

Hearing Impairment, Psychosocial Functioning, and Bullying in Australian Adolescents

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Hearing Impairment, Psychosocial Functioning, and Bullying in Australian Adolescents

The Longitudinal Study of Australian Children (LSAC) is a longitudinal study of 10,000 young people in Australia following two different cohorts of children (Sanson et al., 2002). Cohort B, the “baby” cohort, began the study at birth whilst cohort K, the “kindergarten” cohort, began the study at age 4-5. Data collection focuses on development and wellbeing in relation to areas such as environment, parenting, health, education, family, peers, and childcare. Due to the large number of variables, and its longitudinal nature, the LSAC can be, and has been, used to address a wide variety of research questions. In the present study, it will be used to examine the relationship between hearing impairment and the psychosocial functioning of adolescents, their parents, and the role bullying may play in this.

Previous research using the LSAC, along with studies outside of it, have examined the psychosocial functioning of children and adolescents with and without hearing impairments. This is commonly measured using the Strengths and Difficulties Questionnaire (SDQ) which measures psychosocial functioning on 5 subscales; emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour (Goodman, 1997). For example, in 2015, Phillips & Hogan used the LSAC dataset to compare scores on the Strengths and Difficulties Questionnaire of hearing- and hearing-impaired children aged 4-5 years old in wave 1 of the K cohort. It was found that those with hearing difficulties were more likely to score higher in the hyperactivity scale. In contrast, outside of the LSAC, a study of students aged 6-16 in Austria reported that those who were hearing impaired scored higher on all subscales except hyperactivity/inattention (Fellinger et al., 2008). However, when the researchers compared students based on severity of impairment, students with severe hearing impairment scored higher on conduct problems and hyperactivity/inattention. In a systematic review and meta-analysis, Stevenson et al. (2015) found differences between parent and teacher reported scores on the Strengths and Difficulties Questionnaire. Teachers

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reported that their students with hearing impairments scored higher on conduct problems, whilst parents reported a higher level of emotional symptoms and decreased prosocial behaviour. Sarant et al. (2018) also found decreased prosocial behaviour in hearing impaired children with cochlear implants aged 5-8 years old. However, apart from this there were no significant differences in psychosocial development. In their study of 12-17-year-olds, Huber & Kipman (2011) found no differences between hearing- and hearing-impaired adolescents on all subscales except for peer problems, where they scored higher when rated by teachers.

Hearing impaired adolescents have also been reported to score worse on the Behaviour Assessment System for Children Second Edition (Freeman et al., 2017), Health Related Quality of Life (Le et al., 2020), and the Child Health Questionnaire (Wake et al., 2004). In addition, findings have suggested that they experience higher levels of mental illness (Brown & Cornes, 2015). However, other studies have reported no difference between children and adolescents with and without hearing problems regarding mental illness (Remine & Brown, 2010), perceived stress (Eschenbeck et al., 2017), or psychosocial functioning (Wong et al., 2018). Due to these varying results, it is important to determine whether there are in fact differences in the psychosocial functioning of hearing-impaired adolescents. Identifying where these differences lie may help inform future interventions.

Childhood hearing impairment may also affect parents, as raising a child with a disability can be stressful and impact one's mental health (Hsiao, 2018). Fathers of children with hearing impairments have been reported to experience greater levels of stress when compared to those without any disabilities (Mavrogianni & Lampropoulou, 2020). Mothers of children with hearing difficulties score significantly worse in health-related quality of life than mothers with children without disabilities. They also tend to score worse than fathers (Aras et al., 2014). An Indian study also reported that caregiver strain and psychological morbidities were higher in parents with hearing impaired children. This caregiver strain was

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associated with behavioural problems in their children (Driessche et al., 2014). Similarly, high levels of parental stress have been associated with increased socioemotional problems in the child (Hintermair, 2006). Whilst in Dirks et al.'s (2016) study there was no difference in stress between parent groups, increased levels of child-related stress were associated with poorer socioemotional functioning and language in children. In contrast, a study by Pipp-Siegel et al., (2002) found that mothers of children with hearing loss experienced less distress on the Parental Stress Index than those with hearing children. However, this effect was small. Apart from a few studies examining the psychological wellbeing of parents of children with hearing impairments, there has not been a large amount of research in this area. In addition, the LSAC has not yet been used in this context which provides this study with an opportunity to do so.

Children with hearing difficulties tend to experience bullying victimisation more frequently than those without these difficulties and are less likely to be perpetrators of bullying (Broekhof et al., 2018). Adolescents with poorer language skills and who report higher levels of anger, fear, and shame, have also been found to be bullied more frequently. This may be due to poorer social functioning, as over 50% of deaf children have been reported to experience disrupted social relationships (Landsberger et al., 2014) and are more likely to be worse at interpreting social situations (Torres et al., 2016). No previous articles were found using the LSAC to observe bullying in adolescents or children with hearing problems. However, one study focusing on social inclusion found that children with hearing impairments scored similarly to their hearing peers (Constantinescu-Sharpe et al., 2017). However, whilst most studies suggest hearing impaired adolescents are at greater risk of bullying, they are at a lower risk than those with additional comorbid disabilities (Brunnberg et al., 2008).

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The experience of bullying in adolescence has been linked to poorer psychosocial health, increased risk of anxiety and depression, peer rejection, and poor academic outcomes (Manrique et al., 2020). A German study found that hearing impaired adolescents were bullied more often and that physical and relational victimisation led to more behavioural and emotional problems (Pinquart & Pfeiffer, 2015). A different study of children in fifth and sixth grade in Cyprus were assessed on psychosocial functioning at two time points, 6 months apart (Stavrinides et al., 2011). It was found that bullying victimisation at the first time point was associated with increased emotional problems and decreased school achievement 6 months later. Interestingly, emotional problems the first time point was also associated with an increase in both bullying behaviour and bullying victimisation at the second time point, suggesting a bidirectional relationship between bullying and psychosocial functioning. In addition, a similar relationship between bullying and depression was found in children aged 10-17 in rural Pakistan, with bullying victimisation being a strong predictor of depression (Naveed et al., 2019). Abnormal psychosocial functioning was found to mediate this relationship. In their study on hearing impaired children aged 10-17, Nabors et al. (2016) found that hearing impaired children were less likely to be flourishing. Child flourishing was based on their curiosity to learn, face challenges in a calm way, and follow through with planned actions. However, bullying was not found to be a significant predictor of this. It does not appear that any moderation analyses have been conducted within this population to determine whether hearing impairment and/or depression moderate the effects of bullying on psychosocial functioning.

Another predictor of psychosocial functioning is frequency of contact with friends. In a study by Derdikman-Eiron et al. (2013), participants were assessed on psychosocial functioning in adolescence and were then followed up in early adulthood. It was found that frequency of meeting with friends and subjective rating of wellbeing in adolescence predicted

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psychosocial functioning in adulthood. Another predictor of psychosocial functioning may be language and literacy skills as it has been suggested that the relationship between hearing impairment and psychosocial functioning is due to poorer language skills associated with this impairment (Freeman et al., 2017).

The main research aims of this study are as follows.

1. To determine whether there are differences in psychosocial functioning between hearing- and hearing-impaired adolescents.
2. To determine whether parents of hearing-impaired adolescents experience poorer quality of life.
3. To explore the predictors of psychosocial functioning in adolescents.
4. To determine whether literacy and language skills mediate the relationship between hearing impairment and psychosocial functioning.
5. To determine whether hearing problems or depression moderate the relationship between bullying and psychosocial functioning.

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Method

Sample

Data used in this study were taken from wave 6 of cohort K of the LSAC, where adolescents were aged 14-15 ($n= 3537$). In addition, data from 3455 mothers and 2970 fathers were included. The LSAC used a two-stage clustered design using the Medicare database to select children from 311 postcodes from around Australia. Wave 6 data collection occurred during 2013-14 and the results were released at the end of 2015. An in-depth description of how the data were collected has been described elsewhere (Sanson et al., 2002).

Measures

Strengths and Difficulties Questionnaire (SDQ)

The Strengths and Difficulties Questionnaire measures psychosocial functioning on five subscales; emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour (Goodman, 1997). Each subscale includes 5 items rated on a scale of 1 to 3 for *not true* to *certainly true*. The total score is the sum of the four subscales excluding prosocial behaviour because the absence of prosocial behaviour is considered a separate construct to the presence of problem behaviours. Due to this, both total score and scores on individual subscales were used for analysis. Self-reported adolescent scores were used for this measure. Internal consistency was almost acceptable for total score ($\alpha= .66$) and prosocial behaviour items ($\alpha= .65$). Previous literature evaluating its use with Australian children has reported moderate ($\alpha= .59$) to high ($\alpha= .8$). internal reliability (Hawes & Dadds, 2004).

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Paediatric Quality of Life Scale (PedsQL): Psychosocial Health Summary

The Paediatric Quality of Life Scale is a brief assessment tool initially developed using a model of paediatric cancer to assess health related quality of life in children with chronic conditions (Varni et al., 1999). It is used to assess health related quality of life in both healthy and ill children and adolescents and can be self-reported by children as young as 5 years old (Varni et al., 2007). In the present study, the emotional and social development subscales were used to measure psychosocial health. These consisted of 5 items each rated on a scale of 1 to 5 for *never to almost always*. Total score was calculated as the mean of the summed scores from both subscales recoded such that 1= 100, 2= 75, 3= 50, 4= 25, 5= 0. Thus, a higher score indicates better psychosocial functioning. Internal consistency was high ($\alpha = .89$). Previous literature has also confirmed it has appropriate internal consistency ($\alpha > .70$) and construct validity (Varni et al., 2007).

Parental level of coping

To assess level of coping, parents were asked on a scale of 1 to 5 for *not at all to extremely well*, how well they thought they were coping. This was re-coded such that *not at all* was equal to 0, with the following options being recoded accordingly.

Parental difficulty of life at present

To assess difficulty of life, parents were asked how difficult their life was at present on a scale of 1 to 5 for *no problems or stresses to very many problems and stresses*. This was re-coded in the same way as parental coping.

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Hearing problems

The presence of hearing problems was measured by parents who answered yes or no to if the child experienced ongoing hearing problems. Responses were coded such that 1= Yes and 0= No.

Depression

Adolescent depression was self-reported using 13 statements asking how true they were for the participant on a scale of 1 to 3 from *true* to *not true*. The sum of the 13 scores was taken, and reverse scored such that a higher score indicated greater levels of depression. This was on a continuous scale. Any adolescent who scored 8 or above was considered above the cut off for depression which was measured on a categorical/binary scale as a separate variable. Internal consistency was acceptable ($\alpha = .745$).

Bullying victimisation

The level of bullying victimisation experienced by the adolescent was measured using the bullying frequency measure, which asks how often in the past month the participant had experienced different types of bullying (e.g., being hit, threatened, teased, excluded). Answers on 11 items were scored on a scale ranging from 1 to 3 for *once or twice* to *several times a week*. Scores were then summed to create a total score with a higher score indicating a greater range and/or frequency of bullying victimisation. Internal consistency was acceptable ($\alpha = .787$).

Language and Literacy

Language and literacy skills of the adolescent were reported by either a teacher or carer and were measured using the Academic Rating Scale-Language and Literacy measure. This measure includes 9 items rated on a scale of 1 to 5 for *not yet* to *proficient*. These items

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assessed adolescents on reading comprehension and fluency, written ability, information gathering techniques, and their ability to communicate ideas verbally. The Rasch modelled score of the items was used as the total score. Internal consistency was high ($\alpha = .962$).

Frequency of contact with friends

The adolescent's frequency of contact with their friends was self-reported on a scale of 1 to 6 for *no contact* to *everyday* (-1 = *don't have*). Scores were recoded such that -1 was equal to 0.

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Results

The adolescent participants in this study were aged between 14 and 15, ($Mdn= 14$) with 50.8% of the adolescents having identified as male ($n= 1798$) and 49.2% as female ($n= 1739$). The mean ages of the mothers ($n= 3455$) and fathers ($n= 2970$) in this study were 45 ($SD = 5.15$) and 48 ($SD = 6.16$) respectively. Out of the 3537 adolescent participants, 60 were identified as having ongoing hearing problems which is a prevalence of 1.70%. The gender distribution of adolescents with hearing problems was approximately even, with 51.7% being male ($n= 31$) and 48.3% being female ($n= 29$).

Psychosocial functioning of adolescents with and without hearing problems

The first aim of this research report was to determine whether there were any differences in psychosocial functioning between adolescents with and without hearing problems. Due to the large difference in group sizes between these groups, comparisons were made using the Mann Whitney U test. Effect sizes were calculated using Cliff's delta, as it is less affected by outliers than Cohen's d (Peng & Chen, 2014). As can be seen in Table 1, adolescents with hearing problems scored higher on the total Strengths and Difficulties Questionnaire score and lower on the Paediatric Quality of Life measure of psychosocial functioning with large effect sizes. They also scored higher on the emotional problems and hyperactivity/inattention subscales of the Strengths and Difficulties Questionnaire with large effect sizes, and on the peer problems subscale with a medium effect size. There were no significant group differences on the prosocial behaviour and conduct problems subscales.

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Table 1

Group comparisons of adolescents with and without hearing problems across measures of psychosocial functioning.

	Adolescents without hearing problems		Adolescents with hearing problems		Group comparisons		
	<i>N</i>	Median	<i>N</i>	Median	<i>W</i>	<i>p</i>	Cliff's delta
Total SDQ score	3275	9	56	13	69271	<.01	.98
Peer problems	3275	1	56	2	67512	<.001	.66
Conduct problems	3276	1	56	1.5	79125	.07	.69
Hyperactivity/ inattention	3275	4	56	4	76844	.04	.91
Emotional problems	3275	2	56	3.5	73574	.01	.84
Prosocial behaviour	3277	8	56	8	102144	.14	.99
PedsQL psychosocial functioning	3308	80	59	72.5	123493	<.001	.99

Note. SDQ= Strengths and Difficulties Questionnaire. PedsQL= Paediatric Quality of Life.

Quality of life of parents of adolescents with and without hearing problems

The second aim of this study was to determine whether parents of hearing-impaired adolescents experience poorer quality of life, measured by their self-reported level of coping and difficulty of life. Again, due to the large differences in group sizes, Mann Whitney U tests were conducted with Cliff's delta effect sizes. As can be seen in Table 2, there were no significant differences between groups except for between mothers of adolescents with and without hearing problems on difficulty of life scores. This had a large effect size.

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Table 2

Group comparisons of mothers and fathers of adolescents with or without hearing problems on self-reported scores of level of coping and difficulty of life.

	Mothers of adolescents without hearing problems		Mothers of adolescents with hearing problems		Group comparisons		
	<i>N</i>	Median	<i>N</i>	Median	<i>W</i>	<i>p</i>	Cliff's delta
Level of coping	3213	2	57	2	97321	.37	.99
Difficulty of life	3213	1	57	2	75775	.02	.90

	Fathers of adolescents without hearing problems		Fathers of adolescents with hearing problems		Group comparisons		
	<i>N</i>	Median	<i>N</i>	Median	<i>W</i>	<i>p</i>	Cliff's delta
Level of coping	2283	3	36	2	40907	.90	.99
Difficulty of life	2294	1	36	1	43767	.39	.91

Predictors of psychosocial functioning in adolescence

The third aim of this investigation was to determine the predictors of psychosocial functioning in adolescents. Table 3 shows the correlations between measures of psychosocial functioning and potential predictors. As can be seen, scores on the Strengths and Difficulties Questionnaire and the Paediatric Quality of Life Psychosocial Health Summary were significantly correlated with depression, bullying, literacy and language skills, gender, and hearing problems.

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Table 3*Correlation matrix of psychosocial functioning measures and their potential predictors.*

	1	2	3	4	5	6	7	8
1. Strengths and Difficulties	-							
2. Paediatric Quality of life	-.39***	-						
3. Depression	.63***	-.32***	-					
4. Bullying	.38***	-.22***	.34***	-				
5. Literacy and language skills	-.22***	.15***	-.08**	-.06*	-			
6. Contact with friends	-.03	.03	-.03	-.00	-.01	-		
7. Gender	.12***	-.13***	.18***	.01	.25***	.01	-	
8. Hearing problems	.06*	-.06**	.06*	.04	-.06*	.04	-.00	-

* $p < .05$. ** $p < .01$. *** $p < .001$

To examine the interrelationships between these variables in more detail, multiple linear regression was employed. This was used to determine whether hearing problems predicted psychosocial functioning above and beyond gender, depression, bullying and literacy and language skills. As can be seen in Table 4, these variables were entered first due to having stronger correlations with psychosocial functioning. The presence of hearing problems was then entered to examine whether this changed the model. The individual variance contributed to the model was also determined for each regressor. For both measures of psychosocial functioning, depression contributed most to the variance explained by the model, followed by bullying, literacy/language, and gender (see Table 4). The presence of

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hearing problems was not a significant predictor of scores on the Strengths and Difficulties Questionnaire after controlling for the other variables, although it was for scores on the Paediatric Quality of Life psychosocial health summary. However, one outlier was found to impact the results of this. When removed, the beta coefficient for hearing problems shifted from -5.31 to -3.77. Upon further examination, this participant had scored 0 on the Paediatric Quality of Life psychosocial health summary and had hearing problems. Given the sample of adolescents with hearing problems was already small, this participant was not removed from the analyses.

Table 4

Regression model comparisons across psychosocial health measures.

	SDQ				PedsQL			
	Model 1 $F [4, 2600] = 450.6^{***}$ $R^2 = .409$		Model 2 $F [5, 2599] = 361.4^{***}$ $R^2 = .410$ $R^2 \text{ change} = .001$		Model 1 $F [4, 2557] = 114^{***}$ $R^2 = .151$		Model 2 $F [5, 2556] = 92.24^{***}$ $R^2 = .153$ $R^2 \text{ change} = .002^*$	
	Beta	RI	Beta	RI	Beta	RI	Beta	RI
Depression	.42***	.25	.41***	.25	-.50***	.06	-.50***	.06
Bullying	.61***	.11	.61***	.11	-1.21***	.05	-1.20***	.05
Literacy/ language	-1.28***	.04	-1.27***	.04	3.40***	.03	3.36***	.03
Gender ^a	.97***	.01	.96***	.01	-4.28***	.02	-4.26***	.02
Hearing problems	-	-	1.33	.003	-	-	-5.31*	.003

Note. Beta weights are unstandardised. Greater SDQ scores indicate poorer psychosocial functioning whilst higher PedsQL scores indicate better psychosocial functioning. RI= Amount of model variance

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explained by single regressor. SDQ= Strengths and Difficulties Questionnaire. PedsQL= Paediatric Quality of Life- Psychosocial Health Summary.

^aGender was coded such that 1= Male, 2= Female.

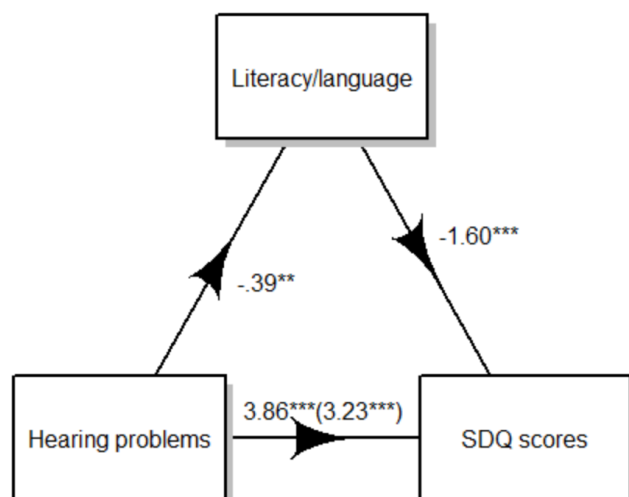
* $p < .05$. *** $p < .001$

Indirect effects of literacy and language skills on psychosocial functioning

The fourth aim of this report was to determine if language and literacy skills mediated the relationship between hearing problems and psychosocial functioning. This was done using the bootstrapping method of mediation. As can be seen in Figures 1 and 2, literacy and language skills partially mediated the relationship between hearing problems and psychosocial functioning. The significance of these effects was tested using bootstrapping procedures with 1000 bootstrapped samples. As can be seen in Table 5, the mediation effects for both psychosocial functioning outcome variables were significant.

Figure 1

Direct effect of hearing problems on scores on the Strengths and Difficulties Questionnaire with indirect pathway of literacy/language as a mediator.



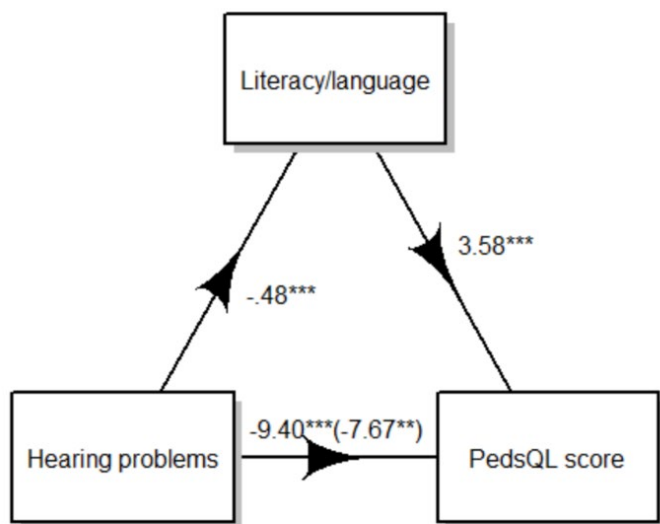
Note. SDQ= Strengths and Difficulties Questionnaire.

** $p < .01$. *** $p < .001$

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Figure 2

Direct effect of hearing problems on psychosocial health summary scores of the Paediatric Quality of Life scale with indirect pathway of literacy/language as a mediator.



Note. PedsQL= Paediatric Quality of Life psychosocial health summary score.

p* <.01. *p* <.001

Table 5

Results of language and literacy skills as a mediator between hearing problems and psychosocial functioning.

Measure of psychosocial functioning	Indirect Effect	95% CI	<i>p</i>
SDQ	(-.39) *(-1.60) = .62	[.05, 1.23]	.03
PedsQL	(-.48) *(3.58) = -1.72	[-3.13, -.55]	<.01

Note. SDQ= Strengths and Difficulties Questionnaire. PedsQL= Paediatric Quality of Life psychosocial summary.

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Moderating effects of hearing problems and depression

The fifth aim was to determine whether adolescents with hearing problems or depression experienced poorer psychosocial functioning due to bullying. The presence of hearing problems was not found to be a significant moderator of this relationship (see Table 6). However, depression was found to significantly moderate this relationship when scores on the Strengths and Difficulties scale were used to measure psychosocial functioning. As can be seen by Figure 3, adolescents with depression were at a greater risk of poorer psychosocial functioning compared to those without depression.

Table 6

Depression and hearing problems as moderators of bullying and psychosocial functioning.

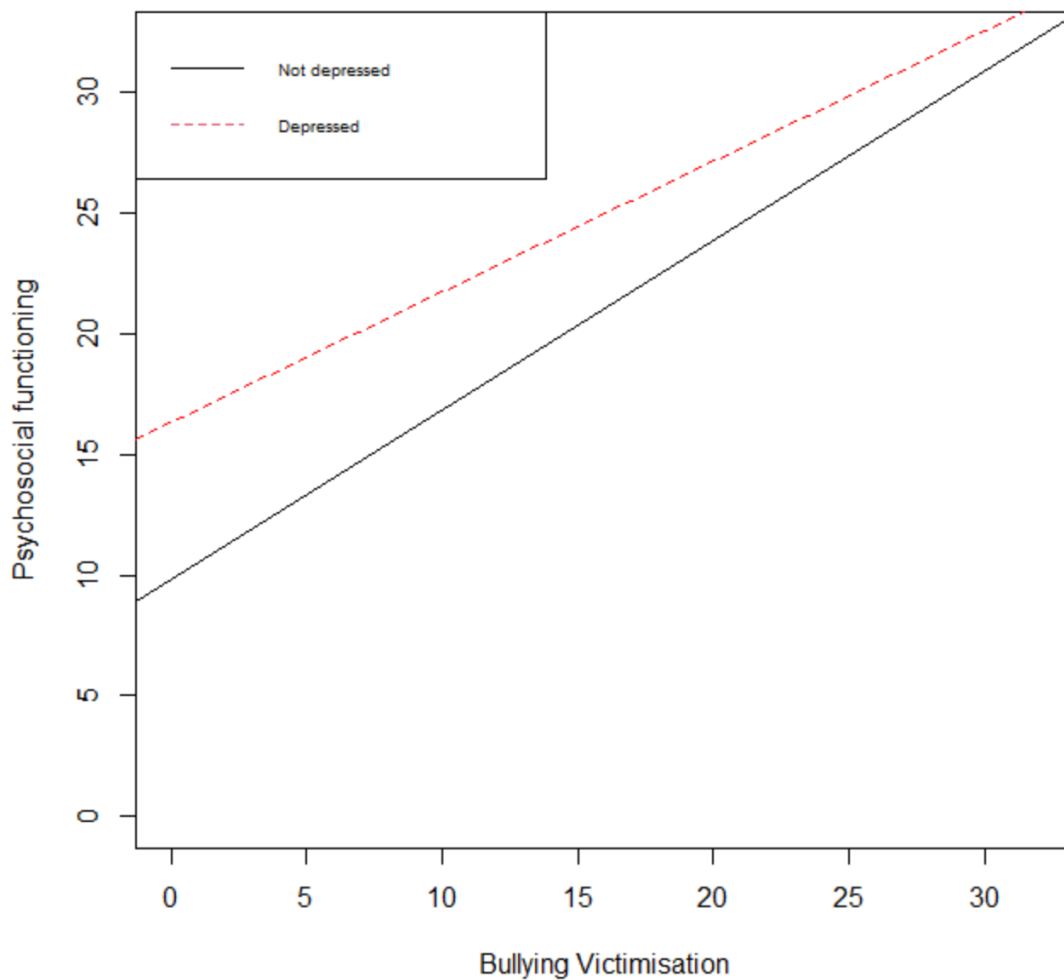
	SDQ				PedsQL			
	Estimate	SE	t	p	Estimate	SE	t	p
Intercept	9.79	.09	103.54	<.001	77.62	.27	282.44	<.001
Bullying	.98	.04	24.52	<.001	-1.69	.12	-14.51	<.001
Hearing problems	1.77	.77	2.30	.02	-7.25	2.15	-3.37	<.001
B*H	.004	.19	.02	.98	-.27	.59	-.45	.65
	Estimate	SE	t	p	Estimate	SE	t	p
Intercept	9.84	.08	116.87	<.001	77.86	.28	280.20	<.001
Bullying	.70	.04	16.31	<.001	-1.36	.14	-9.61	<.001
Depression	6.48	.20	33.04	<.001	-8.37	.65	-12.93	<.001
B*D	-.16	.07	-2.25	.02	.07	.24	.31	.75

Note. SDQ= Strengths and Difficulties Questionnaire, PedsQL= Paediatric Quality of Life Scale, psychosocial health summary. B*H= Bullying*Hearing problems. B*D= Bullying*Depression.

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Figure 3

The relationship between bullying victimisation and psychosocial functioning as a function of depression.



Note. Psychosocial functioning was measured by total score on the Strengths and Difficulties Questionnaire where a greater score indicates poorer psychosocial functioning.

Discussion

Overall, adolescents with hearing problems experienced worse psychosocial functioning than adolescents without hearing problems. However, whilst they scored poorer on the total psychosocial functioning measures, they did not consistently score worse on all subscales of the Strengths and Difficulties Questionnaire. Specifically, there was no difference between adolescents with and without hearing problems on the conduct problems and prosocial behaviour subscales. Due to having run multiple comparisons, it is important to interpret the significance of these tests with caution (Lee & Lee, 2018). Whilst some differences had very small p values, others were bordering on non-significant and therefore it is possible they were due to type 1 errors. In particular, the results regarding hyperactivity/inattention should be interpreted with caution ($p = .04$).

These results are partially supported by previous studies, however due to the inconsistent findings reported, results from the first aim were not entirely consistent with any one study. Differences in hyperactivity/inattention were consistent with the findings of Philips & Hogan (2015), however the additional differences in subscales were not. This was also contrary to Fellingner's (2008) results who had found no differences in hyperactivity. The results from the present study also differ from Pinquart & Pfeiffer's (2018) study on German adolescents, where adolescents with hearing problems reported more conduct problems. Interestingly, adolescents with hearing problems in Pinquart & Pfeiffer's (2018) study also reported more prosocial behaviours than their hearing peers. The inconsistencies in the literature surrounding psychosocial functioning of hearing-impaired children may be due to differences in who is reporting the behaviours. For example, whilst the present study found no difference in prosocial behaviour and used adolescent self-report, Stevenson et al.'s (2015) and Sarant et al.'s (2018) studies both found children with hearing problems had lower scores in prosocial behaviour when using parent reported scores. In another study, whilst parents

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reported higher emotional, peer, and conduct problems, self-reported child scores were only higher for peer problems (Fellinger et al., 2009). Thus, it is likely that different results arise depending on the respondent.

Regarding parental quality of life, parents of adolescents with hearing problems did not consistently experience poorer quality of life. This is evident in the fact that there were no differences in both mother and father coping, and in the difficulty of life of fathers. Mothers of adolescents with hearing problems did, however, report greater difficulty of life than mothers of hearing adolescents. This discrepancy between difficulty of life and coping may be because although these mothers experience more difficulties and stresses, they perceive themselves as being capable of coping. Furthermore, the fact that mothers of adolescents with hearing problems experienced increased difficulty of life but father did not, may be due to gendered factors. For example, Australian mothers tend to spend more time on caregiving duties and hold more responsibility for managing their children (Craig, 2006). This is highlighted by the greater number of missing values for fathers ($n= 1160$) than for mothers ($n= 184$) in the present study. Alternatively, this difference may be due to type 1 error caused by multiple comparisons.

The most important predictor of psychosocial functioning in adolescents was found to be depression, which explained the most variance in psychosocial functioning scores. These results support previous literature which has suggested children with depression experience poorer psychosocial functioning (Birmaher et al., 2004; Derdikman-Eiron et al., 2012). Bullying contributed the second most variance for both measures, followed by literacy and language skills, and gender. The link between bullying and psychosocial functioning found in the present study, is consistent with previous studies (Ford et al., 2017; Pinquart & Pfeiffer, 2015; Stavrinides et al., 2011). Regarding language and literacy skills, language impairments and dyslexia have been associated with poorer psychosocial outcomes, indicating both

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spoken language and written literacy skills may be important for psychosocial development (Conti-Ramsden & Botting, 2008; Parhiala et al., 2015; Snowling et al., 2006). Additionally, better speech intelligibility is associated with better psychosocial outcomes (Freeman et al., 2017). The results of gender predicting psychosocial functioning is surprising however, as it is contradictory to previous research which has indicated that boys tend to score poorer on psychosocial functioning and exhibit less prosocial behaviours (Emam, 2012; Klein et al., 2013). A study in Spain however, found that whilst boys scored higher on the Strengths and Difficulties total score, this decreased with age (Barriuso-Lapresa et al., 2014). Girls tended to score higher in emotional symptoms, which was found to increase with age, and boys scored higher in hyperactivity which decreased with age. This may suggest that boys only experience worse psychosocial functioning when they are younger.

The presence of hearing problems was not a significant predictor of scores on the Strengths and Difficulties Questionnaire, above and beyond other predictors. Although hearing problems were found to significantly predict scores on the Paediatric Quality of Life psychosocial health summary above and beyond depression, bullying, language/literacy and gender, the presence of an outlier may have inflated these results. In addition, hearing problems only contributed 0.3% of the variance explained by the model suggesting it may not be an important predictor of psychosocial functioning once other, stronger predictors are controlled.

The partial mediation effects of language and literacy skills on the relationship between hearing problems and psychosocial functioning were not entirely surprising given the relationship between both hearing problems and language and literacy with psychosocial functioning. Furthermore, research has suggested that children with hearing problems may experience difficulties with language and literacy skills (Cupples et al., 2018; Lee, 2020; Nassrallah et al., 2020). The presence of hearing problems was not found to moderate the

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relationship between bullying and psychosocial functioning, which was surprising considering the results from the group comparisons suggested they experienced poorer psychosocial functioning in general. This may be due to the very small sample size of adolescents with hearing problems. Depression, however, was a significant moderator. A clear relationship between bullying and psychosocial functioning was found, which depression exacerbated. Adolescents with depression began with poorer psychosocial functioning regardless of whether they had been bullied. This was not surprising considering depression was found to be the strongest predictor of psychosocial functioning in the regression analysis.

There are several limitations which should be considered in conjunction with the results. The use of non-parametric tests to observe group differences is one limitation. Such tests often sacrifice statistical power to handle data that violates the assumptions of parametric tests. However, this was necessary due to the large differences in group sizes. In addition, this small number of adolescents with hearing problems may not be representative of all Australian adolescents with hearing problems. This may be in part due to the use of a later wave of the LSAC where dropout is higher. In the wave used in the present study, the response rate had dropped to 71% (Australian Institute of Family Studies, 2019). Previous literature on another longitudinal study, the Avon Longitudinal Study of Parents and Children, has suggested that dropout may be systematic, not random (Wolke et al., 2009). However, despite finding specific predictors of dropout, the regression results were not greatly affected by this. Additionally, external validity may have been decreased due to the primarily non-indigenous (98%), Australian-born (96%) sample. The LSAC researchers did not choose children from postcodes in rural areas due to the costs of data collection, thus the sample is unlikely to be representative of the entire adolescent population of Australia (Australian Institute of Family Studies, 2017). Another limitation is the cross-sectional nature

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of this study which means that directionality of relationships or causation cannot be made. Finally, the method of identifying adolescents with hearing problems was vague as it did not specify the type of hearing problems, or if the child used a hearing device. The type of hearing device used, severity of impairment, and acquisition of hearing loss may affect psychosocial functioning outcomes. For example, in Theunissen et al.'s (2015) study, children with cochlear implants did not score differently from hearing children on internalising and externalising behaviours, whilst those with hearing aids did. Similarly, Wong et al. (2017) found that 5-year-old children with hearing aids scored higher in hyperactivity/inattention and conduct problems when compared to those with cochlear implants. Additionally, deaf adolescents have been found to report more emotional and peer problems when compared to hard of hearing adolescents whilst those with acquired compared to congenital hearing loss scored higher on hyperactivity/inattention. (Pinquart & Pfeiffer, 2018).

Despite the various limitations, this study does have its strengths. Firstly, the use of widely used and validated measures such as the Strengths and Difficulties Questionnaire and the Paediatric Quality of Life scale, along with overall good internal consistency for each variable ensures reliability of the results. The large sample is another strength, especially in the analyses that did not rely on group differences such as the regression analyses. There was also a relatively equal gender split and despite the use of a later wave, response rate was over 70%. The use of this later wave allowed adolescents to self-report, which in some cases, may be more valid and reliable than teacher or parent reported data. Additionally, the use of the bootstrapping mediation method rather than the traditional Baron & Kenny (1986) method is another strength of this study. The Sobel test which is used in the Baron & Kenny method has been criticised for being low in statistical power and has since been replaced with a more

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robust method proposed by Preacher & Hayes (2004) which uses bootstrapping (Zhao et al., 2010).

To address the increased risk of social and emotional problems in adolescents with hearing problems, targeted or school-wide interventions may be implemented. For example, improving peer relationships could be addressed through school-based team building exercises, providing education and prevention on bullying, and improving tolerance towards others. This may be particularly important where adolescents with hearing problems are in mainstream schools. Young adolescents with hearing problems should also be screened for depression and anxiety to identify symptoms early. In addition, interventions to build confidence, reduce anxiety, and improve emotional regulation may aid adolescents to reduce their emotional problems. Furthermore, the literacy and language skills of children with hearing problems may be targeted to improve psychosocial functioning indirectly.

Future research should aim to recruit an equal number of adolescents with and without hearing problems that is representative of the wider population of Australian adolescents. This may include purposive sampling of adolescents from different cultural backgrounds, from both rural and metropolitan areas, and from both non-indigenous and indigenous heritage. This will help improve the generalisability of the results and may allow for specific analyses between cultural groups or areas of Australia. Future researchers should also allow for specification of the type of hearing problem, and the use of hearing devices. Furthermore, observing the additive effects of additional comorbidities on both the psychosocial functioning of the child and the quality of life of the parent would be valuable. As children with hearing problems may have comorbidities (Cejas et al., 2015), this would allow researchers to identify which medical conditions and disabilities have the greatest impact on the child and their family. Qualitative accounts of parents' quality of life as it

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relates to their child's hearing problems would also likely provide valuable insights into how this disability affects their lives.

The results of this study support previous research suggesting children and adolescents with hearing problems experience poorer psychosocial functioning. However, the evidence was not convincing that parents experienced poorer quality of life because of their child having these problems. An association between depression, bullying, language and literacy, and gender, with psychosocial functioning was also found which supported previous literature. Despite its limitations, this study contributes to the body of research on adolescents with hearing problems, and in identifying factors relating to psychosocial functioning, may guide future research and clinical interventions.

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