Psychology in the Schools*, *47*(7), 721–738.

Forouhi, N. G., & Wareham, N. J. (2010). Epidemiology of diabetes. *Medicine*, *38*(11), 602–606.

Frazier, P. A., Tix, A. P., & Barron, K. E. (2004). Testing moderator and mediator effects in counseling psychology research. *Journal of Counseling Psychology, 51*(1), 115–134.

Frech, A. M. (2009). Healthy behavior trajectories between adolescence and emerging adulthood. *Dissertation Abstracts International Section A: Humanities and Social Sciences*. US, ProQuest Information & Learning. 70.

Freeman, A. (2005). *Encyclopedia of cognitive behavior therapy*. New York: Kluwer Academic Publishers.

Freund, A. M. (2006). Age-differential motivational consequences of optimization versus compensation focus in younger and older adults. *Psychology and Aging*, *21*(240–252).

Fromme, K., Wetherill, R. R., & Neal, D. J. (2010). Turning 21 and the associated changes in drinking and driving after drinking among college students. *Journal of American College Health, 59*(1), 21–27.

Furstenberg, F. F., Kennedy, S., Mcloyd, V. C., Rumbaut, R. G., & Settersten, R. A. (2004). Growing up is harder to do. *Contexts, 3*, 33–41.

Furukawa, T. A., Kessler, R. C., Slade, T., & Andrews, G. (2003). The performance of the K6 and K10 screening scales for psychological distress in the Australian

National Survey of Mental Health and Well-Being. *Psychological Medicine, 33*(2), 357–362.

Galambos, N. L., & Krahn, H. J. (2008). Depression and anger trajectories during the transition to adulthood. *Journal of Marriage and Family, 70*(1), 15–27.

Galambos, N. L., Turner, P. K., & Tilton-Weaver, L. C. (2005). Chronological and subjective age in emerging adulthood: The crossover effect. *Journal of Adolescent Research*, *20*(5), 538–556.

Gale, E. A., & Gillespie, K. M. (2001). Diabetes and gender. *Diabetologia, 44*, 3–15.

Gale, J. A., Lambert, D., & Hartley, D. (2008). Substance abuse by youth and young adults in rural America. *The Journal of Rural Health*, *24*(3), 221–228.

Gallagher, D., Visser, M., Sepúlveda, D., Pierson, R. N., Harris, T., &Heymsfield, S. B. (1996). How useful is body mass index for comparison of body fatness across age, sex, and ethnic groups? *American Journal of Epidemiology, 143*(3), 228–239.

Garavan, H., Ross, T. J., & Stein, E. A. (1999). Right hemispheric dominance of inhibitory control: An event-related functional MRI study. *Proceedings of the National Academy of Sciences, 96*, 8301–8306.

Garfield, C. F., Rogers, T. E., & Isacco, A. (2008). A review of men's health and masculinity. *American Journal of Lifestyle Medicine*, *2*(6), 474–487.

Garland, T. (2005). Test Review: WASI. *Journal of Occupational Psychology, Employment and Disability, 7*(2), 130–135.

Gazmararian, J. A., Williams, M., Peel, J., & Baker, D. W. (2003). Health literacy and knowledge of chronic disease. *Patient Education and Counselling, 51*, 267–275.

Gazmararian, J., Jacobson, K. L., Pan, Y., Schmotzer, B., & Kripalani, S. (2010). Effect of a pharmacy-based health literacy intervention and patient characteristics on

medication refill adherence in an urban health system. *Annals of Pharmacotherapy, 44*(1), 80–87.

Geenen, R., van Middendorp, H. t., Kuijer, R., & de Ridder, D. (2008). Psychological adjustment to chronic disease. *Lancet*, *372*(9634), 246–255.

Geldmacher, D. S., Fritsch, T., & Riedel, T. M. (2000). Effects of stimulus properties and age on random-array letter cancellation tasks. *Aging, Neuropsychology & Cognition*, 7(3), 194–204.

George, S., Rogers, R. D., & Duka, T. (2005). The acute effect of alcohol on decision making in social drinkers. *Psychopharmacology*, *182*(1), 160–169.

Ghanem, K. G. Hutton, H. E., Zenilman, J. M., Zimba, R., Erbelding, E. J. (2005). Audio computer assisted self interview and face to face interview modes in assessing response bias among STD clinic patients. *Sexually Transmitted Infections, 81*: 421–425.

Giancola, P. R., & Mezzich, A. C. (2000). Executive cognitive functioning mediates the relation between language competence and antisocial behavior in conduct-disordered adolescent females. *Aggressive Behavior*, *26*(5), 359–375.

Gibbons, F. X., Gerrard, M., Reimer, R. A., & Pomery, E. A. (2008). Unintentional behavior: A subrational approach to health risk. In D. de Ridder & J. de Wit (Eds.), *Self-regulation in Health Behavior* (pp. 45–70). Chichester, UK: John Wiley.

Gibbons, L. E., Carle, A. C., Mackin, R. S., Harvey, D., Mukherjee, S., Insel, P., et al. (2012). A composite score for executive functioning, validated in Alzheimer's Disease Neuroimaging Initiative (ADNI) participants with baseline mild cognitive impairment. *Brain Imaging and Behavior*, *6*(4), 517–527.

Giesbrecht, N., & Greenfield, T. K. (2003). Preventing alcohol-related problems in the US through policy: Media campaigns, regulatory approaches and environmental interventions. *The Journal of Primary Prevention, 24*(1), 63–104.

Gillen, G., & Burkhardt, A. (Eds.). (2004). *Stroke rehabilitation: a function-based approach.* St. Louis, MO: Mosby.

Gioia, G. A., Collins, M., & Isquith, P. K. (2008). Improving identification and diagnosis of mild traumatic brain injury with evidence: psychometric support for the Acute Concussion Evaluation. *Journal of Head Trauma Rehabilitation*, *23*(4), 230–242.

Glanz, K., & Maddock, J. (2000). On judging models and theories: Research and practice, psychology and public health. *Journal of Health Psychology, 5*, 151–154.

Glasgow, R. E., Ory, M. G., Klesges, L. M., Cifuentes, M., Fernald, D. H., & Green, L. A. (2005). Practical and relevant self-report measures of patient health behaviors for primary care research. *Annals of Family Medicine, 3*(1), 73–81.

Glover, S. (2004). Planning and control in action. *Behavioural and Brain Sciences, 27,* 57–69.

Goeleven, E., De Raedt, R., & Dierckx, E. (2010). The positivity effect in older adults: The role of affective interference and inhibition. *Aging & Mental Health*, *14*(2), 129–137.

Goldberg, E. (2001). *The executive brain: Frontal lobes and the civilized mind*. Oxford: Oxford University Press.

Golden, C. J. (1978). *The Stroop Color and Word test*. Chicago, IL, Stoelting Company.

Goldney, R., Eckert, K., Hawthorne, G., & Taylor, A. (2010). Changes in the prevalence of major depression in an Australian community sample between

1998 and 2008. *Australian and New Zealand Journal of Psychiatry*, *44*(10), 901–910.

Gollwitzer, P. M., & Oettingen, G. (1998). The emergence and implementation of health goals. *Psychology & Health, 13*(4), 687–715.

Gollwitzer, P. M., & Oettingen, G. (2007). The role of goal setting and goal striving in medical adherence. In D. C. Park & L. L. Liu (Eds.), *Medical adherence and aging. Social and cognitive perspectives* (pp. 23–47). Washington, DC: American Psychological Association.

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 38; pp. 69–119). San Diego, CA: Elsevier Academic Press Inc.

Gollwitzer, P. M., & Sheeran, P. (2009). Self-regulation of consumer decision making and behavior: The role of implementation intentions. *Journal of Consumer Psychology*, *19*(4), 593–607.

Gonzalez, A. (2012). Vulnerable populations and diabetes. *Diabetes Spectrum, 25*(1), 6–7.

Gonzalez, R., Bechara, A., et al. (2007). Executive functions among individuals with methamphetamine or alcohol as drugs of choice: Preliminary observations. *Journal of Clinical and Experimental Neuropsychology 29*(2), 155–159.

Goodwin, R. D., & Friedman, H. S. (2006). Health status and the five-factor personality traits in a nationally representative sample. *Journal of Health Psychology*, *11*(5), 643–654.

Gordon-Larsen, P., Adair, L. S., Nelson, M. C., & Popkin, B. M. (2004). Five-year obesity incidence in the transition period between adolescence and adulthood:

the National Longitudinal Study of Adolescent Health. *The American Journal of Clinical Nutrition, 80*(3), 569–575.

Gottfredson, L. S. (2004). Intelligence: Is it the epidemiologists' elusive 'fundamental cause' of social class inequalities in health? *Journal of Personality and Social Psychology*, *86*(1), 174–199.

Goudriaan, A. E., Grekin, E. R., & Sher, K. J. (2007). Decision making and binge drinking: A longitudinal study. *Alcoholism: Clinical and Experimental Research*, *31*(6), 928–938.

Goudriaan, A. E., Oosterlaan, J., & de Beurs, E. (2006). Neurocognitive functions in pathological gambling: a comparison with alcohol dependence, Tourette syndrome and normal controls. *Addiction*, *101*(4), 534–547.

Graffy, J., Grant, J., Boase, S., Ward, E., Wallace, P., Miller, J., et al. (2009). UK research staff perspectives on improving recruitment and retention to primary care research; nominal group exercise. *Family Practice*, *26*(1), 48–55.

Graham, K., Agnes, M., Andrée, D., & Jürgen, R. (2007). Does the association between alcohol consumption and depression depend on how they are measured? *Alcoholism: Clinical and Experimental Research, 31*(1), 78–88.

Grant, N., Wardle, J., & Steptoe, A. (2009). The relationship between life satisfaction and health behavior: a cross-cultural analysis of young adults. *International Journal of Behavioral Medicine*, *16*(3), 259–268.

Grzywacz, J. G., & Almeida, D. M. (2008). Stress and binge drinking: A daily process examination of stressor pile-up and socioeconomic status in affect regulation. *International Journal of Stress Management, 15*(4), 364–380.

Gunstad, J., R. H. Paul, et al. (2007). Elevated body mass index is associated with executive dysfunction in otherwise healthy adults. *Comprehensive Psychiatry, 48*(1), 57–61.

Haapea, M., Miettunen, J., Laara, E., Joukamaa, M. I., Jarvelin, M.-R., Isohanni, M. K., et al. (2008). Non-participation in a field survey with respect to psychiatric disorders. *Scandinavian Journal of Public Health*, *36*(7), 728–736.

Hakkinen, A., Rinne, M., Vasankari, T., Hakkinen, K., & Heikki, K. (2010). Association of physical fitness with health related quality of life in Finnish young men. *Health and Quality of Life Outcomes*, *8*(15). doi: 10.1186/1477-7525-8-15

Hakkinen, U., Jarvelin, M. R., Rosenqvist, G., & Laitinen, J. (2006). Health, schooling and lifestyle among young adults in Finland. *Health Economics*, *15*(11), 1201–1216.

Hakkinen, U., Jarvelin, M. R., et al. (2006). Health, schooling and lifestyle among young adults in Finland. *Health Economics, 15*(11), 1201–1216.

Hall, P. A., & Fong, G. T. (2003). The effects of a brief time perspective intervention for increasing physical activity among young adults. *Psychology & Health*, *18*(6), 685–706.

Hall, P. A., Dubin, J. A., Crossley, M., Holmqvist, M. E., & D'Arcy, C. (2009). Does executive function explain the IQ-mortality association? Evidence from the Canadian study on health and aging. *Psychosomatic Medicine, 71*(2), 196–204.

Hall, P. A., Elias, L. J., & Crossley, M. (2006). Neurocognitive influences on health behavior in a community sample. *Health Psychology*, *25*(6), 778–782.

Hall, P. A., Fong, G. T., Epp, L. J., & Elias, L. J. (2008). Executive function moderates the intention-behavior link for physical activity and dietary behavior. *Psychology & Health, 23*(3), 309–326.

Hall, P. A., J. A. Dubin, et al. (2009). Does executive function explain the IQ-mortality association? Evidence from the Canadian study on health and aging. *Psychosomatic Medicine, 71*(2), 196–204.

Hall, S. (2011, n.d.). Being creative can spark students' learning: Cover story. *Illawarra Mercury*, p. 22.

Hall, W. (1996). What have population surveys resealed about substance use disorders and their co-morbidity with other mental disorders? *Drug and Alcohol Review, 15*(157–170).

Hallal, P., Victora, C. G., Azevedo, M. R., Wells, J. (2006). Adolescent physical activity and health. *Sports Medicine, 36*(12),1019–1030.

Halm, E. A., Federman, A. D., Siu, A. L., Wolf, M. S., & Sano, M. (2009). Health literacy and cognitive performance in older adults. *Journal of the American Geriatrics Society, 57*(8), 1475–1480.

Hamer, M., Stamatakis, E., & Steptoe, A. (2009). Dose-response relationship between physical activity and mental health: the Scottish Health Survey. *British Journal of Sports Medicine, 43*(14), 1111–1114.

Hammond, C. (2003). How education makes us healthy. *London Review of Education, 1*(1), 61–78.

Hancock, L., Sanson-Fisher, R., Perkins, J., Girgis, A., Howley, P., & Schofield, M. (2001). The effect of a community action intervention on adolescent smoking rates in rural Australian towns: The CART Project. *Preventive Medicine*, *32*(4), 332–340.

Hanewinkel, R., Wewel, M., Stephan, C., Isensee, B., & Wiborg, G. (2006). Motivational interviewing of unemployed–Acceptance and effects of counselling to improve health-related behaviour. *Gesundheitswensen, 68*(4), 240–248.

Hassan, S. H. (2011). Managing conflicting values in functional food consumption: the Malaysian experience. *British Food Journal, 113*(8), 1045–1059.

Hassmén, P., Koivula, N., & Uutela, A. (2000). Physical exercise and psychological well-being: A population study in Finland. *Preventive Medicine*, *30*(1), 17–25.

Hawkins, N. A., Smith, T., Zhao, L., Rodriguez, J., Berkowitz, Z., & Stein, K. D. (2010). Health-related behavior change after cancer: results of the American cancer society's studies of cancer survivors (SCS). *Journal of Cancer Survivorship: Research and Practice, 4*(1), 20–32.

Hayman, L. L. (2010). Starting young: Promoting a healthy lifestyle with children. *Journal of Cardiovascular Nursing, 25*(3), 228–232.

Hayward, R. A., Smith, D. M., Kaplan, S. H., & Kerr, E. A. (2003). The Association between three different measures of health status and satisfaction among patients with diabetes. *Medical Care Research and Review, 60*(2), 158–177.

He, K., Kramer, E., Houser, R. F., Chomitz, V. R., & Hacker, K. A. (2004). Defining and understanding healthy lifestyles choices for adolescents. *Journal of Adolescent Health, 35*(1), 26–33.

Heaton, M. B., Israelsen, C. L., Eggett, D. L., & Clarke, M. C. (2005). The acquisition of family financial roles and responsibilities. *Family and Consumer Sciences Research Journal, 33*(4), 321–340.

Heikkinen, E. (2011). A life-course approach: research orientations and future challenges. *European Review of Aging and Physical Activity, 8*(1), 7–12.

Hemmingsson, T., Essen, J. V., Melin, B., Allebeck, P., & Lundberg, I. (2007). The association between cognitive ability measured at ages 18–20 and coronary heart disease in middle age among men: A prospective study using the Swedish 1969 conscription cohort. *Social Science & Medicine, 65*(7), 1410–1419.

Hewitt, B., Baxter, J., & Western, M. (2006). Family, work and health: The impact of marriage, parenthood and employment on self-reported health of Australian men and women. *Journal of Sociology, 42*(1), 61–78.

Ho, R., Davidson, G., & Ghea, V. (2005). Motives for the adoption of protective health behaviours for men and women: An evaluation of the psychosocial-appraisal health model. *Journal of Health Psychology, 10*(3), 373–395.

Hoaken, P. N. S. (2003). Executive cognitive function, alcohol intoxication, and aggressive behaviour in adult men and women. *Dissertation Abstracts International: Section B: The Sciences and Engineering.* US, ProQuest Information & Learning. 64: 403–403.

Hoelzle, J. B. (2008). *Neuropsychological assessment and the Cattell-Horn-Carroll (CHC) cognitive abilities model* (Unpublished Dissertation/Thesis). University of Toledo, Ohio.

Holden, C. A., Jolley, D. J., McLachlan, R. I., Pitts, M., Cumming, R., Wittert, G., et al. (2006). Men in Australia Telephone Survey (MATeS): Predictors of men's help-seeking behaviour for reproductive health disorders. *Medical Journal of Australia, 185*(8), 418–422.

Holmila, M., & Raitasalo, K. (2005). Gender differences in drinking, why do they still exist? *Addiction (Abingdon, England) 100*(12),1763–1769.

Holter, A (2007). Men's work and family reconciliation in Europe. *Men and Masculinities, 9*(4), 425–456.

Gonzalez, R., Bechara, A., & Martin, E. M. (2007). Executive functions among individuals with methamphetamine or alcohol as drugs of choice: Preliminary observations. *Journal of Clinical and Experimental Neuropsychology, 29*(2), 155–159.

Henry, L. (2012). Executive functioning in children with specific language impairment. *Journal of Child Psychology & Psychiatry, 53*(1), 37–45.

Howard, J. P. (1988). The Theory of Planned Behavior and C.O.P.D. Smoking Behavior. (PhD. Thesis). University of Massachusetts at Amherst.

Howard, P., Fiona, M., & Judith, A. (1998). Rethinking young people's drug use. *Health Education, 98*(5), 164–172.

Hugh, M. (2001). Australia at a turning point. *Lutheran Theological Journal, 35*(3), 99.

Hughes, D. L., & Bryan, J. (2002). Adult age differences in strategy use during verbal fluency performance. *Journal of Clinical & Experimental Neuropsychology, 24*(5), 642.

Huizinga, M., Dolan, C. V., & van der Molen, M. W. (2006). Age-related change in executive function: Developmental trends and a latent variable analysis. *Neuropsychologia, 44*(11), 2017–2036.

Hulleman, C. S., Schrager, S. M., Bodmann, S. M., & Harackiewicz, J. M. (2010). A meta-analytic review of achievement goal measures: Different labels for the same constructs or different constructs with similar labels? *Psychological Bulletin, 136*(3), 422–449.

Hultsch, D. F., Hammer, M., & Small, B. J. (1993). Age differences in cognitive performance in later life: relationships to self-reported health and activity life style. *Journal of Gerontology, 48*(1), 1–11.

Hutchison, A. J., Breckon, J. D., & Johnston, L. H. (2009). Physical activity behavior change interventions based on the transtheoretical model: A systematic review. *Health Education & Behavior, 36*(5), 829–845.

Hyler, S. E. (1994). *Personality Diagnostic Questionnaire (PDO-4).* New York: State Psychiatric Institute.

IAC search and media (2011). *What makes a good questionnaire?* Retrieved from http://uk.ask.com/wiki/Questionnaire_construction

Ilomaki, J., Korhonen, M. J., Lavikainen, P., Lipton, R., Enlund, H., & Kauhanen, J. (2009). Changes in alcohol consumption and drinking patterns during 11 years of follow-up among ageing men: The FinDrink study. *European Journal of Public Health, 20*(2), 133–138.

Institute of Medicine (2004). *Health literacy: A prescription to end confusion.* Washington DC: National Academic Press.

Irwin, C. E., Jr. (2010). Young adults are worse off than adolescents. *Journal of Adolescent Health, 46*(5), 405–406.

Ishihara, S. (2008). *Ishihara's tests for colour deficiency–concise edition*. Tokyo, Japan: Kanehara Trading Inc.

Ishikawa, H., & Yano, E. (2008). Patient health literacy and participation in the health-care process. *Health Expectations, 11*(2), 113–122.

Iverson, G., & Lange, R. (2011). Mild traumatic brain injury. *The Little Black Book of Neuropsychology* (pp. 697–719). Boston, MA: Springer.

Jack, L., Jack, N. H., & Hayes, S. (2012). Social determinants of health in minority populations: A call for multidisciplinary approaches to eliminate diabetes-related health disparities. *Diabetes Spectrum, 25*(1), 9–13.

Jackson, J. J., Bogg, T., Walton, K. E., Wood, D., Harms, P. D., Lodi-Smith, J., et al. (2009). Not all conscientiousness scales change alike: A multi-method, multi-sample study of age differences in the facets of conscientiousness. *Journal of Personality and Social Psychology*, *96*(2), 446–459

Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Perrig, W. J. (2008). Improving fluid intelligence with training on working memory. *Proceedings of the National Academy of Sciences*, *105*(19), 6829–6833.

James, W. P. T., & David, W. H. (2005). Obesity. *The Lancet*, *366*(9492), 1197.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big-Five Trait Taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). New York, NY: Guilford Press.

John, O. P. and S. Srivastava (1999). The Big Five trait taxonomy: History, measurement and theoretical perspectives. *Handbook of personality: Theory and research*. L. A. Pervin and O. P. John. New York, Guilford Press: 102 - 138.

Johnson, A. M., Dale, A. M., Strickland, J. R., Venditti, P., & Evanoff, B. A. (2008). Employers' concerns regarding research participation. *International Journal of Occupational and Environmental Health*, *14*(1), 11–17.

Jones, R. A., Steeves, R., & Williams, I. (2009). Strategies for recruiting African American men into prostate cancer screening studies. *Nursing Research*, *58*(6), 452–456.

Jordan, J. E., Buchbinder, R., & Osborne, R. H. (2010). Conceptualising health literacy from the patient perspective. *Patient Education and Counseling*, *79*(1), 36–42.

Jordan, J. E., Osborne, R. H., & Buchbinder, R. (2010). Critical appraisal of health literacy indices revealed variable underlying constructs, narrow content and psychometric weaknesses. *Journal of Clinical Epidemiology, 64,* 366–379.

Jorm, A. F. K., A.E. Jacomb, P.A. Christensen, H. Rodgers, B. Pollitt, P. (1997). Mental health literacy": A survey of the public's ability to recognise mental disorders and their beliefs about the effectiveness of treatment. *Medical Journal of Australia, 166,* 182–186.

Jorm, A. F., & Butterworth, P. (2006). Changes in psychological distress in Australia over an 8-year period: evidence for worsening in young men. *Australian and New Zealand Journal of Psychiatry, 40*(1), 47–50.

Jorm, A. F., Anstey, K. J., Christensen, H., & Rodgers, B. (2004). Gender differences in cognitive abilities: The mediating role of health state and health habits. *Intelligence, 32*(1), 7–23.

Jorm, A. F., Windsor, T. D., Dear, K. B. G., Anstey, K. J., Christensen, H., & Rodgers, B. (2005). Age group differences in psychological distress: the role of psychosocial risk factors that vary with age. *Psychological Medicine, 35*(9), 1253–1263.

Jurado, M., & Rosselli, M. (2007). The elusive nature of executive functions: A review of our current understanding. *Neuropsychology Review, 17*(3), 213–233.

Kaplan, H. B. (2007). Self-referent constructs and medical sociology: In search of an integrative framework. *Journal of Health and Social Behavior, 48*(2), 99–114.

Kasl, S. V., & Cobb, S. (1970). Health behavior, illness behaviour and sick role behavior. *Archives of Environmental Health, 12,* 246–266.

Kaye, W., & Wendy, M. (2000). Evaluating mass media approaches to health promotion: a review of methods. *Health Education, 100*(1), 23–32.

Kelly, B. C., Wells, B. E., & Parsons, J. T. (2006). Prevalence and predictors of club drug use among club-going young adults in New York City. *Journal of Urban Health*, *83*(5), 884–895.

Kelly, S., Small, L., Mays, M., Melnyk, B. M., Jacobson, D., & O'Haver, J. (2008). Promoting healthy lifestyle behaviors in culturally diverse adolescents: Freshman 5 to Thrive/COPE Healthy Lifestyles. *Communicating Nursing Research*, *41*, 306–306.

Kerlinger, F. N. (1986). *Foundations of behavioral research* (3rd ed.). Austin, TX: Holt, Rinehart & Winston.

Kerr, W. C., Greenfield, T. K., Bond, J., Ye, Y., & Rehm, J. (2009). Age period cohort modelling of alcohol volume and heavy drinking days in the US National Alcohol Surveys: divergence in younger and older adult trends. *Addiction*, 104(1), 27–37.

Kerr, W. C., & Stockwell, T. I. M. (2012). Understanding standard drinks and drinking guidelines. *Drug and Alcohol Review*, *31*(2), 200–205.

Kessler, R., & Mroczek, D. (1994). *Final versions of our nonspecific psychological distress scale.* Ann Arbor, MI: University of Michigan Press.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S., et al. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, *32*(6), 959–976.

Khaw, K.-T., Wareham, N., et al. (2008). Combined impact of health behaviours and mortality in men and women: The EPIC-Norfolk prospective population study. *PLoS Medicine*, *5*(January 1), e12.

Kilkkinen, A., Kao-Philpot, A., O'Neil, A., Philpot, B., Reddy, P., Bunker, S., et al. (2007). Prevalence of psychological distress, anxiety and depression in rural communities in Australia. *Australian Journal of Rural Health, 15*(2), 114–119.

Kim, S. H. (2009). Health literacy and functional health status in Korean older adults. *Journal of Clinical Nursing*, *18*(16), 2337–2343.

King, K. M., & Chassin, L. (2004). Mediating and moderated effects of adolescent behavioral undercontrol and parenting in the prediction of drug use disorders in emerging adulthood. *Psychology of Addictive Behaviors*, *18*(3), 239–249.

Kirkcaldy, B., Furnham, A., & Siefen, G. (2004). The relationship between health efficacy, educational attainment, and well-being among 30 nations. *European Psychologist*, *9*(2), 107–119.

Kirscht, J. P. (1983). Preventative health behaviour: A review of research and issues. *Health Psychology*, *2*(3), 277–301.

Kiviniemi, M. T., Voss-Humke, A. M., et al. (2007). How do I feel about the behavior? The interplay of affective associations with behaviors and cognitive beliefs as influences on physical activity behavior. *Health Psychology*, *26*(2), 152–158.

Klenberg, L., Korkman, M., & Lahti-Nuuttila, P. (2001). Differential development of attention and executive functions in 3- to 12-year-old Finnish children. *Developmental Neuropsychology*, *20*(1), 407–428.

Kliegel, M., Mackinlay, R., & Jaeger, T. (2008). Complex prospective memory: Development across the lifespan and the role of task interruption. *Developmental Psychology*, *44*(2), 612–617.

Knofczynski, G. T., & Mundfrom, D. (2008). Sample sizes when using multiple linear regression for prediction. *Educational and Psychological Measurement*, *68*(3), 431–442.

Knutson, K. L., Spiegel, K., Penev, P., & Van Cauter, E. (2007). The metabolic consequences of sleep deprivation. *Sleep Medicine Reviews, 11*(3), 163–178.

Kottner, J., Audige, L., Brorson, S., Donner, A., Gajewski, B., Hrobjartsson, A. Roberts, C., Shoukri, M., & Streiner, D. (2011). Guidelines for reporting reliability and agreement studies (GRRAS) were proposed. *International Journal of Nursing Studies, 48*(6), 661–671.

Kraemer, H., Stice, E., Kazdin, A., Offord, D., & Kupfer, D. (2001). How do risk factors work together? Mediators, moderators, and independent, overlapping, and proxy risk factors. *The American Journal of Psychiatry*, *158*(6), 848–856.

Kraus, K. B. (1995). Attitudes and the prediction of behavior: A meta-analysis of the empirical literature. *Personality and Social Psychology Bulletin*, *21*, 58–75.

Kraus, M. W, Piff, P. K., & Keltner, D. (2009). *Social class, sense of control and social explanation*. *Journal of Personality and Social Psychology, 97*(6), 992–1004.

Kripalani, S., & Weiss, B. D. (2006). Teaching about health literacy and clear communication. *Journal of General Internal Medicine, 21*(8), 888–890.

Kristiansen, C. M. (1985). Value correlates of preventative health behaviour. *Journal of Personality and Social Psychology*, *49*, 748–758.

Kropp, F., Lavack, A. M., Silvera, D. H., & Gabler, J. R. (2004). Alcohol consumption among university students: A multi-country study of attitudes, values, identity, and consumer influence. *Journal of Nonprofit & Public Sector Marketing*, *12*(2), 1–28.

Kruglanski, A. W., Thompson, E. P., Higgins, E. T., Atash, M. N., Pierro, A., Shah, J. H., et al. (2000). To 'do the right thing' or just do it': Locomotion and assessment as distinct self-regulatory imperatives. *Journal of Personality and Social Psychology, 79*, 793–815.

Kubzansky, L. D., Martin, L. T., & Buka, S. L. (2009). Early manifestations of personality and adult health: A life-course perspective. *Health Psychology, 28*(3), 364–372.

Kuriyama, K., Mishima, K., Suzuki, H., Aritake, S., & Uchiyama, M. (2008). Sleep Accelerates the Improvement in Working Memory Performance. *Journal of Neuroscience, 28*(40), 10145–10150.

Kutner, M., Greenberg, E., Jin, Y., & Paulsen, C. (2006). *The health literacy of America's adults: Results from the 2003 National Assessment of Adult Literacy*. Washington, DC: National Center for Education Statistics.

Kvaavik, E., Batty, G. D., Ursin, G., Huxley, R., & Gale, C. R. (2010). Influence of individual and combined health behaviors on total and cause-specific mortality in men and women: The United Kingdom Health and Lifestyle Survey. *Archives of Internal Medicine, 170*(8), 711–718.

Kwakkel, G., Kollen, B., & Twisk, J. (2006). Impact of time on improvement of outcome after stroke. *Stroke, 37*(9), 2348–2353.

Laaksonen, M., Prattala, R., & Lahelma, E. (2003). Sociodemographic determinants of multiple unhealthy behaviours. *Scandinavian Journal of Public Health, 31*(1), 37–43.

La Rosa, F. (1985). BASIC program for cluster analysis in numerical taxonomy. *Rivista di Statistica, 18*, 223–228.

Lachman, M. E. (2006). Perceived control over aging-related declines: Adaptive beliefs and behaviors. *Current Directions in Psychological Science, 15*(6), 282–286.

Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology, 74*(3), 763–773.

Landis, R. S., Beal, D. J., & Tesluk, P. E. (2000). A comparison of approaches to forming composite measures in structural equation models. *Organizational Research Methods, 3*(2), 186–207.

Langenecker, S. A., & Nielson, K. A. (2003). Frontal recruitment during response inhibition in older adults replicated with fMRI. *NeuroImage, 20*(2), 1384.

Larstone, R. M., Jang, K. L., Livesley, W. J., Vernon, P. A., & Wolf, H. (2002). The relationship between Eysenck's P-E-N model of personality, the five-factor model of personality, and traits delineating personality dysfunction. *Personality and Individual Differences*, *33*(1), 25–37.

Lau, R. R. (1982). The origins of health sense of control beliefs. *Journal of Personality and Social Psychology*, *43*, 322–334.

Lau, R. R., & Ware, J. W. (1981). The conceptualization and measurement of a multidimensional health specific sense of control scale. *Medical Care*, *19*, 1147–1158.

Lau, R. R., Hartman, K. A., & Ware, J. E. J. (1986). Health as a value: Methodological and theoretical considerations. *Health Psychology*, *5*(1), 25–43.

Leddy, J., Sandhu, H., Sodhi, V., Baker, J., & Willer, B. (2012). Rehabilitation of concussion and post-concussion syndrome. *Sports Health: A Multidisciplinary Approach,* 4(2), 147–154.

Lee, S. P., Cornwell, T. B., & Babiak, K. (2012). Developing an instrument to measure the social impact of sport: Social capital, collective identities, health literacy, well-being and human capital. *Journal of Sport Management, 27*(1), 24–42.

Leibel, R. L., Rosenbaum, M., & Hirsch, J. (1997). Obesity. *New England Journal of Medicine*, *337*(6), 396–407.

Levant, R. F., Wimer, D. J., Williams, C. M., Smalley, K. B., & Noronha, D. (2009). The relationships between masculinity variables, health risk behaviors and attitudes toward seeking psychological help. *International Journal of Men's Health*, *8*(1), 3–21.

Levack, W. M. M., Taylor, K., Siegert, R. J., Dean, S. G., McPherson, K. M., & Weatherall, M. (2006). Is goal planning in rehabilitation effective? A systematic review. *Clinical Rehabilitation, 20*(9), 739–755.

Levinthal, B. R., Morrow, D. G., Wanzhu, T., Jingwei, W., & Murray, M. D. (2008). Cognition and health literacy in patients with hypertension. *Journal of General Internal Medicine*, *23*(8), 1172–1176.

Leventhal, Howard, Weinman, J., Leventhal, E.A. & Phillips L. (2008). Health psychology: The Search for pathways between behavior and health. *Annual Review of Psychology*, 59, 477–505.

Lezak, M. D. (1983). *Neuropsychological assessment* (2nd ed.). New York: Oxford University Press.

Lezak, M. D., Howieson, D. B., Loring, D. W., Hannay, H. J., & Fischer, J. S. (2004). *Neuropsychological assessment* (4th ed.). New York, NY: Oxford University Press.

Ling, P. M., Neilands, T. B., & Glantz, S. A. (2009). Young adult smoking behavior: A national survey. *American Journal of Preventive Medicine*, *36*(5), 389–394. e382.

Link, M. W., & Mokdad, A. H. (2005). Alternative modes for *health* surveillance surveys: An experiment with web, mail, and telephone. *Epidemiology, 16*(5), 701–704

Lis, S., Krieger, S., Hennig, D., Roder, C., Kirsch, P., Seeger, W., et al. (2008). Executive functions and cognitive subprocesses in patients with obstructive sleep apnoea. *Journal of Sleep Research, 17*(3), 271–280.

Llewellyn, D. J., Lang, I. A., Langa, K. M., & Huppert, F. A. (2008). Cognitive function and psychological well-being: Findings from a population-based cohort. *Age & Ageing*, *37*(6), 685–689.

Lorig, K. (2010). Chronic disease self-management: From randomized trial to public policy. *European Journal of Public Health*, *20*, 6–7.

Lorig, K. R., Ritter, P., Stewart, A. L., Sobel, D. S., William Brown, B., Bandura, A., et al. (2001). Chronic disease self-management program. *Medical Care, 39*(11), 1217–1223.

Louise, N. (2005). Waist-to-hip ratio vs BMI. *GP*, 48.

Lu, N., Samuels, M. E., & Kuo-Cherh, H. (2002). Dietary behavior in relation to socioeconomic characteristics and self perceived health status. *Journal of Health Care for the Poor and Underserved*, *13*(2), 241–257.

Lustig, C., Hasher, L., & Tonev, S. T. (2001). Inhibitory control over the present and the past. *European Journal of Cognitive Psychology*, *13*(1), 107–122.

Luszczynska, A., Kiehl, M., Gutierrez-Dona, B., Kuusinen, P., & Schwarzer, R. (2004). Measuring one component of dispositional self-regulation: attention control in goal pursuit. *Personality and Individual Differences, 37*, 555–566.

Lynch, J. W., Kaplan, G. A., & Salonen, J. T. (1997). Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic life-courselife-course. *Social Science & Medicine, 44*(6), 809–819.

Macek, M. D., Haynes, D., Wells, W., Bauer-Leffler, S., Cotten, P. A., & Parker, R. M. (2010). Measuring conceptual health knowledge in the context of oral health literacy: preliminary results. *Journal of Public Health Dentistry, 70*(3), 197–204.

Macintyre, S., Hunt, K., & Sweeting, H. (1996). Gender differences in health: are things really as simple as they seem? *Social Science and Medicine, 42*(4), 617–624.

Mackinnon, A., & Christensen, H. (2007). An investigation of the measurement properties of the Spot-the-Word test in a community sample. *Psychological Assessment, 19*(4), 459–468.

MacLeod, C. M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin, 109*, 163–203.

MacLeod, C. M., Dodd, M. D., Sheard, E. D., Wilson, D. E., & Bibi, U. (2003). In opposition to inhibition. In B. H. Ross (Ed.), *The psychology of learning and motivation* (Vol. 43; pp. 163–168). San Diego, CA: Academic Press.

MacPherson, S. E., Phillips, L. H., et al. (2002). Age, executive function and social decision making: A dorsolateral prefrontal theory of cognitive aging. *Psychology and Aging, 17*(4), 598–609.

Mahalik, J. R., Burns, S. M., & Syzdek, M. (2007). Masculinity and perceived normative health behaviors as predictors of men's health behaviors. *Social Science & Medicine, 64*(11), 2201–2209.

Malcher, G. (2009). Engaging men in health care. *Australian Family Physician, 38*(3), 92–95.

Mancuso, C. A., & Rincon, M. (2006). Impact of health literacy on longitudinal asthma outcomes. *Journal of General Internal Medicine, 21*(8), 813–817.

Mancuso, J. M. (2009). Assessment and measurement of health literacy: An integrative review of the literature. *Nursing & Health Sciences*, *11*(1), 77–89.

Manganello, J. A. (2008). Health literacy and adolescents: a framework and agenda for future research. *Health Education Research*, *23*(5), 840–847.

Marmot, M. G. (2010, April 27). *Beyond evidence and health inequalities: what works, why and how*. Seminar lecture presented at the Australian Health Inequalities Program (AHIP) in Adelaide, Australia.

Markkanen, P., Hartman, C., Li, Y., Barbeau, E. M., Calderon, P., Levenstein, C., et al. (2006). Results of a union-based smoking cessation intervention for apprentice iron workers (United States). *Cancer Causes & Control*, *17*(1), 53–61.

Martin, S., Haren, M., Middleton, S., Wittert, G., (2007). The Florey Adelaide Male Ageing Study (FAMAS): Design, procedures & participants. *BMC Public Health*, *7*(1), 126.

Martinez-Martin, P. (2010). Composite rating scales. *Journal of the Neurological Sciences*, *289*(1), 7–11.

Massoglia, M. Â., & Uggen, C. Â. (2010). Settling down and aging out: Toward an interactionist theory of desistance and the transition to adulthood. *American Journal of Sociology*, *116*(2), 543–582.

Mathers, C., Vos, E., Stevenson, C., & Begg, S. (2001). The burden of disease and injury in Australia. *Bulletin of the World Health Organization*, *79*(11), 1076–1084.

Matute, E., Rosselli, M., Ardila, A., & Morales, G. (2004). Verbal and nonverbal fluency in Spanish-speaking children. *Developmental Neuropsychology*, *26*(2), 647–660.

Maxwell, S. E. (2000). Sample size and multiple regression analysis. *Psychological Methods, 5*(4), 434–458.

McCarty, C. A., Herrenkohl, T. I., McCauley, E., Kosterman, R., Mason, W. A., Hawkins, J. D., et al. (2009). Longitudinal associations among depression, obesity and alcohol use disorders in young adulthood. *General Hospital Psychiatry, 31*(5), 442–450.

McCaul, K. D., Sandgren, A. K., O'Neill, H. K., & Hinsz, V. B. (1993). The value of the theory of planned behavior, perceived control, and self-efficacy expectations for predicting health-protective behaviors. *Basic & Applied Social Psychology, 14*(2), 231–252.

McClelland, G. H., & Judd, C. M. (1993). Statistical difficulties of detecting interactions and moderator effects. *Psychological Bulletin, 114*(2), 376–390.

McCracken, M., Jiles, R., et al. (2007). Health behaviors of the young adult U.S. population: Behavioural risk factor surveillance system, 2003. *Public Health Research, Practice and Policy,* 4(2), A25.

McDonough, C. (2009). Health status measurement, construct validity. In M. Kattan (Ed.), *Encyclopedia of medical decision making* (pp. 561–564). Thousand Oaks, CA: SAGE.

McGrew, K. S. (2009). Editorial: CHC theory and the human cognitive abilities project: Standing on the shoulders of the giants of psychometric intelligence research. *Intelligence, 37,* 1–10.

McGrew, K. S. (2010, October). *Pushing the edge of the contemporary cognitive (CHC) theory: New directions for neuropsychologists.* Paper presented at 16th Annual APS College of Neuropsychologists Conference. Notre Dame University, Freemantle, WA.

McKenzie, J. F., Neiger, B. L., & Thackeray, R. (2009). *Health promotion programs* (5th ed.). San Francisco, CA: Pearson Benjamin Cummings.

Melchior, M., Chastang, J.-F., Goldberg, P., & Fombonne, E. (2008). High prevalence rates of tobacco, alcohol and drug use in adolescents and young adults in France: Results from the GAZEL Youth study. *Addictive Behaviors*, *33*(1), 122–133.

Meng, L., Maskarinec, G., Lee, J., & Kolonel, L. N. (1999). Lifestyle factors and chronic diseases: Application of a composite risk index. *Preventive Medicine*, *29*(4), 296–304.

Merline, A., Jager, J., & Schulenberg, J. E. (2008). Adolescent risk factors for adult alcohol use and abuse: Stability and change of predictive value across early and middle adulthood. *Addiction*, *103*(s1), 84–99.

Mesters, I. (2009). Motivational interviewing: hype or hope? *Chronic Illness*, *5*(1), 3–6.

Meyer, B. J. F., Talbot, A. P., & Ranalli, C. (2007). Why older adults make more immediate treatment decisions about cancer than younger adults. *Psychology and Aging*, *22*(3), 505–524.

Michaud, P.-A., Rodondi, P.-Y., & Narring, F. O. (2000). Drinking behaviour among teenagers in Switzerland and correlation with lifestyles. *European Journal of Pediatrics*, *159*(8), 602–607.

Mielewczyk, F., & Willig, C. (2007). Old clothes and an older look: The case for a radical makeover in health behaviour research. *Theory & Psychology*, *17*(6), 811–837.

Miles, D. (2011). Rollout approaches for young adult TRICARE enrolment. (Around the Fleet). *All Hands* (1130), 9.

Milfont, T. L., Duckitt, J., & Wagner, C. (2010). A cross-cultural test of the Value–Attitude–Behavior Hierarchy. *Journal of Applied Social Psychology, 40*(11), 2791–2813.

Miller, C. H., & Quick, B. L. (2010). Sensation seeking and psychological reactance as health risk predictors for an emerging adult population. *Health Communication, 25*(3), 266–275.

Milligan, R. A. K., Burke, V., Beilin, J., Richards, D., Dunbar, D., Spencer, M., et al. (1997). Health-related behaviours and psycho-social characteristics of 18-year-old Australians. *Social Science & Medicine, 45*(10), 1549–1562.

Mitrushina, M. N., Schinka, J. A., et al. (1999). *Handbook of normative data for neurpsychological assessment.* New York, NY: University Press.

Miyake, A., Friedman, N., Emerson, M., Witzki, A., & Howerter, A. (2000). The unity and diversity of executive functions and their contributions to complex frontal lobe tasks: a latent variable analysis. *Cognitive Psychology, 41*, 49–100.

Modig-Wennerstad, K., Silventoinen, K., Batty, D., Tinelius, P., & Bergman, L. (2008). Association between offspring intelligence and parental mortality: A population based cohort study of one million Swedish men and their parents. *Journal of Epidemiology Community Health, 62*, 722–727.

Mokdad, A. H. (2009). The behavioral risk factors surveillance system: Past, present, and future. *Annual Review of Public Health, 30*(1), 43–54.

Mokdad, A. H., Bowman, B. A., Ford, E. S., Vinicor, F., Marks, J. S., & Koplan, J. P. (2001). The continuing epidemics of obesity and diabetes in the United States. *JAMA, 286*(10), 1195–1200.

Morgan, A. B., Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review, 20*(1), 113–136.

Moriyama, Y., Muramatsu, T., Kato, M., Mimura, M., & Kashima, H. (2006). Family history of alcoholism and cognitive recovery in subacute withdrawal. *Psychiatry & Clinical Neurosciences, 60*(1), 85–89.

Mortensen, E. L., Jensen, H. H., Sanders, S. A., & Reinisch, J. M. (2001). Better psychological functioning and higher social status may largely explain the apparent health benefits of wine: A study of wine and beer drinking in young Danish adults. *Archives of Internal Medicine, 161*(15), 1844–1848.

Mulder, C., Clark, W., & Wagner, M. (2002). A comparative analysis of leaving home in the United States, the Netherlands and West Germany. *Demographic Research, 17*(17), 565–592.

Mullen, K., Watson, J., Swift, J., & Black, D. (2007). Young men, masculinity and alcohol. *Drugs: Education, Prevention, and Policy, 14*(2), 151–165.

Mulligan, M. E. (2008). *Effects of motivational interviewing on college age smokers.* (PhD. Thesis). Hofstra University.

Munley, G. (1999). Gender differences in health check attendance and intention in young adults and application of the health belief model. *Behavior Change, 16*(4), 237–245.

Muhammad, A., & Gagnon, A. (2010). Why should men and women marry and have children? Parenthood, marital status and self-perceived stress among Canadians. *Journal of Health Psychology, 15*(3), 315–325.

National Advisory Committee on Oral Health (NACOH) (2004). Healthy mouths healthy lives: Australia's national oral health plan 2004–2013'**.** Adelaide: South Australian Department of Health. Retrieved from http//www.health.sa.gov.au.

Naksidil Torun-Yazihan, H. (2007). Neuropsychological profiles in levels of obstructive sleep apnea–hypopnea syndrome. *Sleep and Biological Rhythms,* 5(2), 85–94.

National Health and Medical Research Council. (2001). *Australian alcohol guidelines: Health risks and benefits*. Canberra, Australia: Author.

National Health and Medical Research Council. (2005). *Dietary guidelines for Australians: A guide to healthy eating.* Canberra, Australia: Department of Health and Ageing.

National Health and Medical Research Council. (2007). *National statement on ethical conduct in human research.* Canberra, Australia: Author.

National Health and Medical Research Council. (2009). *Australian guidelines to reduce health risks from drinking alcohol*. Canberra, Australia: Attorney Generals Department, Commonwealth of Australia. http://www.alcohol.gov.au/internet/alcohol/publishing.nsf/Content/everyone.

National Transport Commission. (2006, August). *The Kessler Psychological Distress Scale (K10): Fact Sheet.* National Standard for Health Assessment of Rail Safety Workers. Retrieved from http://www.ntc.gov.au/filemedia/bulletins/RAILKesslerFactSheetAug2006.pdf

Neisser, U., Boodoo, G., Bouchard, T. J., Jr., Boykin, A. W., Brody, N., Ceci, S. J., et al. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77–101.

Nelson, D. E., Holtzman, D., Bolen, J., Stanwych, C. A., & Mack, K. A. (2001). Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *International Journal of Public Health*, *46*(Suppl 1), 1–42.

Nelson, H. E. (1976). A modified card sorting test sensitive to frontal lobe defects. *Cortex, 12*(4), 313–324.

Netz, Y., & R. Tomer,. (2007). The effect of a single aerobic training session on cognitive flexibility in late middle-aged adults. *International Journal of Sports Medicine, 28*(1), 82–87.

Newman, J. C., Jarlais, D. J., Turner, C. F., Gribble, J., Cooley, P., Paone, P. (2002). The differential effects of face-to-face and computer interview modes. *American Journal of Public Health, 92*(2), 294–297.

Nicholls, W. L. (1983). CATI Research and Development at the Census Bureau. *Sociological Methods & Research, 12*(2), 191–197.

Noar, S. M., Chabot, M., & Zimmerman, R. S. (2008). Applying health behavior theory to multiple behavior change: Considerations and approaches. *Preventive Medicine, 46*(3), 275–280.

Norfleet, J. (2007). *Teaching the male brain: How boys think, feel, and learn in school*. Thousand Oaks, CA: Corwin Press.

Norman, P., & Conner, M. (2007). Predicting and changing health behaviours: Future directions. In M. Conner & P. Norman (Eds.), *Predicting health behaviour* (pp. 324-372). New York: Open University Press.

Norris, G., & Tate, R. L. (2000). The Behavioural assessment of the dysexecutive syndrome (BADS): Ecological, concurrent and construct validity. *Neuropsychological Rehabilitation, 10*(1), 33–45.

Nosek, B. A., & Banaji. M. R. (2001). The go/no-go association task. *Social Cognition,* 19(6), 625–664. Retrieved from http://www.buyologyinc.com/latency_white_paper.pdf

Nurss, J., Parker, R., & Baker, D. (2001). *TOFHLA Test of Functional Health Literacy in Adults* (2nd ed.). Snow Camp, NC: Peppercorn Books and Press Inc.

Nutbeam, D. (1998). Health promotion glossary. *Health Promotion International*, *13*(4), 349–364.

Nutbeam, D. (2000). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*, *16*(8), 259–267.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine*, *67*(12), 2072–2078.

Nutbeam, D., & Kickbusch, I. (2000). Advancing health literacy: a global challenge for the 21st century. *Health Promotion International*, *15*(3), 183–184.

O'Brien, R., Hunt, K., & Hart, G. (2005). It's caveman stuff, but that is to a certain extent how guys still operate': Men's accounts of masculinity and help seeking. *Social Science & Medicine*, *61*(3), 503–516.

O'Brien, R., Hunt, K., & Hart, G. (2009). 'The average Scottish man has a cigarette hanging out of his mouth, lying there with a portion of chips': Prospects for change in Scottish men's constructions of masculinity and their health-related beliefs and behaviours. *Critical Public Health*, *19*(3–4), 363–381.

O'Donnell, M. P. (2009). Definition of health promotion 2.0: Embracing passion, enhancing motivation, recognizing dynamic balance, and creating opportunities. *American Journal of Health Promotion*, *24*(1), iv–iv.

Ohayon, M. M. (2005). Prevalence and correlates of nonrestorative sleep complaints. *Arch Internal Medicine, 165*(1), 35–41.

Okie, S. (2007). The employer as health coach. *The New England Journal of Medicine, 357*(15), 1465–1469.

Oliffe, J. L., Kelly, M. T., Johnson, J. L., Bottorff, J. L., Gray, R. E., Ogrodniczuk, J. S., (2010). Masculinities and college men's depression: Recursive relationships. *Health Sociology Review, 19*(4), 465–477.

Osborn, C. Y., Weiss, B. D., Davis, T. C., Skripkauskas, S., Rodrigue, C., Bass L., et al. (2007). Measuring adult literacy in health care: Performance of the Newest Vital Sign. *American Journal of Health Behavior, 31*, S36–S46.

O'Sullivan, L. F., Gutnik, L. A., Yoskowitz, N. A., Patel, V. L., & Kaufman, D. R. (2006). Patterns of reasoning and decision making about condom use by urban college students. *AIDS Care, 18*(8), 918–930.

Paasche-Orlow, M., & Wolf, M. (2008). Evidence does not support clinical screening of literacy. *Journal of General Internal Medicine, 23*(1), 100–102.

Palm, J. (2007). Women and men same problems, different treatment. *International Journal of Social Welfare, 16*(1), 18–31.

Parekh, S., King, D., Owen, N., & Jamrozik, K. (2009). Spousal condordance on diet and lifestyle. *Australian and New Zealand Journal of Public Health, 33*(4), 320–324.

Partida, Y. (2012). Language and health care. *Diabetes Spectrum, 25*(1), 19–22.

Park, M. J., & Breland, D. (2007). Alcohol and cigarette use among adolescent and young adult males. *American Journal of Men's Health, 1*(4), 339–346.

Park, M. J., Mulye, T., Adams, S. H., Brindis, C. D., & Irwin, J. C. E. (2006). The health status of young adults in the United States. *Journal of Adolescent Health, 39*(3), 305–317.

Parker, A. M., & Fischhoff, B. (2005). Decision making competence: External validation through an individual differences approach. *Journal of Behavioral Decision Making, 18*(1), 1–27.

Parker, R. M., & Kindig, D. A. (2006). Beyond the Institute of Medicine Health Literacy Report are the recommendations being taken seriously? *Journal of General Internal Medicine, 21*(8), 891–892.

Parker, R. M., Baker, D. W., Williams, M. V., & Nurss, J. R. (1995). The test of functional health literacy in adults: A new instrument for measuring patients' literacy skills. *Journal of General Internal Medicine, 10,* 537–541.

Parmet, S., Lynm, C., & Glass, R. M. (2004). Weight Gain and diabetes. *JAMA: The Journal of the American Medical Association,* 292(8), 998.

Partida, Y. (2012). Language and health care. *Diabetes Spectrum, 25*(1), 19–22.

Pasupathi, P., Bakthavathsalam, G., Rao, Y. Y., & Farook, J. (2009). Cigarette smoking-Effect of metabolic health risk: A review. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews, 3*(2), 120–127

Patel, V. L., Gutnik, L. A., Yoskowitz, N. A., O'Sullivan, L. F., & Kaufman, D. R. (2006). Patterns of reasoning and decision making about condom use by urban college students. *AIDS Care, 18*(8), 918–930.

Paterson, B. L. (2001). The shifting perspectives model of chronic illness. *Journal of Nursing Scholarship, 33*(1), 21–26.

Patock-Peckham, J. A., Cheong, J. W., Balhorn, M. E., & Nagoshi, C. T. (2001). A social learning perspective: A model of parenting styles, self-regulation,

perceived drinking control and alcohol use and problems. *Alcoholism: Clinical and Experimental Research, 25,* 1284–1292.

Patricelli, R. E., & Lee, F. C. (1996). Employer-based innovations in behavioral health benefits. *Professional Psychology: Research and Practice, 27*(4), 325–334.

Patrick, M. E., Blair, C., & Maggs, J. L. (2008). Executive function, approach sensitivity, and emotional decision making as influences on risk behaviors in young adults. *Journal of Clinical & Experimental Neuropsychology, 30*(4), 449–462.

Pedro, J. C. (2001). High blood pressure in young men and long-term mortality. *Journal of Clinical Outcomes Management, 8*(9), 14.

Perlman, F., Bobak, M., Steptoe, A., Rose, R., & Marmot, M. (2003). Do health control beliefs predict behaviour in Russians? *Preventive Medicine, 37*(2), 73–81.

Perret, E. (1974). The left frontal lobe of man and the suppression of habitual responses in verbal category behaviour. *Neuropsychologia*, *12*(3), 323–330.

Peterson, M., Waterfield, A., & Abraham, A. (2005). Marketing physical activity: Lessons learned from a statewide media campaign. *Health Promotion Practice, 6*(4), 437–446.

Petrides, M., & Milner, B. (1982). Deficits on subject-ordered taks after frontal and temporal-lobe lesions in man. *Neurpsychologia*, *20*, 249–262.

Pharma Business Week. (2007). Obesity: New obesity study results from Scotland, Australia and the United States described. *Pharma Business Week,* 2681.

Phillips, A. (2009). Health status differentials across rural and remote Australia. *Australian Journal of Rural Health*, *17*(1), 2–9.

Phillips, L. H. (1997). Do 'frontal tests' measure executive function? In P. M. A. Rabbitt (Ed.) *Issues of assessment and evidence from verbal fluency tests.*

Methodology of frontal and executive functions (191–214). Hove, UK: Psychology Press.

Phillips, L. H. (1999). Age and individual differences in letter fluency. *Developmental Neuropsychology*, *15*(249–267).

Phillips, L. H., Bull, R., Adams, E., & Fraser, L. (2002). Positive mood and executive function: Evidence from Stroop and fluency tasks. *Emotion*, *2*(1), 12–22.

Pitkanen, T. (1999). Problem drinking and psychological well-being: A five year follow-up study for adolescence to young adulthood. *Scandinavian Journal of Psychology*, *40*(3), 197–207.

Pomerleau, J., Pederson, L. L., Østbye, T., Speechley, M., & Speechley, K. N. (1997). Health behaviours and socio-economic status in Ontario, Canada. *European Journal of Epidemiology, 13*(6), 613–622.

Ponsford, J. (2005). Rehabilitation interventions after mild head injury. *Current Opinion in Neurology*, *18*(6), 692–697.

Population Research and Outcomes Studies Unit. (2002). *South Australian Monitoring and Survelliance System (SAMSS) Brief Report* No. 2002–20. Adelaide, Australia: Department of Health.

Poulin, C., Lemoine, O., Poirier, L. & Lambert, J. (2005). Validation study of a nonspecific psychological distress scale. *Social Psychiatry and Psychiatric Epidemiology*, *40*(12), 1019–1024.

Powell, C. K., Hill, E. G., & Clancy, D. E. (2007). The relationship between health literacy and diabetes knowledge and readiness to take health actions. *The Diabetes Educator*, *33*(1), 144–151.

Price, K. (2007). Debating the influence of self reports by people living with chronic disease on healthy aging and longevity. *Annals of the New York Academy of Sciences*, *1114*(1), 144–153.

Price, S., & McKenry, P. (2003). Sustaining families: Why the life-course development approach works. *Journal of Family and Consumer Sciences*, *95*(2), 11–14.

Pudrovska, T., & Carr, D. (2009). Age at first birth and fathers' subsequent health: evidence from sibling and twin models. *American Journal of Men's Health*, *3*(2), 104–115.

Prince, S. (2012). Should alcoholic drinks be ordered and served in "units"? *Perspectives in Public Health*, *132*(5), 205–205.

Quill, L. (2011). The disappearance of adulthood. *Studies in Philosophy and Education*, *30*(4), 327–341.

Raitakari, O. T., Leino, M., Räikkönen, K., Porkka, K. V. K., Taimela, S., Räsänen, L., et al. (1995). Clustering of risk habits in young adults: The Cardiovascular Risk in Young Finns Study. *American Journal of Epidemiology*, *142*(1), 36–43.

Rakover, S. S. (1997). Can psychology provide a coherent account of human behavior? A proposed multiexplanation-model theory. *Behavior and Philosophy*, *25*(1), 43–76.

Ramirez, C. P., Young, R. M., & Connor, J. P. (2003). The combined influence of executive function, drinking behaviour and cigarette use on alcohol-related risk taking. *Australian Journal of Psychology*, *55*, 205–205.

Ransom, M. T. (2008). Executive function differences in medicated depressed, non-medicated depressed, and non-medicated non-depressed individuals. *Dissertation Abstracts International: Section B: The Sciences and Engineering*. US, ProQuest Information & Learning. *68*: 8409–8409.

Raskin, S. A., & Rearick, E. (1996). Verbal fluency in individuals with mild traumatic brain injury. *Neuropsychology, 10*(3), 416–422.

Ratti, M. T., Bo, P., Giardini, A., & Soragna, D. (2002). Chronic alcoholism and the frontal lobe: which executive functions are impaired. *Acta Neurologica Scandinavica*, *105*(4), 276–281.

Rattray, J., & Jones, M. C. (2007). Essential elements of questionnaire design and development. *Journal of Clinical Nursing*, *16*(2), 234–243.

Ready, R. E., Stierman, L., & Paulsen, J. S. (2001). Ecological validity of neuropsychological and personality measures of executive functions. *Clinical Neuropsychologist*, *15*(3), 314–323.

Reeder, A. I., Darling, H., Williams, S., & McGee, R. (2006). Brief report: Disposable income, and spending on fast food, alcohol, cigarettes, and gambling by New Zealand secondary school students. *Journal of Adolescence*, *29*(5), 837–843.

Regard, M., Strauss, E., & Knapp, P. (1982). Children's production on verbal and non-verbal fluency tasks. *Perceptual and Motor Skills*, *55*, 839–844.

Reimondos, A., Evans, A., & Gray, E. (2011). Living-apart-Together (LAT) Relationships in Australia. *Family Matters*, *87*, 43–55.

Reitan, R. M., & Wolfson, D. (1985). *The Halstead-Reitan Neuropsychological test battery*. Tucson, AZ: Neuropsychological Press.

Remine, M.D, Care, E., & Brown, P.M. (2008). Language ability and verbal and nonverbal executive functioning in deaf students communicating in spoken English. *Journal of Deaf Studies and Deaf Education*, *13*(4), 531–545.

Renner, B., Spivak, Y., Kwon, S., & Schwarzer, R. (2007). Does age make a difference? Predicting physical activity of South Koreans. *Psychology and Aging*, *22*(3), 482–493.

Reske, M., Delis, D. C., & Paulus, M. P. (2011). Evidence for subtle verbal fluency deficits in occasional stimulant users: quick to play loose with verbal rules. *Journal of Psychiatric Research, 45*(3), 361–368.

Rhea, J. R., Jr. (2011). *Balancing work and family responsibilities as an Extension 4-H agent* ProQuest, UMI Dissertation Publishing

Riccio, C. A., Rodriguez, O., Valle, M., & Lee, S. W. (2005*). Intelligence.* Thousand Oaks, CA: Sage Publications.

Richards, C. M. B. (1988). *The comparison of health motivation, health knowledge, health sense-of-control, and health protective behavior of freshmen and senior college nursing majors* (PhD abstract). In Dissertation Abstracts International: the sciences and engineering, University Microfilms.

Richards, G. (2009). *Psychology: The key concepts*. Milton Park, Oxon: Routledge.

Rissel, C. (1994). Empowerment the holy grail of health promotion. *Health Promotion International*, *9*(1), 39–47.

Robbins, M. A., Elias, M. F., Elias, P. K., & Budge, M. M. (2005). Blood pressure and cognitive function in an African-American and a Caucasian-American sample: The Maine-Syracuse Study. *Psychosomatic Medicine*, *67*(5), 707–714.

Robbins, J. M., Vaccarino, V., Zhang, H., & Kasl, S. V. (2005). Socioeconomic status and diagnosed diabetes incidence. *Diabetes Research and Clinical Practice*, *68*(3), 230–236.

Robert, J. S. (2006). How could i be so stupid? *USA Today*, 135(2734), 70.

Roberts, B. W., Walton, K. E., & Bogg, T. (2005). Conscientiousness and health across the life-course. *Review of General Psychology*, *9*(2), 156–168.

Roche, K. M., Ahmed, S., & Blum, R. W. (2008). Enduring consequences of parenting for risk behaviors from adolescence into early adulthood. *Social Science & Medicine, 66*(9), 2023–2034.

Rodgers, W. M., Conner, M., & Murray, T. C. (2008). Distinguishing among perceived control, perceived difficulty, and self-efficacy as determinants of intentions and behaviours. *British Journal of Social Psychology, 47*(4), 607–630.

Rodgers, B., Korten, A. E., Jorm, A. F., Christensen, H., Henderson, S., & Jacomb, P. A. (2000). Risk factors for depression and anxiety in abstainers, moderate drinkers and heavy drinkers. *Addiction, 95*, 1833–1845.

Rodgers, B., Windsor, T. D., Anstey, K. J., Dear, K. B. G., F. Jorm, A., & Christensen, H. (2005). Non-linear relationships between cognitive function and alcohol consumption in young, middle-aged and older adults: The PATH Through Life Project. *Addiction, 100*(9), 1280–1290.

Rohrer, J. E., Rush Pierce, J. J., & Blackburn, C. (2005). Lifestyle and mental health. *Preventive Medicine, 40*(4), 438–443.

Roldán-Tapia, L., García, J., Cánovas, R., & León, I. (2012). Cognitive reserve, age, and their relation to attentional and executive functions. *Applied Neuropsychology: Adult, 19*(1), 2–8. doi:10.1080/09084282.2011.595458

Romine, C. B., & Reynolds, C. R. (2005). A model of the development of frontal lobe functioning: Findings from a meta-analysis. *Applied Neuropsychology*, *12*(4), 190–201.

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education and Behaviour*, *15*(2), 175–183.

Ross, T. P., Hanouskova, E., Giarla, K., Calhoun, E., & Tucker, M. (2007). The reliability and validity of the self-ordered pointing task. *Archives of Clinical Neuropsychology, 22*(4), 449–458.

Rotgers, F. (2005). *Motivational interviewing*. In Freeman, A. (Ed.), *Encyclopaedia of cognitive behavior therapy* (pp. 253–256). Boston, MA: Springer US.

Rothman, A. J. (2009). Capitalizing on opportunities to refine health behaviour theories. *Health Education and Behaviour, 36* (Suppl 1), 150S–155S.

Rotter, R. B. (1966). Generalized expectancies for internal and external control of reinforcement. *Psychological Monographs: General and Applied, 80*(609), 1–28.

Rouch, I., Wild, P., Ansiau, D., & Marquié, J.-C. (2005). Shiftwork experience, age and cognitive performance. *Ergonomics, 48*(10), 1282–1293.

Rubinstein, G. (2007). Two behavioural indicators of dependency and the Five-Factor Model of personality. *Psychology & Psychotherapy: Theory, Research & Practice, 80*(3), 333–342.

Ruff, R. M., Light, R. H., Parker, S. B., & Levin, H. S. (1997). The psychological construct of word fluency. *Brain and Language, 57*, 394–405.

Sabia, S., Nabi, H., Kivimaki, M., Shipley, M. J., Marmot, M. G., & Singh-Manoux, A. (2009). Health behaviours from early to late midlife as predictors of cognitive function–The Whitehall II Study. *American Journal of Epidemiology, 170*(4), 428–437.

Sabin, S. (2009). Achieving competitive advantage through the use of project management under the plan-do-check-act concept. *Journal of General Management, 34*(3), 1.

Salthouse, T. A. (1988). Effect of aging on verbal abilities: Examination of the psychometric literature. In. L. L. Light & D. M. Burke (Eds.), *Language, memory and aging* (pp. 17–35). Cambridge, UK: Cambridge University Press.

Sanders, A. E., Spencer, A. J., & Slade, G. D. (2006). Evaluating the role of dental behaviour in oral health inequalities. *Community Dentistry and Oral Epidemiology, 34*(1), 71–79.

Sanders, A. E., Spencer, A. J., & Stewart, J. F. (2005). Clustering of risk behaviours for oral and general health. *Community Dental Health*, *22*(3), 133–140.

Savage, J. C., Fairchild, G., Van Goozen, S. H. M., Moore, S. C., & Syngelaki, E. M. (2009). Executive functioning and risky decision making in young male offenders. *Criminal Justice and Behavior, 36*(11), 1213–1227.

Sawyer, S. M., Britto, M. T., Drew, S., & Yeo, M. S. (2007). Adolescents with a chronic condition: challenges living, challenges treating. *Lancet, 369*(9571), 1481–1489.

Sealey, T. (2011). Socio-economic position and higher education in Australia. *Australian Education Research, 38*, 43–56

Schmutte, T., Flanagan, E., Bedregal, L., Ridgway, P., Sells, D., Styron, T., et al. (2009). Self-efficacy and self-care: Missing ingredients in health and healthcare among adults with serious mental illnesses. *Psychiatric Quarterly*, *80*(1), 1–8.

Scholl, M. B., & Schmitt, D. M. (2009). Using motivational interviewing to address college client alcohol abuse. *Journal of College Counseling, 12*(1), 57–70.

Scholz, U., Benicio Gutierrez, D., Shonali, S., & Schwarzer, R. (2002). Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment, 18*(3), 242–251.

Scholz, U., Keller, R., & Perren, S. (2009). Predicting behavioral intentions and physical exercise: a test of the health action process approach at the intrapersonal level. *Health Psychology, 28*(6), 702–708.

Schuit, A. J., van Loon, A. J. M., Tijhuis, M., Ocké, M. (2002). Clustering of lifestyle risk factors in a general adult population. *Preventive Medicine, 35*(3), 219–224.

Schwartz, B. S., Glass, T. A., Bolla, K. I., Stewart, W. F., Glass, G., Rasmussen, M., et al. (2004). Disparities in cognitive functioning by race/ethnicity in the Baltimore memory study. *Environmental Health Perspectives*, *112*(3), 314–320.

Schwartz, S. H., Cieciuch, J., Vecchione, M., Davidov, E., Fischer, R., Beierlein, C., et al. (2012). Refining the theory of basic individual values. *Journal of Personality and Social Psychology, 103*(4), 663–688.

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviours: theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 355–394). Washington DC: Hemisphere.

Schwarzer, R. (2001). Social cognitive factors in changing health related behaviors. *Current Directions in Psychological Science, 10*, 47–51.

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology: An International Review*, *57*(1), 1–29.

Schwarzer, R., & Luszczynska, A. (2008). How to overcome health-compromising behaviors: The health action process approach. *European Psychologist, 13*(2), 141–151.

Scioli, E. R., Biller, H., Rossi, J., & Riebe, D. (2009). Personal motivation, exercise, and smoking behaviors among young adults. *Behavioral Medicine, 35*(2), 57–64.

Seeman, M. (2008). Personal control. *Psychosocial Notebook.* Retrieved from http://www.macses.ucsf.edu/research/psychosocial/control.php

Seiffe-Krenke, I. (2006). Leaving home or still in the nest? Parent–child relationships and psychological health as predictors of different leaving home patterns. *Developmental Psychology, 42*(5), 864–876.

Settersten R. A., Jr., Furstenberg F. F., Jr., & Rumbaut, R. N. G. (2008). *On the frontier of adulthood: Theory, research, and public policy.* Chicago: The University of Chicago Press.

Shallice, T. (1982). Specific impairments of planning. *Philosophical Transactions of the Royal Society, Series B,* (298), 199–209.

Shawe-Taylor, M., & Rigby, J. (1999). Cognitive behaviour therapy: Its evolution and basic principles. *The Journal of the Royal Society for the Promotion of Health, 119*(4), 244–246.

Sheeran, P., Milne, S., Webb, T. L., & Gollwitzer, P. M. (2007). Implementation intentions and health behaviour. In M. Conner & P. Norman (Eds.), *Predicting health behaviour* (pp. 276-323). New York, NY: Open University Press.

Sheree, J. G., & David, M. F. (2009). Research note: Gender differences in educational participation and achievement across subject areas. *New Zealand Journal of Educational Studies, 44*(1), 83.

Shieh, G. (2010). Sample size determination for confidence intervals of interaction effects in moderated multiple regression with continuous predictor and moderator variables. *Behavior Research Methods, 42*(3), 824–835.

Shimamura, A. P., & Jurica, P. J. (1994). Memory interference effects and aging: Findings from a test of frontal lobe function. *Neuropsychology, 8*(3), 408–412.

Simon, H. A. (1975). The functional equivalence of problem-solving skills. *Cognitive Psychology, 7*, 268–288.

Singh-Manoux, A., Martikainen, P., Ferrie, J., Zins, M., Marmot, M., & Goldberg, M. (2006). What does self rated health measure? Results from the British Whitehall II and French Gazel cohort studies. *Journal of Epidemiology and Community Health*, *60*(4), 364–372.

Sirois, F., Davis, C., Morgan, M. (2006). Learning to live with what you can't rise above: Control beliefs, symptom control and adjustment to Tinnitus. *Health Psychology* 25(1): 119-123.

Skinner, E. A. (1996). A guide to constructs of control. *Journal of Personality and Social Psychology*, *71*, 549–570.

Skinner, T. C., Hampson, S. E., & Fife-Schaw, C. (2002). Personality, personal model beliefs, and self-care in adolescents and young adults with Type 1 diabetes. *Health Psychology*, *21*(1), 61–70.

Slade, A. G. (2001). Interpreting scores on the Kessler Psychological Distress Scale (K10). *Australian and New Zealand Journal of Public Health*, *25*(6), 494–497.

Sloan, J. A., Aaronson, N., Cappelleri, J. C., Fairclough, D. L., & Varricchio, C. (2002). Assessing the clinical significance of single items relative to summated scores. *Mayo Clinic Proceedings, 77*(5), 479–487.

Sloan, C., Gough, B., & Conner, M. (2010). Healthy masculinities? How ostensibly healthy men talk about lifestyle, health and gender. *Psychology & Health*, *25*(7), 783–803.

Smedslund, G. (2000). A Pragmatic basis for judging models and theories in health psychology: The axiomatic method. *Journal of Health Psychology, 5*(2), 133–149.

Smith, J. A., Braunack-Mayer, A., & Wittert, G. (2006). What do we know about men's help seeking and health behaviour use? *Medical Journal of Australia*, *184*(2), 81–83.

Smith, J. A., Braunack-Mayer, A., Wittert, G., & Warin, M. (2007). I've been independent for so damn long! Independence, masculinity and aging in a help seeking context. *Journal of Aging Studies*, *21*(4), 325–335.

Smith, J. D., Braunack-Mayer, A., & Wittert, G. (2008). 'It's sort of like being a detective' Understanding how Australian men self monitor their health prior to help seeking. *BMJ Health Services Research*, *8*(56), 1–10.

Smith, M. L. (1995). *Health literacy and weight-related behaviors among college students* (Unpublished dissertation), University of Missouri Kansas City, Missouri.

Smith, T. W. (2009). Personality as risk and resilience in physical health. In A. A. Baird, M. M. Tugade & H. B. Veague (Eds.), *Current directions in introductory psychology* (pp. 161-168). Columbus, OH: Pearson.

Smolensky, M. H., Di Milia, L., Ohayon, M. M., & Philip, P. (2011). Sleep disorders, medical conditions, and road accident risk. *Accident Analysis & Prevention, 43*(2), 533–548.

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention-behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, *20*(2), 143–160.

Snyder, L. B. (2007). Health communication campaigns and their impact on behavior. *Journal of Nutrition Education and Behavior, 39*(2), S32–S40.

Society for the Study of Emerging Adulthood. (2011). *Society for the Study of Emerging Adulthood founding board*. Retrieved from http://www.ssea.org/about/Steering_Committee.htm

Sorenson, J. R. (2005). Theory and health behavior: are we making progress? *Health Education Research, 20*(3), 274–274.

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, *100*(2), 330–348.

Soubelet, A. (2011). Age-cognition relations and the personality trait of Conscientiousness. *Journal of Research in Personality*, *45*(6), 529–534.

Span, M. M., Ridderinkhof, K. R., & van der Molen, M. W. (2004). Age-related changes in the efficiency of cognitive processing across the life span. *Acta Psychologica*, *117*(2), 155–183.

Speros, C. (2005). Health literacy: concept analysis. *Journal of Advanced Nursing, 50*(6), 633–640.

Stang, A., Moebus, S., Mohlenkamp, S., Erbel, R.& Jockel, K. H., (2008). Gender-specific associations of short sleep duration with prevalent hypertension. *Hypertension*, *51*(3), e15–16.

Statzer, J. E. (2010). *Origins of attitude certainty and their impact on resistance to persuasion: The roles of evidence quality and value-relevance* (Masters thesis). Wake Forest University, North Carolina US.

Steckelberg, A., Hülfenhaus, C., et al. (2009). How to measure critical health competences: development and validation of the Critical Health Competence Test (CHC Test). *Advances in Health Sciences Education, 14*(1), 11–22.

Stein, R. E. K., Bauman, L. J., Westbrook, L. E., Coupey, S. M., & Ireys, H. T. (1993). Framework for identifying children who have chronic conditions: the case for a new definition. *Journal of Pediatrics, 122,* 342–347.

Steinberg, L. (2007). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, *28*(1), 78–106.

Stempel, D., Yancey, S., Kral, K., Sense, W., Sutton, L., & Ortega, H. (2008). Understanding asthma control: Focusing on composite measures. *The Journal of Allergy and Clinical Immunology, 121*(2), S9–S9.

Steptoe, A., & Wardle, J. (2001). Sense of control and health behaviour revisited: a multivariate analysis of young adults from 18 countries. *British Journal of Psychology*, *92*(Part 4), 659–672.

Steptoe, A., Peacey, V., & Wardle, J. (2006). Sleep duration and health in young adults. *Archives of Internal Medicine*, *166*(16), 1689–1692.

Steptoe, A., Tsuda, A., Tanaka, Y., & Wardle, J. (2007). Depression symptoms, socioeconomic background, sense of control, and cultural factors in university students from 23 countries. *International Journal of Behavioural Medicine, 14,* 97–107.

Steptoe, A., Sanderman, R., & Wardle, J. (1995). Stability and changes in health behaviours in young adults over a one year period. *Psychology & Health, 10*(2), 155–169.

Steptoe, A., Wardle, J., Vinck, J., Tuomisto, M., Holte, A., & Wichstrom, L. (1994). Personality and attitudinal correlates of healthy and unhealthy lifestyles in young adults. *Psychology & Health, 9*(5), 331–343.

Stewart, J. F., & Roberts, K. (2008). Risk indicators of caries experience among young adults. *Australian Dental Journal*, *53*(2), 122–127.

Stewart, S. T., & Zelinski, E. M. (2000). Age, medical conditions, and gender as interactive predictors of cognitive performance: *The Journals of Gerontology Series B: Psychological Sciences & Social Sciences*, 55B(6), P381.

Stoddart, M. L., Jarvis, B., Blake, B., Fabsitz, R. R., Howard, B. V., Lee, E. T., et al. (2000). Recruitment of American Indians in epidemiologic research: The Strong Heart Study. *American Indian and Alaska Native Mental Health Research*, *9*(3), 20–37.

Straus, S. E., Tetroe, J., & Graham, I. (2009). Defining knowledge translation. *Canadian Medical Association Journal, 181*(3–4), 165–168.

Strauss, E., Sherman, E. S., & Spreen, O. (Eds.) (2006). *A compendium of neuropsychological tests: Administration, norms and commentary.* New York, Oxford University Press.

Street, G., James, R., & Cutt, H. (2007). The relationship between organised physical recreation and mental health. *Health Promotion Journal of Australia*, *18*(3), 236–239.

Strine, T. W., Balluz, L., Chapman, D. P., Morarity, D. G., Owens, M., & Mokdad, A. H. (2004). Risk behaviours and healthcare coverage among adults by frequent mental distress status. *American Journal of Preventative Medicine*, *26*, 213–216.

Stroebe, W. (2000*). Social psychology and health* (2nd ed.). Buckingham, UK: Open University Press.

Stroop, J. R. (1935). Studies on interference in serial verbal reaction. *Journal of Experimental Psychology, 18,* 643–662.

Sullivan, K. M., Smith, M. L., Bottorff, J. L., & Robinson, C. A. (2010). Just because you've got lung cancer doesn't mean i will: lung cancer, smoking, and family dynamics. *Journal of Family Nursing*, *16*(3), 282–301.

Sunderland, M., Mahoney, A., & Andrews, G. (2012). Investigating the factor structure of the Kessler Psychological Distress Scale in Community and clinical samples of the Australian population. *Journal of Psychopathology and Behavioral Assessment, 34*(2), 253–259.

Suris, J. C., & Parera, N. (2005). Sex, drugs and chronic illness: Health behaviours among chronically ill youth. *European Journal of Public Health, 15*, 484–488.

Swendsen, J. D., Merikangas, K. R., Canino, G. J., Kessler, R. C., Rubio-Stipee, M., & Angst, J. (1998). The comorbidity of alcoholism with anxiety and depressive disorders in four geographic communities. *Comprehensive Psychiatry, 39*(176–184).

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Allyn & Bacon.

Talbot, L., McGlinchey, E., Kaplan, K., Harvey, A., & Dahl, R. (2010). Sleep deprivation in adolescents and adults: changes in affect. *Emotion, 10*(6), 831–841.

Taliaferro, L. A., Rienzo, B. A., Pigg, R. M., Jr., Miller, M. D., & Dodd, V. J. (2009). Associations between physical activity and reduced rates of hopelessness, depression, and suicidal behavior among college students. *Journal of American College Health*, *57*(4), 427–436.

Tam, W.-C. C. (2004). The utility of seven-subtest short forms of the Wechsler Adult Intelligence Scale-III in young adults. *Journal of Psychoeducational Assessment, 22*(1), 62–71.

Tamakoshi, A., Tamakoshi, K., Lin, Y., Yagyu, K., & Kikuchi, S. (2009). Healthy lifestyle and preventable death: Findings from the Japan Collaborative Cohort (JACC) Study. *Preventive Medicine, 48*(5), 486–492.

Tamm, L., Menon, V., & Reiss, A. L. (2002). Maturation of brain function associated with response inhibition. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*(10), 1231–1238.

Taylor, A., Campostrini, S., Gill, T., Carter, P., Dal Grande, E., & Herriot, M. (2010). The use of chronic disease risk factor surveillance systems for evidence-based decision-making: physical activity and nutrition as examples. *International Journal of Public Health, 55*(4), 243–249.

Taylor, A., Grande, E., Gill, T., Chittleborough, C., Wilson, D., Adams, R., et al. (2006). Do people with risky behaviours participate in biomedical cohort studies? *BMC Public Health, 6*(1), 11.

Taylor, A., Campostrini, S., et al. (2010). The use of chronic disease risk factor surveillance systems for evidence-based decision-making: physical activity and nutrition as examples. *International Journal of Public Health, 55*(4), 243–249.

Taylor, S. E. (1999). *Health Psychology* (4th ed.). Singapore: McGraw-Hill.

Teixeira-Pinto, A., Neovius, M., & Rasmussen, F. (2008). Shift in the composition of obesity in young adult men in Sweden over a third of a century. *International Journal of Obesity, 32*(5), 832–836.

Tercyak, K. P., Beville, K. W., Walker, L. R., Prahlad, S., Cogen, F. R., Sobel, D. O., et al. (2005). health attitudes, beliefs, and risk behaviors among adolescents and young adults with Type 1 Diabetes. *Children's Health Care*, *34*(3), 165–180.

The Psychological Corporation. (1997). *WAIS III administration and scoring manual.* San Antonio, TX: The Psychological Corporation.

The Royal Australian College of General Practitioners. (2011). *Oral hygiene. Guidelines for preventative activities in general practice* (7th ed.). Retrieved from https://www.racgp.org.au/redbook/11

Thomsen, S. F. (2005). The incidence of asthma in young adults. *Chest*, *127*(6), 1928–1934.

Thorn, B. L., & Gilbert, L. A. (1998). Antecedents of work and family role expectations of college men. *Journal of Family Psychology*, *12*(2), 259–267.

Todesco, P. (2005). Developmental differences in sensation-seeking, risk-taking and perceptual appraisals. *Dissertation Abstracts International: Section A: Humanities and Social Science, 65*(11-A), 4106.

Tones, K. (2002). Health literacy: new wine in old bottles? *Health Education Research, 17*(3), 287–290.

Tovt-Korshynska, M. I., Dew, M. A., Chopey, I. V., Spivak, M. Y., & Lemko, I. S. (2001). Gender differences in psychological distress in adults with asthma. *Journal of Psychosomatic Research, 51*(5), 629–637.

Travers, E. (2006, May). *Loss and grief following ABI.* Paper presented at the Brain Injury Australia Conference, Gold Coast, Queensland

Tripodi, S. J., Bender, K., Litschge, C., & Vaughn, M. G. (2010). Interventions for reducing adolescent alcohol abuse: A meta-analytic review. *Archives of Pediatrics and Adolescent Medicine, 164*(1), 85–91.

Tsaousis, I., & Nikolaou, I. (2005). Exploring the relationship of emotional intelligence with physical and psychological health functioning. *Stress & Health: Journal of the International Society for the Investigation of Stress, 21*(2), 77–86.

Tudiver, F., & Talbot, Y. (1999). Why don't men seek help? Family physicians' perspectives on help-seeking behavior in men. *Journal of Family Practice, 48*(1), 47–52.

Ugland, J. H. (1989). Health as a value: Implications for practice. *Professional Psychology. Research and Practice, 20*(6), 415–416.

Ulbricht, S., Hanke, M., Meyer, C., John, U., & Haug, S. (2011). Overestimation of drinking norms and its association with alcohol consumption in apprentices. *Alcohol and Alcoholism, 46*(2), 204–209.

Umberson, D., Pudrovska, T., & Reczek, C. (2010). Parenthood, childlessness, and well-being: A life-course perspective. *Journal of Marriage and Family, 72*(3), 612–629.

Uttl, B., & Pilkenton-Taylor, C. (2001). Letter cancellation performance across the adult life span. *The Clinical Neuropsychologist*, 15(4), 521–530.

UyBico, S., Pavel, S., & Gross, C. (2007). Recruiting vulnerable populations into research: A systematic review of recruitment interventions. *Journal of General Internal Medicine, 22*(6), 852–863.

van der Linden, D., Frese, M., & Meijman, T. F. (2003). Mental fatigue and the control of cognitive processes: effects on perseveration and planning. *Acta Psychologica, 113*(1), 45–65.

van Der Weyden, M. B. (2008). Health policy and reform: gathering the evidence. *Medical Journal of Australia, 189*(3), 169–170.

van Harreveld, F., van der Pligt, J., & de Vries, N. K. (1999). Attitudes towards smoking and the subjective importance of attributes: Implications for changing risk-benefit ratios. *Swiss Journal of Psychology, 58*(2), 65–72.

van Mourik, R., Oosterlaan, J., & Sergeant, J. A. (2005). The Stroop revisited: a meta-analysis of interference control in AD/HD. *Journal of Child Psychology & Psychiatry, 46*(2), 150–165.

Vickers Jr, R. R., Conway, T. L., & Hervig, L. K. (1990). Demonstrations of replicable dimensions of health behaviors. *Preventative Medicine, 19*, 377–401.

von Wagner, C., Knight, K., Steptoe, A., & Wardle, J. (2007). Functional health literacy and health promoting behaviour in national sample of British adults. *Journal of Epidemiology and Community Health, 61*, 1086–1090.

von Wagner, C., Steptoe, A., Wolf, M. S., & Wardle, J. (2009). Health literacy and health actions: A review and a framework from health psychology. *Health Education Behaviour, 36*(5), 860–877.

Waldstein, S. R., Jennings, J. R., Ryan, C. M., Muldoon, M. F., Shapiro, A. P., Polefrone, J. M., et al. (1996). Hypertension and neuropsychological performance in men: Interactive effects of age. *Health Psychology, 15*(2), 102–109.

Walker, L., Butland, D., & Connell, R. (2000). Boys on the Road: Masculinities, Car Culture, and Road Safety Education. *The Journal of Men's Studies, 8*(2), 153–169.

Wallston, K. A., & Wallston, B. S. (1980). Health sense of control scales. Advances and innovatins. In H. Lefcourt (Ed.), *Sense of control research* (pp. 198–234). New York: Academic Press.

Wallston, K. A., Wallston, B. S., & DeVellis, R. (1978). Development of the multidimensional health sense of control (MHLC). *Health Education Monographs, 6*, 161–170.

Wallston, K. E. (1992). Hocus-pocus, the focus isn't strictly sense: Rotter's social learning theory modified for health. *Cognitive Therapy and Research*, *16*, 183–199.

Wang, J. (2003). Young men who do not drink, as well as those who drink heavily, have high levels of depression and distress. *Evidence Based Mental Health*, *6*(1), 13-.

Wang, N. Y., Golden, S. H., Meoni, L. A., Klag, M. J., & Brancati, F. L. (2002). Blood pressure in young men predicts incidence of diabetes mellitus. *Journal of Hypertension*, *20*, S322–S322.

Wardle, J., & Steptoe, A. (1991). The European health and behaviour survey: Rationale, methods and initial results from the United Kingdom. *Social Science & Medicine*, *33*(8), 925–936.

Ware, J. E., Snow, K.K., Kosinski, M., & Gandek B. (1993). *SF-36 health survey: Manual and interpretation guide*. Boston, MA: Nimrod Press.

Ware, J. E. (1995). The status of health assessment 1994. *Annual Review of Public Health*, *16*(1), 327–354.

Warren, M., Moore, J. M., & Vogtle, L. K. (2008). Search performance of healthy adults on cancellation tests. *The American Journal of Occupational Therapy*, *62*(5), 588–594.

Wechsler, D. (1939). *The measurement of adult intelligence.* Baltimore: Williams and Watkins.

Wechsler, D. (1997). *Wechsler Adult Intelligence Scale Administration & Scoring Manual* (3rd ed.). San Antonio, TX: The Psychological Corporation.

Wechsler, D. (2008). *Wechsler Adult Intelligence Scale (WAIS IV) Australian language adaptation (WAIS–IV Australian).* Sydney*:* Pearson.

Wecker, N. S., Kramer, J. H., Wisniewski, A., Delis, D. C., & Kaplan, E. (2000). Age effects on executive ability. *Neuropsychology, 14*(3), 409–414.

Weinstein, N. D. (1993). Testing four competing theories of health-protective behavior. *Health Psychology*, *12*(4), 324–333.

Weinstein, N. D. (2007). Misleading tests of health behavior theories. *Annals of Behavioral Medicine*, *33*(1), 1–10.

Weinstein, N. D., & Rothman, A. J. (2005). Commentary: Revitalizing research on health behavior theories. *Health Education Research*, *20*(3), 294–297.

Weiss, B. D., Mays, M. Z., Martz, W., Castro, K. M., DeWalt, D. A., Pignone, M. P., et al. (2005). Quick assessment of literacy in primary care: The Newest Vital Sign. *Annals of Family Medicine, 3*(6), 514–522.

Weiss, G. L., & Larson, D. L. (1990). Health value, health sense of control and the predictors of health protective behaviours. *Social Behavior and Personality*, *18*, 121–136.

Wennerstad, K. M., Silventoinen, K., Tynelius, P., Bergman, L., Kaprio, J., & Rasmussen, F. (2010). Associations between IQ and cigarette smoking among Swedish male twins. *Social Science & Medicine*, *70*(4), 575–581.

West, R. L. (1996). An application of prefrontal cortex function theory to cognitive ageing. *Psychological Bulletin*, *120*, 272–292.

Wethington, E., & Johnson-Askew, W. L. (2009). Contributions of the life-course perspective to research on food decision making. *Annals of Behavioral Medicine*, *38* ,Suppl 1(1), S74–80.

White, V., & Hayman, J. (2007). *Results from the 2005 Australian Secondary Students Alcohol and Drug Survey*. Melbourne, Australia: Centre for Behavioural Research in Cancer and Victorian Department of Human Services.

Whitney, P., Arnett, P. A., Driver, A., & Budd, D. (2001). Measuring central executive functioning: What's in a reading span? *Brain and Cognition, 45*(1), 1–14.

Wilens, T. E., Martelon, M., Fried, R., Petty, C., Bateman, C., & Biederman, J. (2011). Do executive function deficits predict later substance use disorders among adolescents and young adults? *Journal of the American Academy of Child & Adolescent Psychiatry, 50*(2), 141–149.

Willi, C., Bodenmann, P., et al. (2007). Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. *Journal of the American Medical Association, 298*(22), 2654–2664.

Williams, C. (2000). Doing health, doing gender: teenagers, diabetes and asthma. *Social Science & Medicine, 50*(3), 387–396.

Williams, D. M. (2010). Outcome expectancy and self-efficacy: theoretical implication of an unresolved contradiction. *Personality and Social Psychology Review, 14*(4), 417–425.

Williamson, R. J., Sham, P., & Ball, D. (2003). Binge drinking trends in a UK community-based sample. *Journal of Substance Use, 8*(4), 234–237.

Willis, D. G., & Porche, D. J. (2006). Envisioning and advancing marginalized mental health disparities scholarship: The marginality-cultural competence integrative framework (M-CCIF*). Issues in Mental Health Nursing, 27*(4), 425–442.

Wilson, B. A. A., N. Burgess, P W. Emslie, H. Evans, J J. (1996). *Behavioural assessment of the dysexecutive syndrome*. St Edmunds, England: Thames Valley Test Company.

Wilson, K., Eyles, J., Ellaway, A., Macintyre, S., & Macdonald, L. (2010). Health status and health behaviours in neighbourhoods: a comparison of Glasgow, Scotland and Hamilton, Canada. *Health & Place, 16*(2), 331–338.

Wimer, D. J., & Levant, R. F. (2011). The relation of masculinity and help-seeking style with the academic help-seeking behavior of college men. *Journal of Men's Studies, 19*(3), 256–274.

Windle, M., & Blane, H. T. (1989). Cognitive ability and drinking behavior in a national sample of young adults. *Alcoholism: Clinical and Experimental Research, 13*(1), 43–48.

Windsor, T. D., & Anstey, K. J. (2008). A longitudinal investigation of perceived control and cognitive performance in young, midlife and older adults. *Aging, Neuropsychology, and Cognition, 15*(6), 744–763.

Wolfe, J. D. (2009). Age at first birth and alcohol use. *Journal of Health and Social Behavior, 50*(4), 395–409.

World Health Organization. (1946). *Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference*, New York, 19–22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948

World Health Organization. (1978). *Declaration of Alma-Ata.* International conference of Primary Health Care, Alma-Ata, USSR, 6–12 September 1978. Retrieved from http://www.who.int/hpr/NPH/docs/declaration_almaata.pdf

World Health Organization. (1992). *International statistical classification of diseases and related health problems, tenth revision (ICD-10).* Geneva: Author.

World Health Organization. (2003). Diet, nutrition and the prevention of chronic diseases. *World Health Organization Technical Reports Series,* 916. Geneva: Author.

World Health Organization. (2000). *International guide for monitoring alcohol consumption and related harm.* Geneva: Author

World Health Organization. (2011). *Global status report on alcohol and health. In Department of Mental Health and Susbstance Abuse*. Geneva: Author. Retrieved from http://www.who.int/substance_abuse/publications/global_alcohol_report/msbgsruprofiles.pdf

World Health Organization. (2007). *Engaging men and boys in changing gender-based inequity in health: Evidence from programme interventions.* Geneva: Author.

World Health Organization. (2007b). *Achieving health equity: From root causes to fair outcomes.* Geneva: Author.

Wong, C. L., & Mullen, B. A. (2009). Predicting breakfast consumption: an application of the theory of planned behaviour and the investigation of past behaviour and executive function. *British Journal of Health Psychology*, *14*, 489–504.

World Diabetes Foundations. (2010). *Diabetes Facts* (4th ed.). Retrieved from http://www.worlddiabetesfoundation.org/composite-35.htm

Xu, X. (2009). Health motivation in health behavior: Its theory and application (PhD thesis). University of Navada, Las Vegas US.

Yang, S., Lynch, J. W., Raghunathan, T. E., Kauhanen, J., Salonen, J. T., & Kaplan, G. A. (2007). Socioeconomic and Psychosocial exposures across the life-course and binge drinking in adulthood: Population-based study. *American Journal of Epidemiology, 165*(2), 184–193.

Yilldirium, F., & Demirbay, H. (2008). Alcohol use prevalence and socio-demographic correlates of alcohol use in a university student sample in Turkey. *Social Psychiatry and Psychiatric Epidemiology, 43*(7), 575–583.

Yilmaz, M. B., Yalta, K., et al. (2007). Sleep quality among relatively younger patients with initial diagnosis of hypertension: Dippers versus non-dippers. *Blood Pressure 16*(2), 101–105.

Young, T., J. Skatrud, et al. (2004). Risk factors for obstructive sleep apnea in adults. *Journal of the American Medical Association, 291*(16), 2013–2016.

Yuspeh, R. L., & Vanderploeg, R. D. (2000). Spot-the-word: A measure for estimating premorbid intellectual functioning. *Archives of Clinical Neuropsychology, 15*(4), 319–326.

Zalonis, I., Christidi, F., Bonakis, A., Kararizou, E., Triantafyllou, N. I., Paraskevas, G., et al. (2009). The Stroop Effect in Greek healthy population: Normative data for the Stroop Neuropsychological Screening Test. *Archives of Clinical Neuropsychology, 24*(1), 81–88.

Zanjani, F. A., Schaie, K. W., & Willis, S. L. (2006). Age group and health status effects on health behavior change. *Behavioral Medicine, 32*(2), 36–46.

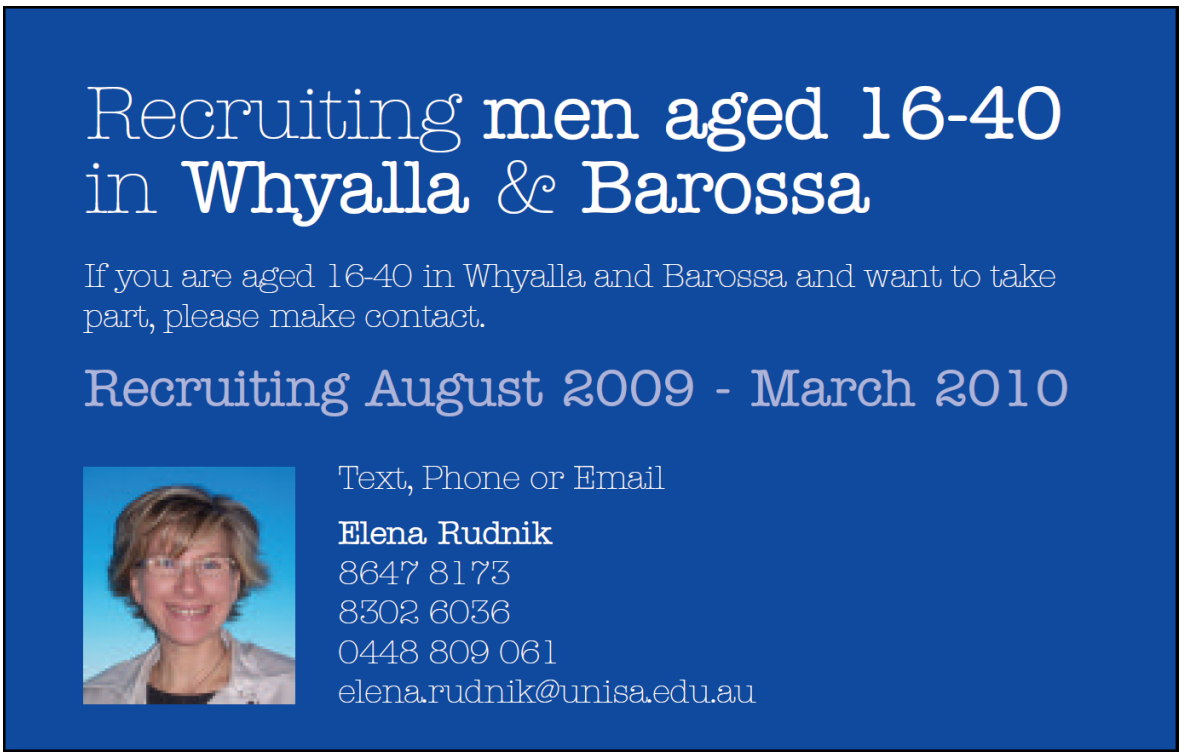
Zee, P. C., & Turek, F. W. (2006). Sleep and Health: Everywhere and in Both Directions. *Archives of Internal Medicine, 166*(16), 1686–1688.

Zelazo, P. D., Craik, F. I. M., & Booth, L. (2004). Executive function across the life span. *Acta Psychologica, 115*(2–3), 167–183.

7. Appendices

Appendix 1 Recruitment Postcard – Side A and Side B





Appendix 2 Male participants by age group in study two, Blokes Brains & Behaviours (BBB) as a percentage of the number of men living in Whyalla and Barossa as reported by Australian Bureau of Statistics (ABS, 2012) providing an indication of representativeness and response rate*

	15-24**			**25–29**			**35–39 *****			**Total Males 15-40**		
	ABS	BBB		ABS	BBB		ABS	BBB		ABS	BBB	
Location	**no.**	**no.**	**(%)**	**no.**	**no.**	**(%)**	**no.**	**no.**	**(%)**	**no.**	**no.**	**(%)**
Whyalla	1611	18	(1.1)	714	11	(1.5)	777	18	(2.3)	3768	56	(1.5)
Barossa	1332	12	(0.9)	584	9	(1.5)	693	19	(2.7)	3229	46	(1.4)
Combined	2943	30	(1.0)	1882	20	(1.1)	2163	37	(1.7)	10226	102	(1.0)

* Response rates cannot be calculated for a convenience sample
** Male population age range of 15-24 years reported by the ABS exceeds the aged range of research participants aged 16-24 years. The response rate calculation is an underestimate.
*** Participant age range of 35 – 40 years exceeds the reported ABS population age range of 35 – 39 years. The response rate is an overestimation.

Appendix 3 Participant Information Sheet

Participant Information Sheet

Research project title: **Blokes Brains and Behaviour – health behaviour and executive functions of adult men**

Researcher name: Elena Rudnik

Supervisor's names: Dr. Janet Bryan, Dr. Matthew Haren

We would like to invite you to take part in this project being conducted in the School of Psychology with support of the Spencer Gulf Rural Health School at the University of South Australia.

What is the aim of the research?

The aim is to explore how health behaviours are associated with executive function and health literacy. Executive functions are cognitive skills that allow us to plan, organise goal focussed behaviour, in-hibit behaviour and other abilities that promote independent living.

Who can be involved?

Men aged between 16 and 40 years of age. There are some conditions that preclude participation and these include: colour blindness, a history of serious head injury, neurological condition, psychiatric illness and alcoholism.

What will you be asked to do?

You will be asked to attend one testing session which will take about 2 hours. During the testing session you be provided with breaks at your request when tea and coffee will be provided. During the testing session you will be asked to complete a questionnaire and a series of tasks that assess different aspects of executive function. Most people find these tasks enjoyable.

We will discuss your present health behaviour such as physical activity, alcohol, cigarette and food consumption.

How long will it take?

About 2 hours.

How can you take part?

If you are interested in being part of the research or want to know some more, phone, email or text Elena Rudnik to arrange a testing session at a clinic closest to you. Phone 044 88 09061 or 8647 8173.

What if you choose not to take part?

Your involvement in this project is voluntary and if you agree to participate you are free to discontinue at any time.

Will I be paid?

Your time and effort is appreciated and a once off payment of $20 and a chance to win a game console equivalent to an Xbox or Wii, will be provided to you to cover your travel and attendance costs.

Will this be confidential?

All information gathered during this study will be kept confidential. The researcher will protect the identities of participants and maintain confidentiality of all information they provide, but researchers may be required to provide information to legal authorities, including that related to illegal activities such as recreational drug use under court order or subpoena.

Subject to any legal obligations to disclose information, no information will be published that will identify or lead to the identification of any individuals who take part. Once you have completed the executive function tests your name will be removed from documents and replaced with an ID number. Your information will be kept securely at the University campus. After the completion of the study all information collected will be kept in locked storage area at the School of Psychology for 5 years.

Two of the cognitive tests will be audio taped to ensure accurate recording of your results and scoring.

Will the results of the research be published and available to you?

The study findings, without any identifiable data, will be published in a report and may be published in a peer reviewed journal or presented at a conference. A summary of the report will be produced and available on the University website http://sgrhs.unisa.edu.au/ with individual copies of the summary and report posted to you if you have agreed to this.

The study findings will also be made available to your employer in the form of a report of key findings. The report will not contain any information which would allow individual participants to be identified.

No publication or public presentation or discussion of results of research based on identified data shall include any information that could allow an individual to be identified.

Has the study received ethical approval?

This study has received ethics approval from the University of South Australia Human Research Ethics Committee. Should you wish to discuss the project with someone not directly involved, or ethical concerns please contact: Vicki Allen, Exec. Officer, HREC Tel: 8302 3118 or vicki.allen@unisa.edu.au

Who can you talk to and find out more information?

Elena Rudnik: elena.rudnik@unisa.edu.au M 0448 809 061 P 8647 8173
UniSA Nicolson Ave Whyalla Norrie SA 5608

Janet Bryan: janet.bryan@unisa.edu.au P 8302 4385

Matthew Haren: matt.haren@unisa.edu.au P 86 478 152

Appendix 4 Consent Form





CONSENT FORM

Project title 'Health, behaviour and executive functions of young adult men'

Researcher's name Elena Rudnik

Supervisor's name Janet Bryan, Matthew Haren

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.

- I understand the purpose of the research project and my involvement in it.

- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.

- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.

- I understand the statement in the information sheet concerning payment to me for taking part in the study.

Name of participant.....

Signed.....**Date**.....

I have provided information about the research to the research participant and believe that he/she understands what is involved.

Researcher's signature and date.....

Appendix 5 Health Behaviour and Personal Information Questionnaire (HBPIQ)

ID No. _____

HEALTH BEHAVIOUR AND PERSONAL INFORMATION QUESTIONNAIRE

This questionnaire asks you about your health behaviour, health status and includes questions about your general background. There is no time limit for completion, however it should take approximately 10-15 minutes. Please answer each question.

1. When is your date of birth? DD/ MM / YYYY) _____ / ____ / ___

2. In general, would you say that your health is

[ ] Excellent

[ ] Very good

[ ] Good

[ ] Fair

[ ] Poor

3. All things considered, how satisfied are you with your life as a whole?

[ ] Very satisfied

[ ] Moderately satisfied

[ ] No feelings either way

[ ] Moderately dissatisfied

[ ] Very dissatisfied

Alcohol

The next questions are about drinking alcohol, including beer, wine, spirits and any other alcoholic drink

A **Standard Drink** is equivalent to a schooner of full strength beer, a glass of wine or a drink containing 30 ml nip of spirits.

4. Would you describe yourself as

[ ] A non-drinker **->please go to Q11**

[ ] A very occasional drinker

(special occasions only)

[ ] An occasional drinker

[ ] A regular drinker

5. If you are an "occasional" or "regular" drinker:

On how many days over the past two weeks (14 days) did you have a drink? .....

What alcoholic drink(s) do usually have? .....

6. How often do you drink 7 or more standard alcoholic drinks in one session?
(tick ONE box only)

[ ] Every day
[ ] 5-6 days a week
[ ] 3-4 days a week
[ ] 1-2 days a week
[ ] Weekly or less
[ ] Fortnightly or less
[ ] Monthly or less
[ ] Never -> **please go to question 8**

7. On these occasions how many standard drinks do you usually have? **(tick ONE box only)**

[ ] 7-8 drinks

[ ] 9-12 drinks

[ ] 13-20 drinks

[ ] More than 20 drinks

8. How often do you drink 6 or less standard alcoholic drinks in one session? **(tick ONE box only)**

[ ] Every day

[ ] 5-6 days a week

[ ] 3-4 days a week

[ ] 1-2 days a week

[ ] Weekly or less

[ ] Fortnightly or less

[ ] Monthly or less

[ ] Never -> ***please go to question 10***

9. On these occasions how many standard drinks do you usually have? **(tick ONE box only)**

[ ] 1-2 drinks

[ ] 3-4 drinks

[ ] 5-6 drinks

10. Would you like to reduce the amount that you drink? [ ] Yes

[ ] No

[ ] Unsure

The next questions are about smoking tobacco.

11. Please read all the following statements carefully and tick the box next to the one that best describes you.

a) I have never smoked a cigarette, not even a puff [ ]

b) I have only ever tried one or two cigarettes [ ]

c) I used to smoke sometimes, but I don't now [ ]

d) I don't smoke cigarettes, but smoke a pipe or cigars [ ]

e) I smoke cigarettes, but not as many as one per day [ ]

f) I usually smoke between 1 and 10 cigarettes per day [ ]

g) I usually smoke between 10 and 20 cigarettes per day [ ]

h) I usually smoke more than 20 cigarettes per day [ ]

12. Would you like to reduce the amount you smoke?

[ ] Yes
[ ] No
[ ] Unsure

13. How often do you eat breakfast?

[ ] Every day
[ ] Most days
[ ] Rarely or never

14. How many meals do you eat each day? .....

15. How many between-meal snacks do you eat each day? .....

16. How often do you eat a meal that includes meat (beef, pork, lamb, veal, bacon, hamburgers, sausages etc)?

[ ] At least once a day
[ ] Every 2 or 3 days
[ ] About once a week
[ ] Less than once a week
[ ] Never

17. How often do you eat fruit?

[ ] At least once a day
[ ] Every 2 or 3 days
[ ] About once a week
[ ] Less than once a week
[ ] Never

18. How many serves of fruit do you usually eat each day? A serve is 1 medium piece or 2 small pieces of fruit or 1 cup of diced fruit. **(tick ONE box only)**

[ ] 1 serve or less
[ ] 2 serves
[ ] 3 or more serves
[ ] Don't eat fruit

19. How many serves of vegetables do you usually eat each day? A serve is half a cup of cooked vegetables or 1 cup of salad vegetables. **(tick ONE box only)**

[ ] 1 serve or less
[ ] 2-3 serves
[ ] 4-5 serves
[ ] 6 serves or more
[ ] Don't eat vegetables

20. Do you make a conscious effort to avoid eating foods that contain fat and cholesterol?

[ ] Yes
[ ] No
[ ] Unsure

21. Are you trying to lose weight?

[ ] Yes
[ ] No
[ ] Unsure

22. Do you consider yourself to be

[ ] Very overweight
[ ] Slightly overweight
[ ] About right
[ ] Slightly underweight
[ ] Very underweight

23. Over the past 2 weeks (14 days), have you had any exercise, (e.g. sport, physically active pastime)?

[ ] Yes
[ ] No
[ ] Unsure

If 'YES', what activity did you do? .....

24. How many times over the past 2 weeks did you exercise? .....

25. Approximately how much time over the past 2 weeks did you spend doing vigorous exercise / physical activity? ……. hours ……. min

26. Approximately how much time over the past 2 weeks did you spend doing light exercise / physical activity? ……. hours ……. min

27. Would you like to increase the amount that you exercise?

[ ] Yes
[ ] No
[ ] Unsure

28. Do you currently have any of these conditions? **(tick all that apply)**

[ ] Diabetes
[ ] Asthma / Chronic bronchitis / COAD
[ ] Cardiovascular (Heart) Disease
[ ] Arthritis
[ ] Osteoporosis
[ ] Hypertension (High Blood Pressure)
[ ] High Cholesterol
[ ] Depression / Anxiety
[ ] Other Mental Health Condition/s
[ ] None
[ ] Other, please specify _____

29. Do you seek help with your decision making, problem solving or planning in relation to your health and wellbeing?

[ ] Yes
[ ] No **-> please go to question 32**
[ ] Unsure

30. When you have a health issue where do you go for help, advice or assistance?

For each source of support **please tick** how often you consult with that source on the scale from every time I have a problem to never.

	Every time	Most of the time	Some of the time	Rarely	Never
Parent/s	[ ]	[ ]	[ ]	[ ]	[ ]
Brother / Sister	[ ]	[ ]	[ ]	[ ]	[ ]
Other Family	[ ]	[ ]	[ ]	[ ]	[ ]
Partner	[ ]	[ ]	[ ]	[ ]	[ ]
Friend (similar age)	[ ]	[ ]	[ ]	[ ]	[ ]
Friend (older)	[ ]	[ ]	[ ]	[ ]	[ ]
GP / Doctor	[ ]	[ ]	[ ]	[ ]	[ ]
Other Health Service	[ ]	[ ]	[ ]	[ ]	[ ]
Other (please specify)	[ ]	[ ]	[ ]	[ ]	[ ]

……..

31. Please read the statements and indicate how important they are to you. Circle the appropriate number

		Of very low importance									**Of very great importance**
1.	To take regular exercise	1	2	3	4	5	6	7	8	9	10
2.	Not to eat too much animal fat	1	2	3	4	5	6	7	8	9	10
3.	To eat enough fibre	1	2	3	4	5	6	7	8	9	10
4.	To keep your body weight within the normal range	1	2	3	4	5	6	7	8	9	10
5.	To eat enough fruit	1	2	3	4	5	6	7	8	9	10
6.	Not to smoke	1	2	3	4	5	6	7	8	9	10
7.	Not to add too much salt	1	2	3	4	5	6	7	8	9	10
8.	To eat breakfast almost every day	1	2	3	4	5	6	7	8	9	10
9.	To get seven or eight hours sleep on most nights	1	2	3	4	5	6	7	8	9	10
10.	To brush your teeth regularly	1	2	3	4	5	6	7	8	9	10
11.	To wear a seatbelt when travelling in a car	1	2	3	4	5	6	7	8	9	10

12.	Never to drive after drinking alcohol	1	2	3	4	5	6	7	8	9	10
13.	To drive within the speed limit most of the time	1	2	3	4	5	6	7	8	9	10
14.	Not to drink too much alcohol	1	2	3	4	5	6	7	8	9	10
15.	To use sunscreen when you are in the sun	1	2	3	4	5	6	7	8	9	10
16.	To lose weight	1	2	3	4	5	6	7	8	9	10
17.	To make deliberate efforts to control or Avoid stress	1	2	3	4	5	6	7	8	9	10
19.	For women to examine their breasts at least once a month for possible signs of cancer	1	2	3	4	5	6	7	8	9	10
20.	For women to have a regular cervical smear test	1	2	3	4	5	6	7	8	9	10
21.	For men to examine their testicles at least once a month for possible signs of cancer	1	2	3	4	5	6	7	8	9	10

32. Do you visit your GP for medical checks when you are not necessarily unwell?

[ ] Yes
[ ] No
[ ] Unsure

How often?

Two or more times per year	[ ]
Once per year	[ ]
Once every two years	[ ]
Other (please specify)	[ ]

33. Please indicate how many times you have visited the following health service providers in the last **twelve months**? **(write number of visits in the box)**

e.g. [3] GP (indicates visited a GP 3 times in last twelve months)

[ ] General Practitioner / GP / doctor
[ ] Hospital (Accident & Emergency / Inpatient)
[ ] Community Nurse
[ ] Optometrist
[ ] Physiotherapist / Occupational Therapist / Chiropractor
[ ] Audiologist
[ ] Alternative Therapists (Naturopath / Osteopath)
[ ] Psychologist / Psychiatrist / Other Community Mental Health Services
[ ] Dentist / Orthodontist
[ ] Personal Trainer
[ ] Pharmacist
[ ] Podiatrist
[ ] Dietitian / Nutritionist
[ ] Specialist Doctor (e.g. surgeon),

34. What is your current marital status? **(tick all that apply)**

[ ] Married / Living with a partner (De Facto)
[ ] Divorced / Separated
[ ] Widowed
[ ] Single
[ ] In relationship

35. Do you have any children?

[ ] Yes
[ ] No

36. Are you currently financially supporting children who are not living with you?

[ ] Yes
[ ] No

37. How would you **best** describe your living arrangement? **(tick ONE box only)**

[ ] Living with parents / family
[ ] Living with other adult/s
[ ] Single adult with children
[ ] More than one adult with children
[ ] Living alone
[ ] Other

38. What is the highest level of education you have completed? **(tick ONE box only)**

[ ] Never attended school
[ ] Completed primary school
[ ] Some high school
[ ] Completed high school
[ ] TAFE, trade certificate or diploma
[ ] University or some other tertiary institute degree or higher
[ ] Other, please specify _____

39. Which of these best describes your current employment status? **(tick ONE box only)**

[ ] Full time employment

[ ] Part time employment

[ ] Student with paid employment

[ ] Unemployed

[ ] Home duties / student / unable to work / retired

[ ] Other, please specify _____

40. On average, how many hours of sleep do you get in a 24 hour period? .....hours…….....minutes

.

41. When driving or riding in the front seat of a car do you wear a seat belt?

[ ] All of the time

[ ] Some of the time

[ ] Never

[ ] I don't ride in cars

42. If you do drive a car, do you travel within the speed limit?

[ ] All of the time

[ ] Most of the time

[ ] Some of the time

[ ] Little of the time

[ ] Never

43. Over the last year, how many times did you drive when you felt that you had perhaps had too much to drink?

…….. times

44. How often do you brush your teeth?

[ ] Twice or more a day

[ ] About once a day

[ ] Less than once a day

[ ] Seldom or never

45. Have you taken any treatment (pills or medicines) over the past four weeks? (e.g. painkillers for headache, vitamins, antibiotics)

[ ] Yes, prescribed by a doctor
[ ] Yes, bought in a shop
[ ] No

46. Have you ever worked shift work?

[ ] Yes
[ ] No
[ ] Unsure

47. Do you currently work shift work?

[ ] No
[ ] Yes

How long have you been working shift work? ……years ……. months.

48. Please list the medicines you are currently talking (e.g. prescription, over the counter including antihistamines and herbal)

[ ] Yes, (Name/dose/frequency) _____

[ ] Not taking any medicines

49. Which best describes your money situation? **(tick ONE box only)**

[ ] I am spending more money than I get
[ ] I have just enough money to get through to the next pay day
[ ] There's some money left over each week but I spend it
[ ] I can save a bit every now and then
[ ] I can save a lot

50. Would you describe your family background as:

[ ] Wealthy (within the highest 25% in your country in terms of wealth)

[ ] Quite well-off (within the 50 - 75 % range for your country)

[ ] Not very well off (within the 25 - 50 % range for your country)

[ ] Quite poor (within the lowest 25% in your country in terms of wealth)

51. Which annual gross income bracket do **you** fit into? That is, your total income before tax is taken out. **(tick ONE box only)**

[ ] Up to $12,000

[ ] $12,001 - $20,000

[ ] $20,001 - $40,000

[ ] $40,001 - $60,000

[ ] $60,001 - $80,000

[ ] $80,001 - $100,000

[ ] $100,001 - $150,000

[ ] $150,000 or more

52. Which annual gross income bracket does **your household** fit into? That is, the total income for all people in your household before tax is taken out.
(tick ONE box only)

[ ] Up to $12,000

[ ] $12,001 - $20,000

[ ] $20,001 - $40,000

[ ] $40,001 - $60,000

[ ] $60,001 - $80,000

[ ] $80,001 - $100,000

[ ] $100,001 - $150,000

[ ] $150,000 or more

53. Does your family have

[ ] No car
[ ] One car
[ ] More than one car

54. Please give us an idea about the education of your mother and father:

Mother:

[ ] No education
[ ] Primary school
[ ] High school
[ ] College/University
[ ] I do not know

Father:

[ ] No education
[ ] Primary school
[ ] High school
[ ] College/University
[ ] I do not know

These questions concern your feelings about your life in general

55. Please circle the appropriate number.

		Disagree strongly				**Agree strongly**
1.	There is little I can do to change many of the important things in my life	1	2	3	4	5
2.	I often feel helpless in dealing with the problems in my life	1	2	3	4	5
3.	Whether or not I am able to get what I want is in my own hands	1	2	3	4	5
4.	What happens to me in the future mostly depends on me	1	2	3	4	5
5.	I have little control over the things that happen to me	1	2	3	4	5
6.	I can do just about anything I really set my mind to	1	2	3	4	5

This section concerns what you know about various health problems.

56. Across the page you will see a series of illnesses or health problems. Down the page are listed some factors that might influence them. For each health problem, put a cross in the box if you believe that it is influenced by the factor shown.

    For example, if you believe that heart disease is influenced by smoking, you should put a cross into the first box on the first line.

	Heart Disease	Lung cancer	Mental illness	Breast cancer	High blood pressure
Smoking	[ ]	[ ]	[ ]	[ ]	[ ]
Alcohol	[ ]	[ ]	[ ]	[ ]	[ ]
Exercise	[ ]	[ ]	[ ]	[ ]	[ ]
Stress	[ ]	[ ]	[ ]	[ ]	[ ]
Heredity	[ ]	[ ]	[ ]	[ ]	[ ]
Eating fat	[ ]	[ ]	[ ]	[ ]	[ ]
Being overweight	[ ]	[ ]	[ ]	[ ]	[ ]
Eating fibre	[ ]	[ ]	[ ]	[ ]	[ ]

Illicit drugs

All information gathered during this study will be **kept confidential**. The researcher will protect the identity of participants and maintain confidentiality of all information they provide, but researchers may be required to provide information to legal authorities including that relating to illegal activities such as recreational drug use under court order or subpoena. You are invited to answer these questions, but may choose not to.

57. Have you ever used recreational drugs?
    [ ] Yes
    [ ] No ***Thank you for completing the questionnaire***

58. Which of these **best** describes your recreational / illicit drug use? Please tick how often you currently use recreational drugs or if previously used. Write the age when you started using each drug and age when you last used. **(Tick all that apply)**

	Never tried	Tried once	Current daily	Current weekly	Current monthly	Past user	Age started	Age stopped
Marijuana / Cannabis	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
LSD / Hallucinogens	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Cocaine	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Ecstasy	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Heroin	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Meth / Amphetamine/Speed	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Other, please specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
Other, please specify	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

Thank you for completing this survey.

Appendix 6 NEO Conscientiousness Questionnaire

NEO PI-R Personality Inventory (C facets)

ID No. _____

This questionnaire contains 48 statements. Please read each item carefully and circle the one answer that best corresponds to your agreement or disagreement.

Circle 'SD' if the statement is definitely false or if you **strongly disagree**	(SD) D N A SA
Circle 'D' if the statement is mostly false or if you **disagree**	SD (D) N A SA
Circle 'N' if the statement is about equally true or false, if you cannot decide, or if you are **neutral** on the statement	SD D (N) A SA
Circle 'A' if the statement is mostly true or if you **agree**	SD D N (A) SA
Circle 'SA' if the statement is definitely true or if you **strongly agree**	SD D N A (SA)

There is no right or wrong answers, and you need not be an expert to complete this questionnaire. Describe yourself honestly and state your opinions as accurately as possible.

Answer every item. If you make a mistake or change your mind, do not erase. Make an X through the incorrect response and then draw a circle around the correct response.

Now begin with item 1.

1	I'm known for my prudence and common sense	SD D N A SA		
2	I would rather keep my options open than plan everything in	SD D N A SA		
3	I try to perform all the tasks assigned to me conscientiously	SD D N A SA		
4	I am easy going and lackadaisical	SD D N A SA		
5	I'm pretty good about pacing myself so as to get things done on	SD D N A SA		
6	Over the years I've done some pretty stupid things	SD D N A SA		
7	I don't take civic duties like voting very seriously	SD D N A SA		
8	I keep my belongings neat and clean	SD D N A SA		
9	Sometimes I'm not as dependable or reliable as I should be	SD D N A SA		
10	I have a clear set of goals and work toward them in an orderly fashion	SD D N A SA		
11	I waste a lot of time before settling down to work	SD D N A SA		
12	I think things through before coming to a decision	SD D N A SA		
13	I keep myself informed and usually make intelligent decisions	SD D N A SA		
14	I am not a very methodical person	SD D N A SA		
15	I pay my debts promptly and in full	SD D N A SA		
16	When I start a self-improvement program, I usually let it slide after a few days	SD D N A SA		
17	I am a productive person who always gets the job done	SD D N A SA		
18	Occasionally I act first and think later	SD D N A SA		
19	I often come into situations without being fully prepared	SD D N A SA		
20	I like to keep everything in its place so I know just where it is	SD D N A SA		
21	Sometimes I cheat when I play solitaire	SD D N A SA		

22	I work hard to accomplish my goals	SD	D	N	A	SA		
23	I have trouble making myself do what I should	SD	D	N	A	SA		
24	I always consider the consequences before I take action	SD	D	N	A	SA		
25	I pride myself on my sound judgment	SD	D	N	A	SA		
26	I never seem to be able to get organized	SD	D	N	A	SA		
27	When I make a commitment I can always be counted on to follow through	SD	D	N	A	SA		
28	I don't feel like I'm driven to get ahead	SD	D	N	A	SA		
29	Once I start a project I almost always finish it	SD	D	N	A	SA		
30	I often do things on the spur of the moment	SD	D	N	A	SA		
31	I don't seem to be completely successful at anything	SD	D	N	A	SA		
32	I tend to be somewhat fastidious or exacting	SD	D	N	A	SA		
33	I adhere strictly to my ethical principles	SD	D	N	A	SA		
34	I strive to achieve all I can	SD	D	N	A	SA		
35	When a project gets too difficult, I'm inclined to start a new one	SD	D	N	A	SA		
36	I rarely make hasty decisions	SD	D	N	A	SA		
37	I'm a very competent person	SD	D	N	A	SA		
38	I'm not compulsive about cleaning	SD	D	N	A	SA		
39	I try to do jobs carefully, so they won't have to be done again	SD	D	N	A	SA		
40	I strive for excellence in everything I go	SD	D	N	A	SA		
41	There are so many little jobs that need to be done that I sometimes just ignore them all	SD	D	N	A	SA		
42	I plan ahead carefully when I go on a trip	SD	D	N	A	SA		
43	I am efficient and effective at my work	SD	D	N	A	SA		
44	I spend a lot of time looking for things I've misplaced	SD	D	N	A	SA		
44	I'm something of a workaholic	SD	D	N	A	SA		
45	I'd really have to be sick before I'd miss a day of work	SD	D	N	A	SA		
47	I have a lot of self-discipline	SD	D	N	A	SA		
48	I think twice before I answer a question	SD	D	N	A	SA		

Thank you for completing this questionnaire.

Appendix 7 Kessler 10

K10

For all questions, please tick in the appropriate response circle

In the past 4 weeks:	None of the time	A little of the time	Some of the time	Most of the time	All of the time
1. About how often did you feel tired out for no goodreason?	○	○	○	○	○
2. About how often did you feel nervous?	○	○	○	○	○
3. About how often did you feel so nervous that nothing could calm you down?	○	○	○	○	○
4. About how often did you feel hopeless?	○	○	○	○	○
5. About how often did you feel restless or fidgety?	○	○	○	○	○
6. About how often did you feel so restless you could not sit still?	○	○	○	○	○
7. About how often did you feel depressed?	○	○	○	○	○
8. About how often did you feel that everything is an effort?	○	○	○	○	○
9. About how often did you feel so sad that nothing could cheer you up?	○	○	○	○	○
10. About how often did you feel worthless?	○	○	○	○	○

Appendix 8 Measure of Communicative and Critical Health Literacy

Measure of communicative and critical health literacy [#]

Do you think you can find and utilize the health and medical information if you need?

Please circle one number against each statement.

	Agree Strongly		Neutral		Disagree Strongly
1. I can collect health related information from various sources	1	2	3	4	5
2. I can extract the information I want`	1	2	3	4	5
3. I can understand and communicate the obtained information	1	2	3	4	5
4. I can interpret and judge the credibility of the information	1	2	3	4	5
5. I can make decisions based on the information, relate it to my situation and health issues	1	2	3	4	5

 # Ishikawa & Yaro 2008 **E M Rudnik/PhD/Communicative & Critical Health Literacy Measure**

Appendix 9 Sample distribution and outlier adjustments made to continuous variables

Variable	Shapiro-Wilk (df)	Number of outliers
Health Behaviour Score	0.98 (95)	2 outliers adjusted
Age	0.92 (102)*	Nil adjustment
Executive Functions composite z-score	0.98 (102)	Nil adjustment
Planning composite z-score	0.99 (102)	Nil adjustment
Zoo profile score	0.82 (102)*	Nil adjustment
SOPT total errors (RS)	0.98 (102)	Nil adjustment
Tower Achievement score	0.98 (102)	1 outlier adjusted
Inhibition composite z- score	0.99 (102)	Nil adjustment
Stroop Interference score	0.96 (102)*	2 outliers adjusted
Trail Maker B time (RS)	0.91 (102)*	1 outlier adjusted
Interference Control		Nil adjustment
Letter cancellation total	0.98 (102)	1 outlier adjusted
Verbal Fluency		Nil adjustment
Initial Letter total	0.98 (102)	Nil adjustments
Health Literacy composite z-score	0.1 (101) *	Nil adjustment
Functional Health Literacy composite z-score	0.62 (102)*	Nil adjustment
STOFHLA score	0.28 (102)*	9 outliers adjusted
NVS score	0.74 (102)*	2 outliers adjusted
CCHL score (RS)	0.95 (101)*	Nil adjustments
Intelligence composite z-score	0.96 (102)*	Nil adjustment

Variable	Shapiro-Wilk (df)	Number of outliers
Spot the Word total	0.95 (102)*	3 outliers adjustments
Matrix reasoning total	0.91 (102)*	Nil outliers adjusted
Sense of Control	0.97 (102) *	2 outliers adjusted
Health Behaviour Value Composite	0.98 (100)	Nil outlier adjustments
To take regular exercise	0.89 (102)*	Nil outlier adjustments
Not to smoke	0.65 (102)*	Nil outliers adjusted
Not to drink too much alcohol	0.95 (102)*	Nil outliers adjusted
To eat enough fruit	0.95 (102)*	Nil outliers adjusted
To keep your body weight within normal range	0.92 (102)*	Nil outliers adjusted
To get 7-8 hours sleep on most nights	0.88 (102)*	Nil outliers adjusted
To brush your teeth regularly	0.82 (102)*	Nil outliers adjusted
Never to drive after drinking alcohol	0.78 (101)*	2 outliers adjusted
To wear a seatbelt when travelling in a car	0.63 (102)*	4 outliers adjusted
To drive within the speed limit most of the time	0.88 (101)*	Nil outliers adjusted
To eat breakfast almost every day	0.80 (102)*	Nil outliers adjusted

SOPT = Self ordered pointing test; SToFLA = Shortened test of functional health literacy; NVS = Newest Vital Sign; CCHL = Critical & Communicative Health Literacy

* $p < .05$ indicating significantly different from a normally distributed sample