Consistencies in Body-Focused Hand Movements

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Contents

Abstract

Irrelevant self- or object-manipulations are a common part of human nonverbal behaviour. While the systematic association between stressful settings and the occurrence of these body-focused hand movements has suggested to many authors that they are an indicator of arousal (e.g. LeCompte, 1981), other authors have suggested that body-focused movements act as an aid to attention focusing during distraction (e.g. Barroso et al., 1978).

In this series of investigations attempts were made to relate an attention narrowing measure (using a reaction time probe procedure) to body-focused movement frequencies. No significant correlations were obtained. Experimental attempts to increase body-focused movement frequencies by manipulating the level of distraction experienced by the subjects were also not successful. It was concluded that no simple relationship exists between body-focused movement occurrence and distraction.

While body-focused movements have been researched for more than half a century there is still little information concerning individual and cross-cultural consistencies in body-focused movement production.

Over a series of studies the preferences of individual subjects for particular forms and frequencies of body-focused movement were examined. While comparisons of some settings demonstrated that the subjects were consistent in body-focused movement preferences other settings showed much lower levels of consistency. Attempts to relate a variety of relevant personality measures to body-focused movement

frequencies showed little consistency across experimental settings. However, different tasks were consistently associated with different frequencies of body-focused movement.

The consistent association of body-focused movements with particular tasks was examined for four groups of subjects drawn from different cities (Adelaide, Brussels, Rome and Sheffield). While some quantitative differences between the cities were observed, the same significant task effects were obtained in each city. Naturalistic observations of body-focused movement performance in public settings were recorded from seven cities (Adelaide, Antwerp, Brussels, Munich, Paris, Rome, and Sheffield). Similar associations between settings and body-focused movement production were observed in each city.

Overall the data collected suggested that body-focused movements are produced for similar reasons by subjects from different cultural backgrounds. The stress model was the most successful predictor of setting differences in body-focused movement occurrence.

Copywrite Statement

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While the assistance of the above people was instrumental in the completion of this thesis the form, content and any errors it may contain are entirely the responsibility of the author.

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A Note on Statistical Analyses

All the statistical calculations reported in the subsequent chapters were calculated using the SPSSx statistical program package (SPSS inc., 1986). In subsequent tables, unless otherwise indicated, a statistic which is statistically significant at the 0.05 type one error rate will be indicated by an "*" while statistics significant at the 0.01 type one error rate will be indicated by the symbol "**".

Figures

Figures cont.

Chapter 1

Consistencies in Body-Focused Hand Movements - A Review

In recent years the study of nonverbal behaviour and its role in the total communication process has advanced considerably (see Patterson, 1983 for a review). Unfortunately the significance and possible functions of many common classes of movement are still not well understood. This thesis is concerned with hand movements, and in particular the frequent apparently irrelevant self- or object-manipulating movements which are among the most frequent discrete actions produced in everyday circumstances (LeCompte, 1981).

While movements of the hands and feet appear to play a role in the communication of emotion, along with facial expressions and gross postural factors (Ekman, Friesen, O'Sullivan & Scherer, 1980), the part played by self- or object-manipulations is far from clear.

Certain types of hand movement present relatively few problems to the investigator as they are readily decoded by those familiar with the cultural context (Ekman & Friesen, 1972; Ekman, 1976; Johnson, Ekman & Friesen, 1975). The child who raises his hand in class or the traffic policeman gesturing at passing vehicles have little doubt that their movements will be understood. Similarly the political speaker emphasizing points with his fist on the table, or the fisherman indicating the size of his catch, can communicate effectively through the association of their movements with simultaneous changes in the form or content of the speech flow.

However, there are many frequently occurring hand movements that do not appear to have either a simple readily decodable meaning or an intimate association with speech content or form (Ekman & Friesen, 1972; Freedman & Steingart, 1975). When embarrassed, subjects can often be observed to engage in repeated manipulation of the face, body, or surrounding objects (Edelman & Hampson, 1979; Krout, 1954a). Very similar self- or object-manipulations can be observed in a range of stressful and other contexts (Ekman & Friesen, 1972; Feiring & Lewis, 1979; Freedman et al., 1972; Jones, 1943a, b; LeCompte, 1981). Some of these movements, such as scratching the head or rearranging one's clothing, might be explained as attempts by the subject to make themselves more comfortable, or as attempts to improve upon their appearance. Others, such as vigorous twisting and pulling of one's clothing or prolonged manipulations of one hand by the other, do not seem to be comfort or self-presentation related. The apparent irrelevance of these hand movements to the primary activity engaged in by the performer, together with their systematic association with stressful contexts, has encouraged many authors to examine experimentally the occurrence and significance of all self- or object-manipulating movement. Unfortunately little agreement has been reached in the literature concerning the terminology to employ. As a consequence it is necessary to consider briefly the range of terminologies and definitions that have been created over the past half century or so (Olson, 1930) of systematic research on apparently irrelevant hand movement.

Terminology

Many hand movements appear to be related to the speech of the performer. Some common types of hand movement appear to stand for simple concepts and may even replace speech (Johnson, Ekman & Friesen, 1975). Others accompany speech and appear to be related to its temporal patterning (Ekman & Friesen, 1972; Freedman et al., 1972). Still others serve to elaborate on the verbal statement (Graham, Bitti & Argyle, 1975). The apparently irrelevant hand movements mentioned above appear to behave somewhat differently. They do not appear to be directly associated with the form or temporal patterning of speech (Ekman & Friesen, 1972; Freedman & Steingart, 1975). As a consequence most authors concerned with hand movements have differentiated between these two classes of movements (Ekman & Friesen, 1972; Friesen, Ekman & Wallbott, 1979; Freedman & Hoffman, 1967; Kimura, 1973a, b; Krout, 1954a; Ruggieri, Celli & Crescenzi, 1982; Sainsbury, 1955). When the subject's movements are recorded on videotape or film for analysis inter-observer reliability measures for the distinction between these two classes of movement have universally been extremely high (Ekman & Friesen, 1972; Friesen, Ekman & Wallbott, 1979; Freedman et al., 1972; Kimura, 1973a,b; Koch, 1942; Krout, 1954a; Ruggieri, Celli & Crescenzi, 1982). The technique of timing and recording the frequencies of each class of movement after repeated viewing of the subject's performance on videotape results in relatively few difficult discriminations between the two classes of hand movement (Friesen, Ekman & Wallbott, 1979).

Freedman and his colleagues (Freedman & Hoffman, 1967; Freedman, O'Hanlon, Altman & Witkin, 1972) refer to the speech related movements as "object-focused movements".

> "Object-focused movements, by definition, are those hand movements which are intimately linked to the formal and/or context aspects of speech. These movements also have a characteristic directionality in that they tend to occur at a distance from the body surface and do not involve body-touching" (Freedman, 1972 p.157).

Those hand movements that appear to be unrelated to either the speech or other activities of the subject are "body-focused movements".

> "The defining characteristic of body-focused movements is that the hands are involved in the stimulation of the body or its adornments." (Freedman, 1972 p.162).

Freedman et al. (1972) also recognize several subcategories of body-focused movement. Irrelevant self-manipulations that involve one hand manipulating itself or the other hand are called "hand-to-hand" behaviour. Other self-manipulations, such as stroking the face or rubbing an arm or leg, are "direct body-focused movements", while irrelevant manipulations of the subject's clothing or other associated objects are "indirect body-focused movements". Brief body-focused movements (less than 3 seconds duration) are called "discrete" movements and are tabulated separately.

While a variety of terms exist to label both body- and object-focused movements the terminology developed by Freedman appears to present some advantages for the questions posed in the studies to follow. It is primarily through the work of Freedman and his colleagues that the exploration of an association between attention and hand movement has arisen (Barroso et al., 1978; Barroso and Feld, 1986). To allow simple comparison with Freedman's findings directly comparable categorization schemata are an advantage. Also the varied subcategories postulated by Freedman allow more detailed consideration of consistencies in the form of the movement than could be obtained with many of the broader categories employed by many other hand movement researchers. (See below for a consideration of some of the alternative terminology). For these reasons Freedman's terminology will be employed throughout the studies that follow with only minimal modification. This terminology is essentially compatible with that employed by other leading researchers of hand movement (Friesen, Ekman & Wallbott, 1979).

While both body and object-focused movements may occur in similar contexts, external variables may influence their frequency and form in quite different ways. Blass, Freedman and Steingart (1974) found that congenitally blind subjects displayed very few object-focused movements when giving a brief monologue. Sighted subjects were reported to produce many object-focused movements when given the same task. Both blind and sighted subjects produced many body-focused movements in this setting, with the blind subjects producing the higher frequencies.

Object-focused movements are usually associated with communicative settings. For example, subjects requested to communicate the solution to a water-jar problem to the experimenter employed many object-focused hand movements to indicate the required sequence of actions (Barroso, Freedman, Grand & van Meel, 1978). The same subjects produced very few object-focused movements when asked to complete the well known Stroop colour confusion task (Barroso et al., 1978). Body-focused movement showed the opposite trend. Higher frequencies of body-focused movement were associated with the Stroop task rather than the water-jar problem.

While object-focused movements appear to be associated with conversations or other settings involving interpersonal communication, body-focused movement can frequently be observed in settings where little interpersonal communication is apparent (Ekman & Friesen, 1972; Kimura, 1973a, b; Sainsbury & Wood, 1977; Williams, 1973). For example Williams (1973) observed frequent self-manipulatory movement while the subjects were performing a problem solving task in an isolated room, and while they were not aware that they were being observed.

These varied differences in the factors influencing body-focused movement and object-focused movement suggest that the mechanisms underlying each are significantly different.

Some descriptive differences in the two classes of hand movement have also been reported. Studies dating from the work of Kimura (1973a, b) on the laterality of hand movement have reported differences for object and body-focused movements. Object-focused movements tend to be associated with the dominant hand, at least in right-handed subjects. Body-focused movements have generally been found to show no bias to either hand (Dalby, Gibson, Grossi & Schneider, 1980; Feyereisen, 1977; Ingram, 1975; Kimura, 1973a, b;

Souza-Poza, Rohrberg & Mercure, 1979), though Ruggieri, Celli & Crescenzi (1982) did report a weak bias for body-focused movement to the nondominant hand.

Despite the widespread agreement on the distinction between irrelevant self- or object-manipulatory behaviours and those associated with verbal communication, the number of terms used to label these categories is only slightly fewer in number than the number of relevant investigators. More important are the differences between authors in their exact definition of irrelevant movement. Terms such as "adaptors" (Ekman & Friesen, 1972), "manipulators" (Friesen, Ekman & Wallbott, 1979), "nervous habits" (Koch, 1942; Williams, 1973), "tics" (Blatz & Ringland, 1935), "self-touching" (Kimura, 1976), "autocontacts" (Feyereisen, 1977), "unconscious manual symbolic gestures" (Krout, 1954a), "alone movements" (Sainsbury & Costain, 1971), and "exploratory gestures" (Beuter, 1980) all seem to be describing overlapping categories of irrelevant movement. All seem to include in the scope of their definitions body-focused movement, that is irrelevant hand movements that involve self-manipulation.

However a number of authors have avoided the inclusion of irrelevant object-manipulations in their categories. Thus "self-touching" and "autocontacts" have a slightly narrower scope in this respect than the terminology employed by Freedman. Comparisons of irrelevant object-manipulations and self-manipulations by Freedman and his group appear to show very similar frequencies and situational influences for these two types of movements, and they have largely abandoned this distinction in more recent papers (Freedman, Blass, Rifkin & Quitkin, 1973). Similarly Ekman, Friesen and their colleagues (Friesen, Ekman & Wallbott, 1979) have considered both object- and self-manipulations in their discussions of "manipulators". At this stage it would therefore seem useful to consider such irrelevant object-manipulations together with self-manipulations.

Both "self-touching" and "autocontacts" have also been used to include foot or other body movements when these involve self-contact. Little is known about the relationship between irrelevant foot and hand movements. At a simple practical level, hand movements are less likely to be inhibited by postural factors than are foot movements, and their frequency is likely to be higher in many settings as a consequence. The author has followed Freedman in concentrating exclusively on hand behaviour.

Even in the central core area of irrelevant self-manipulatory hand movement some authors employ much broader categories than others. LeCompte (1981), for example, incorporated "hands in pockets" and "one hand resting on another part of the body". The classification of static touching as irrelevant hand behaviour appears unnecessarily to broaden the central concept of irrelevant manipulation. While there appear to be no quantitative comparisons of static self-touching behaviours and body-focused movement in the literature, the defining quality of irrelevance appears to be much less obvious in the case of such postural behaviour. Having the hands in the pocket may simply be a comfortable resting position. Similarly having one's chin resting on a hand may be a comfortable relaxing posture when seated. Active manipulations do not seem so open to simple interpretations of comfort. Active rubbing of the chin, for example, seems to require a different type of explanation. LeCompte (1981) after analyzing his field observations of "self-stimulations" appears to have recognized that his categories may be overly broad.

> "Perhaps the smallness of the effect is partially a consequence of the extremely global definition of the observational category .... Although it seemed reasonable in an initial investigation of this phenomenon to include all examples of hand-body contact, perhaps other studies could attempt to refine this observational category." (p. 720).

This possibility that passive touching may represent a quite different process from active manipulation suggests that the more conservative category of examining only active manipulations may be more productive in this early stage of our understanding of hand movement. As a consequence only active manipulations will be considered in the studies that follow.

One further term requires elaboration. The term "stereotypies" or "stereotyped movements" has been widely employed in the literature for a group of movements which share the property of apparent irrelevance with body-focused movement. Despite some similarities between body-focused movement and stereotyped movement it will be suggested here that there are sufficient differences to warrant separate consideration.

Hutt and Hutt (1965 p.1) define stereotyped behaviour to be

> "repetitions in an invariant pattern of certain movements having no observable goal."

While both body-focused and stereotyped movements can both be hand movements, and can both lack an obvious goal, the two categories are not synonymous. The distinctive feature of stereotyped movement, as the name suggests, is their constancy of form. Further, many of the common stereotyped movements observed in "normal" subjects e.g. rocking or leg swinging, do not involve self- or object-manipulations. There are some similarities in the types of external variables which will influence both classes of movement. Arousal or frustration, for example, appear to lead to elevations of stereotyped movement frequencies (Billig, 1941; Forehand & Baumeister, 1970; Hutt & Hutt, 1970; Thelen, 1981) and have similar effects on body-focused movement (Kehrer & Tente, 1969; Feiring & Lewis, 1979; Waxer, 1977). However the lower frequency of these stereotyped movements in the "normal" population contrasts with their frequency in observations of those suffering behavioural, sensory or neurological impairment (Forehand & Baumeister, 1970; Eichel, 1978, 1979; Hutt & Hutt, 1965), or in the very young (Thelen, 1979, 1980, 1981). There does not appear to be similar associations of high frequencies of body-focused movement with these types of individuals. Hutt & Hutt (1965) found an inverse relationship between the effects of environmental complexity on stereotyped and body-focused movement in a group of autistic children. Increases in "environmental complexity" increased stereotyped movement while decreasing the frequency of body-focused movement. However, Berkson and Davenport (1962), when examining the behaviour of a group of "mental defectives" (a number of whom were blind) found a significant positive correlation between stereotyped movement and self-manipulation and a negative correlation with "environmental manipulation" (a category resembling irrelevant object-manipulations but also containing "exploit object").

In summary, while there are some similarities between body-focused movement and stereotyped movement, there appear to be a number of reasons to distinguish body-focused and stereotyped movements as separate movement categories. While it might well emerge that the two categories are related, at this stage it seemed wise, on simple practical grounds, to limit the studies in the current project to body-focused movements as these are considerably more frequent in everyday settings and therefore can be more readily examined in detail.

Individual Differences and Body-Focused Movement

We all know someone who is known for the particular way she pulls her earlobe when in thought or the way he wrings his hands when under emotional stress. But how significant are the individual variations in body-focused movement performance? Are the distinctive behavioural elements we recognize in those we deal with a minor or major part of the total body-focused movement performance produced by these individuals? Are the circumstances which elicit body-focused movement significantly different across individuals or are there common elements?

The primary technique that has been employed to explore the association between individual differences and both the form and frequency of body-focused movement has been to intercorrelate body-focused movement occurrence with personality measures. The results of such correlational procedures have unfortunately been lacking in consistency. As will be discussed further below, an association of body-focused movement with anxiety has frequently been suggested (Barroso et al., 1978; Ekman & Friesen, 1972; Freedman & Steingart, 1975; Jurich & Jurich, 1974). However, while paper-and-pencil anxiety measures have been found by some investigators to correlate with body-focused movement frequency (Waxer, 1977) others have not found this relationship (Grand, Marcos, Freedman & Barroso, 1977; Wiens, Harper & Matarazzo, 1980).

Field-dependence has been another focus of interest following the influential work of Freedman et al. (1972). Similar difficulties have been found in replicating the finding of a positive relationship between field-dependence measures and body-focused movement frequencies. While some have found a positive relationship (Freedman, et al., 1972; Souza-Poza & Rohrberg, 1977) others have not found this result with similar paper-and-pencil measures (Wiens et al., 1980; Williams, 1973).

Inconsistencies over correlations with body-focused movement measures are not confined to personality. Findings in the area of clinical behaviour pathologies are similarly lacking in consistency. Ekman & Friesen (1974) found that one class of object-focused movement ("illustrators") was negatively related to depressive mood but direct body-focused movement frequency ("self-adaptors" in their terminology) was not related to the degree of depression of the patient. However, Miller, Ranelli and Levine (1977) and Jones and Pasna (1979) found that subjects diagnosed as depressed produced higher frequencies of hand movements to the body. Similarly, Ruggieri, Guiliano and Fusco (1980) obtained significant correlations between self-touching scores and Zung's Depression Questionnaire with a group of Italian subjects.

Duncan and Fiske (1977) found few correlations between "self-adaptor" measures and external variables. However the association of negative affect with body-focused movement was supported by their finding of a significant correlation between self-adaptor rate and the subjects' report of their own feelings. For at least some subjects self-adaptor frequency was correlated with self-reports of

> "Gloomy, Sensitive (opposite pole from Cheerful, Objective)." (p.113).

Campbell and Rushton (1978) intercorrelated a number of nonverbal behaviour frequencies observed during a dialogue with a variety of personality measures. "Touching the self" failed to correlate with paper-and-pencil measures of IQ, Extroversion or Neuroticism. An independent rating of these same individuals on a Teachers Rating Scale, designed to indicate extroversion and neuroticism, did however correlate significantly with self-touching frequency.

Fairbanks, McGuire and Harris (1982) examined the nonverbal behaviour of groups of psychiatric patients, psychiatrists and normal controls during a brief psychiatric interview. Some body-focused movement frequencies ("grooming") were higher for the patients when contrasted with the control group. Other types of body-focused movement ("hand tapping") did not differentiate these groups. The patients and psychiatrists also showed some differences in some body-focused movement frequencies. Correlations of nonverbal behaviour and the patient's score on the Brief Psychiatric Rating Scale suggested some positive associations between the body-focused movement frequencies observed and whether the patient was judged to be suffering from "Thought Disorder" or "Anxiety-Depression".

Given the common belief that body-focused movements show consistent differences between individuals this failure to find consistent associations between body-focused movement and a variety of plausible external variables is disappointing. In looking for an explanation of this lack of consistency across studies the possibility that the variety of settings employed by these investigators is having a significant effect needs to be considered. Most of these investigations of personality correlates of body-focused movement frequencies were restricted to observations of only one context. The inconsistencies observed between studies may reflect significant influences associated with the requirements of the specific tasks performed by the subjects.

Even where positive associations between body-focused movement and personality measures have been found these have not always generalized across tasks. In the study by Freedman et al. (1972) the significant difference in hand-to-hand manipulations (one class of body-focused movement) observed between field-dependent and field-independent subjects was only observed for some of the experimental settings employed, and was not observed in others. Though Souza-Poza and Rohrberg (1977) also report a significant difference in body-focused movement between field-dependent and field-independent subjects engaging in a similar task, they found the major differences to be in continuous body-touching (a synthesis of the direct and indirect movement categories employed by Freedman and his colleagues), rather than in the hand-to-hand movement found by Freedman et al. (1972).

There are surprisingly few studies where the individual consistencies of body-focused movements have been reported across repeated performances by the same subjects, making it difficult to determine the relative significance of individual differences in body-focused movement performance.

The finding by Freedman et al. (1972) that only some settings produced correlations with field-dependence measures, and the widespread acknowledgment that situational changes can produce marked changes in body-focused movement frequencies across subjects (Barroso et al., 1978; Barroso and Feld, 1986; Goldberg & Rosenthal, 1986; LeCompte, 1981; Wild, Johnson & McBrayer, 1983) suggest that individual consistencies are only one of the factors affecting body-focused movement frequencies in any given combination of settings.

Sainsbury and Costain (1971) report extraordinarily high correlations between body-focused movement frequencies ("alone movements") for repetitions of the same interview task for "healthy controls" and for "psychoneurotics" and "manics". When only short delays were present (15 minutes) correlations as high as 0.82 were reported, while after an interval of four weeks the highest figure obtained was 0.71. Considering the general agreement that measures of body-focused movement are characterized by high variances (Williams, 1973), this level of agreement argues for considerable involvement of individual differences in the amount of body-focused movement observed for a given situation.

Unfortunately, some cautionary notes need to be added. Sainsbury and Costain (1971) do not make it completely clear how they scored the movements they describe. Movements were recorded by the use of electromyograph leads attached to the subjects' forearms. It is not made clear whether the number of movements only was tallied or whether their duration was also considered. How the body-focused movements were differentiated from other types of hand movement was also not clearly explained. This EMG technique may well mask idiosyncrasies by failing clearly to differentiate different types of hand and arm movement (Williams, 1973).

In a more clear-cut investigation, Ruggieri, Guiliano and Fusco (1980) examined the body-focused movement frequency ("self-contact") of subjects while completing the Zung's Depression Scale and while being interviewed. Significant correlations between body-focused movements for the same subjects across the tasks led these authors to conclude-

> "..it is clear that different situations lead to more or less exhibition of self-contact, but it is equally true that in different situations the subjects rank hierarchically. Some subjects are inclined to show very high self-contact in different situations and some are inclined to

show always a minimum, as if self-contact were a personality feature." (Ruggieri, et al., 1980 p.193)

Here, again, methodological factors may present a problem with interpretation, as these authors use passive as well as active self-touching in their behavioural measures.

In attempting to understand the pattern of occurrence of body-focused hand movement a clear grasp of the role of individual differences and their significance is essential. While the literature discussed above may be viewed as suggesting a significant role for individual differences in body-focused movement the general lack of consistency across studies is disappointing and requires explanation. While some inconsistencies may relate to methodological or definitional differences this is not a sufficient explanation. One possible explanation is that in at least some settings situational effects overwhelm and mask individual subject movement preferences. The intercorrelation of body-focused movement with personality measures over a range of settings may help in obtaining a more consistent picture.

Context and Body-Focused Movement

Consistent situational effects on body-focused movement have been reported by many authors over the last half century (Olson, 1930) of systematic investigation. High frequencies of body-focused movement have been described for embarrassing situations (Krout, 1954a; Edelman

& Hampson, 1979), crowding (Stokols, Smith & Prostor, 1975) and generally for lying (Ekman, Friesen & Scherer, 1976; Knapp, Hart & Dennis, 1974; Kraut, 1978; McClintock & Hunt, 1975; Mehrabian, 1971; O'Hair, Cody, & McLaughlin, 1981). Feiring and Lewis (1979) observed an increase in "self-stimulations" when 2-year-olds were prevented from reaching their mother by a barrier. Kehrer and Tente (1969) reported an increase in the number and variety of body-focused movements when they failed to tell children the end of an exciting story. Jones (1943a,b) observed subjects while they were performing mental arithmetic and "inhibiting micturition". In both circumstances the frequencies of body-focused movement were greater than that for a comparison "rest" condition. Rosenfeld (1967) provided "approving" and "nonapproving" nonverbal and verbal responses to high school children in an interview. Fewer self-manipulations were observed for the approving condition. Williams (1973) observed high frequencies of body-focused movement when isolated subjects were presented with difficult problems to solve. Wild, Johnson and McBrayer (1983) reported that even the difference between watching a film on insects and one on birds was sufficient to obtain a consistent difference in body-focused movement frequency, with insects being the more powerful elicitor.

In brief, this small sample of the available studies demonstrates that an extraordinary range of situations can produce marked and significant changes in body-focused movement. Indeed, the range of situations that will produce significant shifts in body-focused movement frequency has caused some researchers to despair of finding a general explanation for body-focused movement occurrence. Wild et al. (1983) suggest, for example, that there is an

> "apparent lack of close dependence of such behaviour on internal processes" (p.550).

In attempting to explain his failure to find a relationship between neuroticism scores and body-focused movement frequencies ("nervous habits") Williams (1973) concludes that

> "The most likely explanation is that nervous habit patterns are idiosyncratic..."(p. 107).

The fact that many quite diverse situations can systematically influence body-focused movement frequencies suggests that we need to look beyond individual differences in the subjects' attitudes and experiences if we are to understand the factors influencing body-focused movement occurrence. It may be that this diverse range of movements can be influenced by a wide diversity of factors, and therefore single models which seek to explain all body-focused movement occurrences may be overly ambitious. None the less hypotheses which are only applicable to specific individual settings, while they are often easily generated, may lead us to miss important similarities underlying body-focused movement occurrence in diverse settings. These similarities may be our best sign-posts towards the development of an understanding of the significance of these apparently irrelevant and yet systematically occurring movements.

For example, Wild et al. (1983) argue that their finding of greater body-focused movement frequency for their insect film watching task may be related to the subjects imagining the insects crawling upon them, and their responding to the consequent skin irritation. Such an hypothesis clearly has little generality in explaining systematic associations between body-focused movement and settings. While the hypothesis might be potentially correct, it would seem constructive at this stage in our understanding to also consider broader hypotheses. Could perhaps the subjects have found the experience of watching insects, as contrasted with a "neutral" film, unpleasant and thereby arousing? Perhaps then the self-manipulations could be related to similar manipulations in such diverse circumstances as embarrassment or frustration. Unfortunately the Wild et al. (1983) study is unable to tell us very much about the reactions of the subjects to the setting examined and therefore such general models must remain speculations. What is needed is a clearer understanding of the significant features of the settings which are influencing body-focused movement occurrence. While the more general hypothesis, if true, is likely to have greater predictive utility than a number of more specific hypotheses, the question of which approach is in fact correct is fundamentally an empirical one.

While the many studies listed above demonstrate the widespread finding that there are systematic associations between body-focused movement and settings, few studies have examined whether such findings persist when diverse populations of subjects are compared. For example, are the forms or frequencies of body-focused movement influenced by the cultural background of the participants?

Cross-Cultural Comparisons of Body-Focused Movement

Along with many other types of nonverbal behaviour, hand movements are known to vary substantially in frequency and form from culture to culture (Efron, 1941; Graham, Bitti & Argyle, 1975; Morris, Collett, Marsh & O'Shaughnessay, 1979; Sainsbury & Wood, 1977). However, virtually all of these studies have been concerned with object-focused rather than body-focused movement.

Many authors have noted similar types of body-focused movement produced by subjects who speak many different languages and who come from a range of cultural backgrounds (Feyereisen, 1977; LeCompte, 1981; Ruggieri, Guiliano & Fusco, 1980; Seiss, 1965), but few have made direct quantitative comparisons. Hatta and Dimond (1984) have reported comparisons between Japanese and British subjects of the forms and frequencies of face-touching. They found some differences in the parts of the face-touched, but found little statistical difference between these two populations in the total frequencies of face-touching observed in a range of situations. A methodological cautionary note again needs to be added here. Passive self-touching on the face was included by these authors in their analysis, and thus many of their behavioural scores fall outside of the definition of body-focused movement employed here. None the less, the similarity between observations made in cultures as diverse as those found in Turkey (LeCompte, 1981) and Japan (Hatta & Dimond, 1984) suggests that these movements may show very extensive cross-cultural similarities in form and eliciting circumstance, supporting Ekman's (1977) suggestion that they may be associated with biological influences analogous to those found for facial expressions. However so far, no systematic cross-cultural study appears to have been published.

The argument that biological factors may be involved in the production and perhaps the form of body-focused movement raises the question of whether or not similar movements have been observed in our closer relatives among the primates or in other vertebrate groups. In fact similar irrelevant behaviour, which systematically occurs in stressful settings, has been observed in many vertebrate species (Zeigler, 1964). This apparent similarity between human body-focused movement and these "displacement activities" has been noted by many authors (Grant, 1968; Kehrer & Tente, 1969; McGrew, 1972; Morris, 1977; Tinbergen, 1951; Seiss, 1965). A very brief examination of the evidence relating to irrelevant behaviour in other vertebrate species, and the theoretical models that have been proposed to explain them, may therefore provide useful background information for studies of human body-focused movement.

The Comparative Context

An extensive literature exists concerned with irrelevant movement in many vertebrate species. It has been found that animals of a wide variety of species, when placed in a conflicting or frustrating situation, produce apparently irrelevant movements normally associated with some other context.

A detailed study by Rowell (1961) of displacement preening in chaffinches (*Frigilla coelebs*) can serve as a typical example of the findings that have been obtained with a diverse group of vertebrates (Zeigler, 1964). Wild-caught male chaffinches were housed in a cage containing a series of perches at intervals from one end to the other. Chaffinches are well known to mob owls in the wild. This anti-predator device involves these small birds approaching a potentially dangerous predator in large groups with the apparent aim of frightening the predator away by force of numbers.

Rowell placed a stuffed owl at one end of the cage and observed the behaviour of the birds. As expected, groups approached the stuffed owl but oscillated to and fro, never remaining too close. At the mid-point in this oscillation process the birds produced significantly higher levels of preening compared with their behaviour at other positions in the cage and that of control birds observed without the owl present. There seemed to be no obvious function to such an irrelevant movement in such a threatening environment.

Similar observations have been made for other species and for behaviour other than grooming or preening (e. g. "tail-fanning" in the three spined stickleback (*Gasterosteus aculeatus*) (Sevenster, 1961)), though so called "comfort movements" appear to predominate in observations of displacement activities (Van Iersel & Bol, 1958; Duncan & Woodgush, 1972; Zeigler, 1964).

It should also be noted that different displacement activities can be elicited depending on available environmental stimuli (e. g. Morris, 1954), though the nature of these movements and the stimuli to which they respond are still characteristic of the species concerned.

While most of the studies mentioned above have concerned themselves with bird or fish species, observations of displacement activities are not confined to these groups. Many mammals (Ewer, 1968), including primates (e.g. Poirier, 1974; Schaller, 1965; Van Lawick-Goodall, 1968; Zeigler, 1964) display irrelevant movements during situations characterized by conflict or thwarting. The very generality of this phenomenon across species, together with the often crucial importance of the settings where it occurs, suggests that the processes underlying its occurrence must either reflect a fairly fundamental aspect of behavioural organization or else a type of organization which confers a significant advantage on a wide range of vertebrate species.

Zeigler (1964) has examined much of the older ethological literature on this topic and it is not my intention to duplicate this here. However, the so called Disinhibition Model, which has resulted from these studies, warrants consideration. It is argued by this model that when an animal is in a conflict situation or is thwarted it is "stuck", in the sense that the appropriate avenues used to satisfy its motivational needs can not be implemented. It is argued that at all times the stimuli that generate grooming and similar movements are present, but due to their low priority they are ignored while more important activities are enacted. When these high priority activities are blocked by conflict or thwarting the low priority activities are free to emerge (i. e. are disinhibited). Thus according to this model displacement activities are an epiphenomenon associated with the blocking of responses. While this hypothesis has some appeal due to its simplicity it has a number of difficulties in dealing with some of the observations that have been made.

Firstly it seems unlikely that so many species could have evolved such a potentially lethal or damaging device as engaging in irrelevant behaviour in time of stress without there being some secondary benefit. Secondly the hypothesis predicts that the types of behaviour to emerge during conflicts should be similar to those engaged in by the animal when at rest. This is frequently, but not always, the case.

The occurrence of tail-fanning in the three spined stickleback has been examined in considerable detail (Sevenster, 1961). Many of the characteristics of irrelevant preening in chaffinches can also be observed for tail-fanning in this fish species. The tail-fanning movements are normally observed when the male is at the nest, and appear to be associated with increasing the water flow over the eggs, thus providing more oxygen to the developing young. However the same distinctive movement can be observed in other situations. These alternative settings are generally conflict situations. The normal occurrence of the tail-fanning movement is confined to a brief period in the reproductive cycle. The irrelevant occurrences of this movement can occur in any season given the appropriate conflict setting. It seems implausible to argue that such a specialized movement is an ever-present low priority behaviour (Wiltz, 1970).

Thirdly, there are other types of irrelevant behaviour that can be observed in many vertebrate species. These "adjunctive behaviours" (Falk, 1970), occur in partial reinforcement settings and appear to resemble displacement activities in a number of ways. While these behaviours will be discussed in more detail below, it is sufficient here to note that these similar movements appear to be associated with arousal regulation (Brett & Levine, 1979; Dantzer & Mormede, 1981). It does not seem unreasonable to speculate that displacement activities might have a similar association with arousal.

Delius (1967,1970) argues that displacement activities are an arousal regulating device. He suggests that these movements are an outcome of a de-arousal mechanism which comes into play when arousal becomes so high that it interferes with performance. Delius has reported that areas of the brain which appear to elicit displacement activities when electrically stimulated are often adjacent to areas associated with sleep behaviour.

Early models of displacement activity occurrence suggested a "sparking over" model. This model suggested that there was a build-up in "action specific energy" associated with the thwarting of response production. This hypothetical "action specific energy" sparked over to other alternative behaviour control systems when a critical level was reached, thus causing the production of irrelevant behaviours (Tinbergen, 1951). Such a "sparking over" model is generally now considered to be difficult to relate to neurological processes and has largely been abandoned (Zeigler, 1964). This makes it difficult to relate displacement activities to arousal through simple neuroanatomical association. Delius, recognizing this, suggests attention as a possible intervening variable, though he does not provide details on how attention might be involved.

McFarland (1966a,b) has elaborated an extension of the disinhibition model which incorporates attention. He has argued that when an animal is in a conflict situation or is thwarted it is incapable of obtaining an outcome expected for its behaviour. This mismatch of expectation and outcome causes the animal to divert its attention away from the situation, which thereby allows other behaviour to emerge. Displacement activities are seen as a consequence of attention diversion.

The difficulty of measuring attention shifts in animal species has made extensive investigations of this hypothesis difficult, though McFarland has produced two observations in support of it. He has observed that in conflict situations or thwarting his doves either stand still fixating their objective or stand in a relaxed fashion looking around. It is during the latter "attention diverting" posture that turning to preen or peck at the ground is observed (McFarland, 1966a). He also examined displacement activity frequency in partial reinforcement situations. Partial reinforcement was associated with his birds observing more stimuli which were irrelevant to the ongoing discrimination task. Doves which took longest to extinguish an approach response also spent more time displacement pecking (McFarland, 1966b). He argues that partial reinforcement is essentially a frustration situation as it involves repeated nonreward. The shifting in attention during such trials is seen as the result of this lack of fulfillment of the animal's expectation.

McFarland's observations of irrelevant movement in a partial reinforcement or extinction context are not isolated. Such so called "adjunctive behaviour" has now been studied in some detail (Falk, 1970). A variety of apparently irrelevant behaviours have been elicited while animals are engaged in a partial reinforcement paradigm. For example:

> "When a rat is reduced to about 80 per cent of its free feeding body weight by limited daily food intake and allowed to earn most of its food by lever pressing on a variable interval one-minute schedule. . . a curious phenomenon occurs when water is concurrently available. Although the animal is never deprived of water during the daily lever-pressing session for intermittent food. . . the water intake amounts to about one half the body weight. . . Little or no water was consumed between sessions" (Falk, 1970 p. 577).

The rats will consume the water even when large quantities of salt are added (Falk, 1966). Normally, hungry rats decrease water intake (Roper, 1978). Rats under similar partial reinforcement circumstances will also run in a wheel (Levitsky & Collier, 1968), "air lick" (Mendelson, Zec & Chillag, 1971) and show aggressive behaviour (Hutchinson, Azrin & Hunt, 1968). Pigeons will also show vigorous attack behaviour against a conspecific (Falk, 1970) as will pigs (Dantzer, Arnone & Mormede, 1980), while Rhesus monkeys will ingest wood shavings (Falk, 1970). If rats are provided with both the opportunity to run in a wheel and drink they engage in high levels of both (Falk, 1970).

Adjunctive behaviours are usually performed just after delivery of the reinforcement, and will continue to occur persistently after months on a fixed-interval schedule (Falk, 1970). Rats will sustain a large fixed-ratio response level to obtain the opportunity to perform the adjunctive behaviour of water drinking (Falk, 1970). As Falk (1970

p. 583) comments:

> "It. . . implies that the animal is not simply engaging in some arbitrary, time filling response, or that drinking is just reflexly elicited by eating."

McFarland's suggestion that his similar pecking displacement behaviours could be the product of the failure of his birds to confirm expectations seems less appropriate as an explanation for behaviour that persists on a constant schedule over months.

Is there any evidence that such apparently irrelevant behaviour may in fact benefit the animal through some indirect means? Falk (1970) is unable to suggest an adaptive role for these apparently irrelevant movements nor is he able to demonstrate that they are the product of some failure or pathology in the animal's normal behaviour regulating systems.

The de-arousal model suggested by Delius for displacement activities has parallels with similar arguments presented to explain the persistence and reinforcing nature of adjunctive behaviour. The types of situations which elicit adjunctive behaviours also elevate blood corticosteroid levels in rats (Brett & Levine, 1979) and pigs (Dantzer, Arnone & Mormede, 1980), and more importantly, the opportunity to perform adjunctive behaviour results in lower circulating corticosteroid levels in both species (Brett & Levine, 1979; Dantzer & Mormede, 1981).

It has been known for some time that the occurrence of one behaviour can result in a general change in the frequency of many others which apparently have little in common with it (Fentress, 1973; 1976). However the apparent irrelevance of both displacement activities and adjunctive behaviours to the ongoing activity of the animal, together with their association with thwarting settings, argue for a more specific hypothesis. The similarities of displacement activities and adjunctive behaviour in terms of the contexts that release them and the range of species for which they can be observed suggest that it may be worthwhile to develop an hypothesis which can account for both through similar mechanisms. The work of McFarland (1966a, b) on attention, and the association of adjunctive behaviour with arousal (measured by adrenocortical activity (Brett & Levine, 1979; Dantzer, et al., 1980)), suggest that arousal and attention may be useful intervening variables to consider in developing such an hypothesis. So far no detailed hypothesis along this line seems to have been developed with respect to animal behaviour.

The distinctive features which enable the recognition of displacement activities are their apparent irrelevance to the ongoing activity of the animal and their association with conflict or thwarting situations. The actual form of the movements varies considerably from species to species, though some form of comfort movement (i.e. movements associated with self-manipulation such as preening or grooming, or cleaning movements such as bill-wiping) appears to predominate (Zeigler, 1964).

While the above discussion has centered on species often quite distantly related to humans, evidence from observations of primates fits well into the general framework outlined above. Many primate species, such as chimpanzees (Van Lawick-Goodall, 1968), gorillas (Schaller, 1965) and colombine monkeys (Poirier, 1974), produce irrelevant behaviour during behavioural conflicts or thwarting. A direct comparison of human face-touching and similar movements in old and new world monkeys, gorillas, orang-utans and chimpanzees (Dimond & Harries, 1984) showed that while the monkeys displayed little face touching, the movements observed for the three ape species were comparable in form and frequency to similar human movements.

How comparable in general are human body-focused movement and animal displacement activities or adjunctive behaviours? The two defining properties of displacement activities appear to apply quite well to many instances of human body-focused movement. The irrelevance consideration is met by the definitional requirement to this effect contained in the definition of body-focused movement considered earlier. The association of body-focused movement with thwarting (Feiring & Lewis, 1979; Kehrer & Tente, 1969) has already been mentioned. The idea that approach/avoidance conflicts might elicit body-focused movement is supported to some extent by the observation that body-focused movement frequencies appear to increase during personal space invasion and crowding (Argyle, 1975; Stokols, Smith & Prostor, 1975). The fact that most body-focused movements are self-manipulatory in nature, and often involve "comfort movements" suggests that human body-focused hand movement activity is just what might have been predicted from observations of irrelevant behaviour in other vertebrate species. This similarity in both the broad type of movement involved and the types of situations which elicit them has encouraged many authors to suggest that human body-focused movement and animal displacement activities may be related (Grant, 1968; Kehrer & Tente, 1969; McGrew, 1972; Morris, 1977; Tinbergen, 1951), and that hypotheses designed to explain one type of movement may have general applicability.

While most of the studies of human body-focused movement have made little or no mention of the animal displacement activity literature some of the models proposed in the animal literature show remarkable similarities to those that have been independently suggested in the human body-focused movement literature. Other models by their nature appear to have relevance to human behaviour only.

The important models that have been suggested as devices to explain the occurrence of body-focused movement are reviewed briefly below. It should be noted that the hypotheses are not mutually exclusive and that therefore combinations of them are possible. It is also possible that body-focused movements do not represent a unitary behaviour class, despite their apparent similarities, and that different mechanisms may be needed to explain body-focused movement in different settings.

Models of Human Body-Focused Movement Occurrence

1. Symbolic Models.

In the earlier decades of this century a number of authors proposed that body-focused movements had important symbolic value (e.g. Krout, 1935, 1954a,b). It was argued that specific movements, such as "cupped hand held upheld by palm" or "four fingers in palm or fist" (Krout, 1954a), need to be recognized and related to specific motivational conditions, such as "hope,anxiety" or "ego-inflation" (Krout, 1954a). Often it was argued that the movements produced may provide insights into the subject's motivational state (Krout, 1954b; Mahl, 1966) and interest was frequently centered on psychiatric applications (e.g. Berkson, 1967; Freedman, 1972; Krout, 1954b; Mahl, 1966). Often the symbols were derived from a Freudian framework. For example, when discussing the insights to be obtained from observations of hand movements Mahl (1966 p.296) quotes cases described by Freud

> "Dora's "chance" fingering of a reticule worn at her waist, for example, appeared to occur when repressed memories of childhood masturbation were stimulated (by Freud's remarks) but not recalled."

Similarly Adatto (1970 p. 826) interpreted an instance of nose rubbing during a psychiatric interview as

> "a residual infantile wish in the transference being acted out in a masturbatory equivalent of face rubbing."

Unfortunately, the symbolic approach presents many difficulties. The range of possible self-manipulatory movements, assuming all possible movement variations are treated as significantly different, is huge and as a consequence it is unlikely that many movements will be repeatedly observed. Testing of hypothesized relationships between very specifically defined hand movements and very specifically defined motivational states thus becomes extremely difficult if one wishes to go beyond a case study approach. If progress is to be made in examining across individual or even across situational consistencies in body-focused hand movement then it will be necessary to determine whether important elements of self-manipulatory actions can be recognized which cut across individual or situational differences rather than concentrating on every possible finger or hand position. While this somewhat coarser analysis will miss some specific details it may serve to block out the core features of body-focused movement form upon which individuals construct their specific variations.

Perhaps the greatest difficulty with many of the applications of the symbolic approach lies in the justification of the particular symbolic interpretation made by the observer. It is difficult, at best, to attach generally agreed upon interpretations to abstract symbols. With very detailed movement categories and little repetition interpretations often rely on external theoretical models, such as Freud's concept of sexual repression. Such interpretations are then dependent on the theoretical preferences of the observer and are difficult to substantiate by further experiment or observation. Such a subjective approach may well have considerable difficulty with inter-observer consistencies in movement interpretation and, as a consequence, relatively little predictive value. A more specific and testable link between body-focused movement form and frequency and the subject's situation or motivation is needed than a simple symbolic model appears to provide.

The symbolic approach, while perhaps providing a framework for the interpretation of hand movements, makes few specific suggestions about why such symbolic actions should be performed. Without significant further elaboration of the model the only obvious function for such movements would appear to be affective communication. The obvious difficulties researchers have had in attempting to interpret specific movements would seem to indicate that hand movements are not normally very successful at communicating specific motivational information.

In view of the difficulties in interpreting hand movement as having symbolic significance most of the remainder of the current discussion is focused on more contemporary hypotheses which seek to explain body-focused movement occurrence by recourse to more general descriptions of the form of the hand movements and their association with more broadly based motivational factors.

2. An "Arousal" Model.

Arousal, as a concept, is both difficult to define and difficult to measure (Hinde, 1970). Even physiological measures that are often associated with arousal or anxiety, such as heart rate, blood pressure and skin resistance, can show significant independent variation (Lawler, 1980). Its very vagueness therefore makes arousal a difficult intervening variable to explore satisfactorily. None the less the consistent association of high frequencies of body-focused movement with stressful settings, such as embarrassment, anxiety, frustration, lying and so on, have caused many authors to suggest a role for arousal in body-focused movement production (Argyle, 1972; Barroso, et al., 1978; Feiring & Lewis, 1979; Koch, 1942; LeCompte, 1981; Morris, 1977).

The way in which arousal or anxiety might cause an increase in body-focused movement is not altogether apparent. Certainly, arousal may lead fairly directly to an increase in muscle tension (Sainsbury & Costain, 1971), which might in turn facilitate the performance of hand or arm movement. However, such a model, without elaboration, would not seem to predict any consistent form for the hand movements thus produced. Some of the more detailed observations of the forms of body-focused movement show that certain types of movements clearly are substantially more common than others for a given setting (e.g. Williams, 1973). To cope with this difficulty one might reasonably argue that increased arousal does not equally increase muscle tension generally. Just such specificity in the tension of certain skeletal muscle groups under arousal has been reported (Shipman, Heath & Oken, 1970). Alternatively it might be argued that for some secondary reason, perhaps the presence of appropriate peripheral stimulation, certain types of consequent movements are more likely to be facilitated by arousal.

On the other hand one might argue that it is the stimuli that are the result of self- or object-manipulations which are important. These might act as some form of self-reassurance (Morris, 1971), thereby reducing arousal. One might wish to grant the analogy between being reassuringly touched by others and self-touching. However if we wish to include the apparently related irrelevant object manipulations in a general model of body-focused movement occurrence, then additions to this self-reassurance model would seem to be needed.

A complication for an arousal model which seeks to be a general explanation of body-focused movement is that there are a number of contexts in which a substantial increase in body-focused movement can be observed that do not appear to be associated with an increase in arousal. The often mentioned association of high body-focused movement frequencies with isolation of the performer (Ekman & Friesen, 1972; Sainsbury & Costain, 1971; Sainsbury & Wood, 1977), and his or her non-engagement in any particular task, is hard to understand in terms of a simple arousal hypothesis. It might be that these superficially similar movements are elicited by different factors and that more than one hypothesis is needed to explain different instances of body-focused movement.

Two assumptions additional to the simple arousal hypothesis have been suggested in order to produce an hypothesis with wider explanatory power. Berlyne (1960) argues that boredom itself is an arousing circumstance. He points out the generally aversive nature of boredom and argues that it results in an increase in arousal.

Secondly, it has been suggested that some sort of display rule control (Ekman, 1971) of body-focused movement production occurs (Goldman & Rosenthal, 1986; Sainsbury & Costain, 1971). This hypothesis would predict that there are cultural norms for the production of body-focused movement which serve to regulate its occurrence in public and which cease to apply when subjects believe they are not observed. This latter display rule argument, however has some difficulty with the simple observation that in some quite public situations body-focused movement frequencies are very high (LeCompte, 1981; Seiss, 1965). Perhaps display rules are relevant only in specific types of setting.

The major problem with a general arousal explanation is the simple observation that body-focused movements are extremely common in everyday settings (LeCompte, 1981). It is difficult to see why simple everyday tasks should generate sufficiently high levels of arousal to make them stand out as body-focused movement elicitors. For example, as noted above, Wild, Johnson and McBrayer (1983) found that a significantly higher frequency of "self-manipulatory gestures" was observed for those subjects watching a film about insects compared with others watching a "neutral" film.

While it is perhaps the most successful predictor of situational influences on body-focused movement occurrence the arousal model appears to present problems as a general explanation. It is possible to conclude either that those situations that do not fit the predictions of the arousal model may be associated with different causal mechanisms, or that alternative general models need to be considered.

3. An Affective "Communication" Model.

Smith (1977) has suggested that animal displacement activities might well represent a communicative display. Thus displacement activities would communicate to conspecifics a "message of indecision". A number of decoding studies of human body-focused movement support the notion that these movements may have a communicative role to play.

Raskin (1962) had 211 different therapists rate 234 patients on the types of behaviour they evidenced during their initial clinical interview. He also had the therapists note their interpretations of the behaviour of these patients. The occurrence of such actions as "moves and shifts restlessly" and "uses hand excessively" was significantly associated with the therapists' ratings of patient anxiety.

In a similar decoding study Waxer (1977) showed 46 psychology students 20 one-minute videotapes of psychiatric patients, without a sound track. Independent information concerning the patient's anxiety levels was available from two paper-and-pencil state anxiety measures completed by each of the patients. After viewing the videotape segments the student raters were required to estimate the anxiety level of the patient for each of the one-minute sections. The raters indicated their estimate of patient anxiety by means of a ten-point rating scale. They were also required to check off which of ten anatomical locations they felt was associated with interpreting anxiety level. The raters proved to be able to estimate the anxiety level of the patients, as determined by the paper-and-pencil anxiety score, from the silent one-minute videotape samples. "Hands" was reported by the raters as the most salient area for determining anxiety level. Subsequent analysis of the videotapes indicated that the more highly anxious patients engaged in more "stroking, twitches and tremors" than did the less anxious patients. In a subsequent comparison of verbal, paralinguistic and body-movement cues to anxiety Waxer found that the nonverbal cues were the most "potent and accurate" information source in judging patient's independently measured state anxiety levels (Waxer, 1981). Similarly, decoders were able to estimate accurately the degree of severity of patient depression using nonverbal cues, with a lack of hand movement as one diagnostic signal (Waxer, 1976).

These results support the conclusion drawn by Ekman and his colleagues that gross postural cues and movement of the hands and feet do appear to provide information about the performer's affective state (Ekman, Friesen, O'Sullivan & Scherer, 1980).

In recent years a number of decoding studies examining the attributions associated with body-focused movement production have been conducted by Harrigan and her group (Harrigan, 1985; Harrigan, Kues & Weber, 1986; Harrigan, Weber & Kues, 1986). These have involved playing short sections of video-material, taken from an interview context, which displayed isolated body-focused movements to decoder populations. All the movements examined involved face-touching only. While the decoders did tend to rate the performance of body-focused movement as an indication of anxiety or negative affect various other attributions were obtained. Unfortunately this methodology has severe limitations. The displaying of isolated behaviour with little context or other nonverbal information may provide a quite misleading impression. Subjects who have no other information may provide consistent attributions which would not in fact generalize to circumstances where more varied information was available. A study conducted by Harrigan, Oxman and Rosenthal (1985) provided decoders with a more natural range of nonverbal information. Again subjects were asked to provide attributions and in this instance body-focused movement frequencies, though measured, had no predictive value. None the less the results of these decoding studies indicate that if no other information is available subjects will produce somewhat consistent attributions to at least some types of body-focused movement performance.

It is difficult, however, to find many authors who argue that body-focused movements are produced primarily, perhaps in a fashion analogous to facial expressions, as a means of communicating affective state. Though Barash (1974), in the context of his dental patient observations, does suggest that such movements

> "may function in some how (*sic*) communicating an individual's patient/nonpatient status to others of the same species." (p.948).

More recently Goldberg and Rosenthal (1986) have suggested that "self-touching behaviour" may play a significant role in person perception. They found that foot touching correlated with a favourable hiring decision in a simulated job interview. They suggest that:

> "self-touching may be an important but neglected variable in social interaction." (p.65)

The reason for the frequent lack of support in the literature for a model which emphasizes the communicative significance of body-focused movement is, most probably, the lack of association between communicative settings and body-focused movement performance (Barroso et al., 1978). Indeed, it has been suggested that body-focused movements are at their greatest frequency, and most elaborate in form, when subjects are alone and believe themselves to be unobserved (Sainsbury & Wood, 1977). While it is possible to envisage the production of essentially communicative movement in noncommunicative settings one might still expect to see quantitatively higher frequencies of body-focused movement in communicative settings if a communicative model were to have general explanatory value. This does not seem to be the case.

As a general explanation of the occurrence of body-focused movement the communication model usually shares with the arousal model the assumption that their occurrence is associated simply with arousal or anxiety and that therefore such movement can be used as a reliable guide to the underlying affective state. As has been indicated above, the associations between body-focused movement and situations appear too complex for such a simple direct interpretation.

It may be that body-focused movements are part of a complex series of body movements which communicate something about the performers emotional state to others. This does not mean that the primary function of body-focused movement is to act as a communication mode or channel. Such a communication model seems unable to explain those high frequencies of movement which occur in everyday settings, many of which do not appear to be situations where affective communication is relevant. It may be that the similar movements produced in apparently arousing situations and those occurring in these everyday public settings, are causally unrelated. However, if so, the possibilities of confusion for those engaged in decoding these supposedly communicative actions is clearly great. Until there are clearer grounds for dividing body-focused movement into those with a communication role and those for which other hypotheses are needed it would seem useful to examine a variety of causal mechanisms.

4. The Disinhibition Model.

While mostly employed as an explanatory device for observations of animal displacement activities, the disinhibition model has also been suggested as an explanation for the occurrence of comparable human body-focused movements (Kehrer & Tente, 1969; Seiss, 1965). It suffers from some of the same problems here as it does in its original comparative context.

In particular, the suggestion that body-focused movements are low priority behaviours which emerge when more important behaviours are thwarted seems at odds with observations that can be made of the form of some types of body-focused movements. For example, while hair arranging, head scratching or chin stroking might be seen as simple comfort movements it is difficult to see the relevance of much of the extreme wringing of the hands, distortions of ones clothing, or destruction of useful objects through repeated manipulation that can be observed as body-focused movement. These appear to have little to do with normal low priority behaviours. Detailed comparison of the movement that can be observed when subjects are alone with those produced by the same individuals when carrying out other tasks, may provide further insights into the relevance of this hypothesis.

5. The Attention Model

It has been previously noted that Freedman et al. (1972) obtained a significant difference in the frequency of body-focused hand movement for field-dependent and field-independent groups for certain settings. They had subjects engage in five-minute psychiatric interviews with either a "cold" or "warm" interviewer. Field-dependent subjects showed higher levels of one class of body-focused movement (hand-to-hand manipulation i.e. where one hand manipulates the other).

In attempting to interpret these findings the authors argue that certain types of hand movement are indicative of "cognitive style" and information processing ability. The more discrete hand movements (the "emphatic" gesture or the discrete body-touch) were suggested as indicating greater "kinesic internalization" while the more "unpatterned and diffuse" movements (motor primacy or hand-to-hand movements) were proposed as indicative of less "kinesic internalization".

As we have seen above, attempts to duplicate the findings of an association between body-focused movement and field-dependence measures have often proved unsuccessful. More recent attempts to relate field-dependence measures to information processing and susceptibility to distraction measures have not generally proved successful (Blowers, 1976), and field-dependence is now argued to be related to social skill. It is suggested that field-dependent people are more attentive to social cues than are field-independent individuals (Witkin & Goodenough, 1977).

In support of their model relating body-focused movement and information processing ability Freedman and his colleagues have investigated the hand movements of those suffering from psychopathological conditions of various types.

One would expect, on the basis of their hypothesis, that there should be a relationship between inappropriate arousal levels or poor information processing ability and the characteristics of the patient's hand movement. As a consequence some relationship between the nature of the subjects' psychiatric disorders and their hand movement types might be expected. In two related studies which compared the performance of schizophrenic and depressed patients Steingart and Freedman (1975) and Grand (1977) found higher frequencies of body-touching in depressed patients, while higher frequencies of hand-to-hand behaviour were observed for a group of schizophrenics. They argue that schizophrenics, with their deficiencies in information processing, produce the "less internalized" movements.

A more detailed examination of a small group of nonparanoid schizophrenics found that those judged independently to be more assertive and less prone to hospitalization produced less hand-to-hand activity and more discrete body-focused movement (Grand, Freedman, Steingart & Buchwald, 1975). When these subjects were tested on the Stroop colour interference tasks (Stroop, 1935) the less hospital-prone patients were better at the simple colour naming, while they were worse at the interference task itself. This greater ability to be mislead by the distracting colour word suggests to these authors that the less hospital-prone patients were employing a more complex information processing strategy which in turn leads to greater distractability during the Stroop task. The simpler strategy apparently employed by the more hospital-prone would, they argue, involve less sophisticated analysis of the stimulus array and would thus enable them to avoid some of the interference from the secondary and inappropriate cue of the colour word (Grand, Steingart, Freedman & Buchwald, 1975).

Similarly when they applied their own language analysis schema (Steingart & Freedman, 1972) to the verbal responses of these patients, they found that the subjects more prone to hospitalization used simpler grammatical forms. The schizophrenic subjects demonstrated a relationship between type of hand movement and complexity of language. Hand-to-hand movements were associated with the simpler speech forms while the continuous body-touching and discrete body-touching movements were associated with the more complex forms (Steingart, Grand, Margolis, Freedman & Buchwald, 1976).

More recently Freedman and his colleagues (Barroso, Freedman, Grand and Van Meel, 1978; Freedman & Bucci, 1981; Grand, 1977) have hypothesized that attention processes, particularly the narrowing of attention focus that can be observed in stressful settings (Cornsweet, 1969; Easterbrook, 1959; Hockey, 1970; Kahneman, 1973), might be involved in the production of body-focused movement. They point in particular to their own results with the Stroop confusion and colour naming tasks as evidence of the effects of the distraction engendered by the colour confusion on body-focused movement frequency. Body-focused movement frequencies were significantly higher for one class of body-focused movement (hand-to-hand) during the performance of the confusion task than for its colour naming control.

Freedman, Barroso, Bucci and Grand (1978) have attempted to relate the specific forms of body-focused movement to information processing strategies employed by their subjects. Based on analyses of verbal material obtained during a demanding dialogue, together with information about the subjects based upon field-dependence and Stroop tasks scores, they found that subjects apparently changed the form of their body-focused movement in line with both changes in the content of the dialogue and the subject's information processing strategies. In general subjects who had "high-interference" scores on the Stroop tasks produced more lateral movements while bilateral body-focused movements were characteristic of the "low-interference" subjects.

Freedman & Bucci (1981) examined the complex relationships between language performance and body-focused movement production for field-dependent and field-independent subjects. Higher frequencies of hand-to-hand behaviour were displayed by the field-dependent subjects. When the field-dependent and field-independent groups were further subdivided on the basis of their propensity to produce object-focused movement (those hand movements normally associated with speech production) the small number of field-independent subjects who also displayed high frequencies of object-focused movement produced higher frequencies of total continuous body-focused movements and discrete movements than did the field-independent subjects who did not display a tendency to produce frequent object-focused movements. Again for the high object-focused movement frequency group prolonged pauses in speech were associated with direct body-focused movement production. This process of examining the detailed hand-movements of a relatively small sample of subjects who are repeated subdivided on the basis of limited individual differences information appears open to significant methodological criticism. Nevertheless, the authors conclude that the production of particular types of body-focused movement is not only a useful indicator of underlying attentional processes but plays an important role in attention regulation, in particular "shielding" and "contrasting", and that the need to apply these two processes differs for field-dependent and field-independent subjects.

> "..there is the shielding strategy, a continuous activity which cuts across clause and pause boundaries. The strategy of shielding appears primarily to function as a means of insulating the speaker from interference cues....There is also the strategy of contrasting ...Contrasting appears in pausing and in phases of altered state ....Contrasting when it occurs at the pause is manifested not only by tactile self-stimulation, but involves the participation of gross muscular activity... When this [contrasting sequence] occurred at critical junctures, it tended to signify the inclusion of peripheral thought into language production." (pp. 246-247).

In a relatively recent study of self-touching and attentional processes Barroso and Feld (1986) have examined the hand movements produced by a small sample of subjects while they engaged in a variety of auditory "shadowing" tasks. The subjects were required to repeat selected passages which were being played through headphones. Different passages were simultaneously played to each ear. The subjects in each of three groups were required either to shadow the loudest passage, the passage read by a person of a particular gender, or to follow a passage continuously despite voice changes. The different tasks produced differences in the form and frequency of associated body-focused movements, though these were complicated by large gender differences. However, the most demanding task (as determined by a measure of the subjects' shadowing performance) was not the task which was associated with the highest frequency of body-focused hand movements. They conclude that:

> "Self-touching, then, does not appear to be simply a response to a difficult attentional selection demand. Furthermore, the movements of the hands on the body or onto each other seem to be related to particular aspects or stages of information processing." (p.63)

Unfortunately, while perhaps suggestive, all these data concerning attention and body-focused movement are very indirect. It is difficult of course to measure separately intervening variables such as attention and arousal processes, and we are frequently left to rely on inferences from complex situational effects or associated verbal material all of which are open to multiple interpretations.

The idea that body-focused movement might assist normal language production through its association with distraction filtering, or indeed through any other mechanism, appears at odds with some available evidence. Restraining hand movement appears to have no observable impact upon speech production (Lickiss & Wellens, 1978).

The suggestion that attention narrowing during arousal might be implicated in the occurrence of body-focused movement is a useful starting point for investigation. Such a model offers one of the few prospects for accounting for the occurrence of body-focused movement in everyday situations, such as considering a problem (Williams, 1973) or performing mental arithmetic (Jones, 1943a).

One additional attraction of the attention model is that it suggests a possible role for the stimuli that result from the performance of body-focused movements. Certainly, the production of a distracting stimulus can be a useful coping strategy for subjects suffering short-term painful experiences (McCaul & Haugtvedt, 1982), and even in the Stroop colour confusion task the presence of loud irrelevant sounds actually seems to increase performance success slightly (Mathews & Brunson, 1979). Children have been found to cope with prolonged waiting for a reinforcer when they engaged in "motoric strategies", i.e. shuffling, restlessness, finger tapping or any other "undefined noise" (Yates, Lippett & Yates, 1981). Perhaps irrelevant stimuli associated with body-focused movement performance are acting as a similar means of coping with distraction. Even in the "deep in thought" contexts, that appear on anecdotal evidence to be associated with body-focused movement performance, there is some behavioural evidence for attention shifts in the old observation that subjects "look away" (Argyle, Ingham, Alkema & McCallin, 1973; Bakan & Strayer, 1973; Day, 1964; Kendon, 1967).

While arousal models seem to have predictive value in suggesting some of the situations that are characterized by high frequencies of body-focused movement they appear to have difficulty in explaining the high frequencies that are associated with common everyday settings. The attention model provides some opportunity to overcome this difficulty. Unfortunately the evidence outlined above is quite indirect and incomplete. However one advantage of this model is that it is in principle readily testable. Several approaches to the testing of this hypothesis will be explored in the studies that follow.

Conclusions

Body-focused movements appear to be influenced by both situational factors and individual differences. The relative contribution of each source of variation is not clear from the current literature. There is some evidence that some of the situational influences on body-focused movement may have some cross-cultural consistency. Again, the extent of such consistency is not clear from the literature.

None of the models currently adduced to explain the occurrence and significance of body-focused movement, provides a simple convincing explanation for the variety of situations which appear to influence body-focused movement frequencies and form. The arousal model, while appearing to possess some predictive value, appears to be inadequate to encompass all the circumstances which appear to influence body-focused movement occurrence without significant elaboration. The attention model, while more indirect and lacking in convincing empirical support, does seem to be potentially more relevant to many everyday occurrences of body-focused movement. As a result it deserves more detailed consideration that it has had so far in the literature.

It may be that none of the current hypotheses are capable of explaining all body-focused movement occurrences. Body-focused movement may not be a unitary class of behaviours and may be produced for a variety of reasons. Therefore some combination of these hypotheses, or indeed totally new explanatory models, might be required. Nevertheless, the attention and arousal models provide a framework for further examination of consistencies in body-focused movement occurrence which may give further insight into the significance of this interesting if little understood class of everyday behaviours.

Research Implications

The preceding literature review has led the author to single out the following issues as of central interest. It is largely with these questions that the experimentation in subsequent chapters will be concerned.

a) What is the predictive value of the Freedman attention focusing model of body-focused movement occurrence? Is it an advance on a simple stress or arousal model?

b) How much consistency do individual subjects display in their body-focused movement preferences across a range of settings?

c) What is the value of field-dependence and other personality measures for prediction of individual differences in body-focused movement occurrence?

d) Do subjects from different cultures produce similar forms and frequencies of body-focused hand movement in similar settings?

The implications of these questions for the design of the subsequent research program is considered briefly below.

Models of Body-Focused Movement Production.

As was discussed above the factors which underlie body-focused movement occurrence remain obscure. While "arousal" or "anxiety" provoking situations appear to be associated with an increase in body-focused movement frequency the reasons for this association are not well understood. Nor is a simple "arousal" or "anxiety" explanation sufficient to explain body-focused movement occurrence as at least some settings, which are associated with high body-focused movement frequencies, can not be readily characterized as stressful or arousing (Wild et al., 1983). Recent work by Freedman and his colleagues (Barroso et al., 1978; Freedman and Bucci, 1981) on a theoretical model which proposes that body-focused movements act as an aid to distraction filtering appears to be a useful first step on the path to understanding these anomalous body-focused movement occurrences in relatively nonstressful settings.

The experiments in Chapter 2 sought to examine the predictive value of the distraction filtering or attention narrowing hypothesis by examining correlations between an attention focusing measure and body-focused movement performance. In Chapter 3 the hypothesis was further tested by experimentally manipulating the level of distraction experienced by the subjects and determining whether body-focused movement frequencies vary correspondingly.

Individual Differences, Personality and Body-Focused Movement.

Freedman has emphasized the importance of the correlations he has obtained between body-focused movement form and frequency and field-dependence measures (Freedman et al., 1972; Freedman et al., 1978; Freedman and Bucci, 1981). These individual differences findings have frequently formed the core of evidence upon which much of Freedman's attention focusing hypothesis is based. Other authors have reported correlations between body-focused movement frequencies and various personality measures (Ruggieri, Guiliano, & Fusco, 1980; Souza-Poza & Rohrberg, 1977; Waxer, 1977; Wiens, Harper, & Matarazzo, 1980; Williams, 1973). However, the results obtained have often varied from study to study. Most of these correlational studies have examined body-focused movements in only one context. Therefore the consistencies with which individual subjects show a preference for particular body-focused movement forms and frequencies from setting to setting has yet to be clearly established. Without such information the general significance of the correlations obtained between body-focused movement frequencies and personality measures remains unclear. There is a need to examine personality and body-focused movement correlations across a range of settings in order to establish their short-term and long-term significance as predictors of body-focused movement performance.

In Chapter 2 a variety of relevant personality measures were correlated with body-focused movement frequencies. The subjects were observed in several settings to obtain an indication of the short-term consistencies displayed by individual subjects in their body-focused movement preferences. The subjects were also re-examined in identical circumstances after a period of six months in order to obtain information on longer-term hand movement preferences. In Chapter 3 these observations were extended with the examination of body-focused movement consistencies for a different group of tasks.

Cross-cultural Consistencies and Body-focused Movement.

The subjects involved in many of the previously published studies of body-focused movement have been drawn from many different cultural backgrounds (e.g. Feyereisen, 1977; LeCompte, 1981; Ruggieri et al., 1980; Seiss, 1965). While Ekman (1977) has hypothesized that body-focused movements might show extensive cross-cultural consistency, there have been no detailed studies performed to test this hypothesis. Without such information it is difficult to determine whether it is appropriate to generalize conclusions drawn from particular experiments conducted in one country to similar studies conducted elsewhere.

In Chapter 4 subjects drawn from four different Cities (Adelaide, Brussels, Rome and Sheffield) performed identical tasks in similar settings. These results were extended in Chapter 5 with a series of field investigations of body-focused movement occurrence in natural settings in seven cities (Adelaide, Antwerp, Brussels, Munich, Paris, Rome and Sheffield). From these investigation it should be possible to determine the cross-cultural consistency of body-focused movement performance for at least those cultural groups which have been the source of most of the experimental subjects employed in the studies reported in the literature to date.

Chapter 2

Individual Differences, Personality and Attention

Experiments 1 and 2.

Individual differences, personality and attention.

The studies in this chapter seek to examine two questions simultaneously. What is the consistency of individual differences in body-focused movement form and frequency, and do body-focused movements occur with significantly greater frequency during periods of greater information processing demands, as measured by a reaction time probe procedure?

Individual Differences and Body-focused movements.

Significant relationships between personality factors and body-focused movement frequencies may well provide useful clues in the attempt to understand body-focused movement occurrence. As was noted in Chapter 1 the results of such correlations have varied from study to study and, in at least one study, from situation to situation (Freedman et al., 1972). Of the personality variables employed the two most promising appear to be anxiety and field-dependence measures.

Anxiety and Arousal Measures and Body-focused Movements.

The extensive literature on anxiety measures provides evidence of the difficulty of finding a single measure of this variable (Hodges, 1976; Zuckerman, 1976). Correlations between physiological measures of arousal and paper-and-pencil anxiety measures are often small or insignificant (Hodges, 1976; Scott & Kessler, 1969). Paper-and-pencil measures of anxiety as a long-term personality disposition do not always predict responses reported by individuals to specific situations (Lamb, 1976, 1979; Mellstrom et al., 1978; Zuckerman, 1976). Thus a number of authors have suggested differentiating between state anxiety, or the short-term reaction of the subject to the situation, and trait anxiety, which is the general tendency of individuals to display anxiety in a range of settings.

Attempts to quantify anxiety by state and trait means, and relate these findings to body-focused movement frequency, have varied substantially in their success. In the few quantitative studies to relate anxiety measures to body-focused movement state anxiety measures seem to have been generally more successfully associated with body-focused movement frequency (Waxer, 1977) than have trait measures (Grand et al., 1977). However, most authors have attempted to relate body-focused movement and anxiety by drawing inferences about anxiety from the setting (Barash, 1974; LeCompte, 1981; Morris, 1977) or by inferences drawn by decoders (Raskin, 1962; Waxer, 1977) rather than by direct measurement.

In Experiment 1 in this Chapter several noninvasive state and trait anxiety measures were employed. The General Anxiety Scale for Children (GASC) and the Test Anxiety Scale for Children (TASC) are paper-and-pencil tests of reported anxiety developed by Sarason et al. (1960) on children of similar age to those employed in Experiment 1. Both might be considered trait anxiety measures though TASC asks questions specifically about anxiety produced by tests and other evaluatory settings.

A simple self-report measure was employed as a noninvasive indicator of state anxiety. A second indicator of state anxiety was obtained by measuring the number of speech disturbances produced by the subjects during their monologues. Such speech disturbances as failing to finish a sentence, stuttering or omitting essential words have been shown by many investigators to indicate anxiety in both adults and children (Cook, 1969; Dibner, 1956; Kasl & Mahl, 1965; Zimbardo, Mahl & Barnard, 1963). The filling of pauses with "umm" or "ah" etc. is not so readily related to anxiety and seems to be sensitive to other extraneous factors (Kasl & Mahl, 1965).

Field-Dependence Measures and Body-Focused Movements.

Field-independence was originally envisaged to be the ability of the subject to assess a situation independently of its setting. Field-dependent subjects were more likely to be swayed by the context in which their evaluation was conducted and the background stimuli present (Witkin et al., 1962). Tests to measure this tendency have generally involved the use of a rod-and-frame perceptual illusion setting or an embedded figures test (Witkin et al., 1962). The former involves the tendency of subjects to see a rod as moved from its actual vertical inclination on the basis of misleading clues provided by the background. The embedded figures test involves the ability to detect shapes hidden in a larger pattern. The embedded figures approach is simpler to conduct and a form of this test has been standardized on children of similar age to those taking part in Experiment 1 (Witkin et al., 1971). This Children's Embedded Figures Test (CEFT) was employed in Experiment 1 as a measure of field-dependence.

Field-dependence measures were believed by their developers to have relevance beyond the simple perceptual settings in which they were measured. Initially it was believed that they were related to resistance to distraction. However subsequent experimentation has failed to confirm this belief (Blowers, 1976). Witkin and Goodenough (1977) now argue that the test is a measure of the social skill of the subject. As such this measure is not as relevant as it appeared earlier to attentional models of body-focused movement occurrence, though the significant associations between field-dependence and body-focused movement frequency found by some investigators (Freedman et al., 1972; Souza-Poza & Rohrberg, 1977) still suggest that it deserves further examination.

Distraction, Attention Narrowing and Body-Focused Movements.

The attention model proposed by Freedman and his colleagues (Barroso et al., 1978) may be a useful starting point for a model which seeks to explain the significant changes in body-focused movements that occur in everyday settings which appear to present major difficulty to the other models. However, to test this hypothesis effectively it will be necessary to go beyond indirect inferences based on situational effects, such as the conclusion that differences in hand movements produced by subjects engaged in the two Stroop tasks are due to attention narrowing (Barroso et al., 1978). In order to examine this question more closely a reasonably independent measure of attention focusing is needed that can be employed while the subjects are engaged in hand-movement eliciting circumstances.

The reaction time probe procedure (Kahneman, 1973), developed by information processing investigators to examine information processing demands during task performance, appears to provide a useful mechanism to investigate this hypothesized relationship between attention and body-focused movement.

If it is assumed that during human information processing there is limited capacity available to interpret and analyze incoming sensory information, then the reaction time observed on presentation of an unpredictable second or "probe" stimulus during the performance of the primary task might be considered to be a measure of "spare capacity".

> "..the accuracy and the speed of the response to an unpredictable probe reflect the spare capacity that is allocated to perceptual monitoring at the instant of presentation. The theory assumes that spare capacity decreases regularly with increasing investment of effort in the primary task." (Kahneman, 1973 pp.185-186).

Provided the probe task itself is sufficiently slight in its demands then it might be expected, on the basis of Freedman's attention model, that some correlation between reaction time to the probe task and body-focused movement form or frequency would be observed. Slower probe reaction times would indicate high demands on information processing as a result of the primary task and might be expected to be associated with higher frequencies of body-focused movement.

Experiment 1

Introduction

In this study the frequencies of body-focused movements have been recorded for three different contexts on the same subjects. The attentional demands for two of the three different contexts have been measured using a reaction time probe procedure (Kahneman, 1973) in order to test Freedman's hypothesized relationship between body-focused movements and attentional demand. Each subject was also tested on general anxiety and field-dependence measures in order to examine further their possible relationship to individual consistencies, as part of an attempt to explain why such different correlational results have been obtained by a number of authors for these measures and body-focused movement frequencies (Freedman et al., 1972; Grand, Marcos, Freedman & Barroso, 1977; Souza-Poza & Rohrberg, 1977; Waxer, 1977; Wiens, Harper & Matarazzo, 1980; Williams, 1973).

The three tasks chosen, a monologue, the performance of mental arithmetic, and relaxing and doing nothing were selected on the basis that they were all situations which had previously been found to be associated with high body-focused movement frequencies (Freedman et al., 1972; Jones, 1943a; Sainsbury & Wood, 1977), and yet they appeared to differ significantly in nature and in the probable information processing demands by which each were likely to be characterized.

Method

Subjects. Twenty-seven fifth grade children attending Dernancourt Primary School, Adelaide, were the subjects for this experiment. The mean age of the 14 girls and 13 boys was 10 years and 1.5 months. Twenty-one subjects completed all aspects of the study. The six omissions resulted from prolonged absences from school or were caused by equipment failure. Ten-year-olds were chosen because this would allow comparison with the results of Barroso et al. (1978), who used children of a similar age.

Procedure. Each of the subjects was videotaped for five-minutes in each of three conditions. The order of presentation of these conditions or tasks was balanced over the subjects. In the Monologue condition the subjects, while seated, were required to give a five-minute monologue on a subject of their own choosing. In the Mental Arithmetic condition the subjects were required to solve lists of three-number single-digit addition problems and report the answers verbally. The problems were presented on white cards, measuring 21 x 15 cm, with two columns of 12 problems on each card. The subjects sat 3m from the cards. In the Rest condition the experimenter excused himself from the room and left the subjects seated by themselves. They were asked to relax and remain in their seats until he returned.

During the Monologue and Mental Arithmetic conditions the experimenter sat behind a table facing the subject at a distance of approximately 3m. The experimenter attempted to behave in a "warm" manner towards the subjects, though eye contact was limited due to the need to monitor reaction times. The experimenter endeavored to keep his behaviour constant across conditions. Most subjects spent most of their time looking away from the experimenter, frequently gazing at the RT light (see below), suggesting that any minor variations in the experimenter's behaviour were likely to have minimal impact.

Attention Measures. While carrying out the Monologue and Mental Arithmetic tasks the subjects were required to perform a simple probe reaction time task (Kahneman, 1973). The probe task required the subject to press a button mounted on a board, with his or her right foot (a manual or vocal response would interfere with the primary task) as soon as he or she observed the onset of a light. The 1.5 volt torch globe was mounted on a board located approximately 2m from the subject at an angle of approximately 30 degrees to the subjects' left, and was well within the subjects field of view, provided they faced generally to the front. The relay that activated the light produced an audible click. Many subjects subsequently reported that they were responding to this auditory cue. Ten such stimuli were presented to each subject during each five-minute condition, two in each minute. One of the stimuli in each minute was randomly presented according to a prearranged schedule, while the other was presented by the experimenter on the first occurrence of a body-focused movement. If no such movement occurred, the stimulus was presented at the end of the one-minute interval.

The subjects were informed that the light would come on a number of times, but that its occurrence was random and that not even the experimenter could predict its occurrence.

The subjects were all given a five-minute practice with the reaction time task before commencing the three conditions.

The few reaction times (RTs) which exceeded three seconds were excluded from subsequent analysis. These slow times were generally several times the length of the other RTs for the same subject and were usually associated with the subject's foot missing the button on the first attempt.

The subjects appeared to view their RT performance competitively, assuring a generally high level of motivation toward this task.

Apparatus. A National half-inch videotape recorder (NV3085A) and camera (WV3200N) recorded the movements and speech of all subjects. (See Figure 1 for a photograph of the experimental setting.) An AKG microphone in a microphone stand was placed approximately 1m to the subject's right to provide the input for the sound track. The camera was mounted on a tripod located directly behind and above the experimenter. No attempt was made to conceal the camera or microphone. The reaction time stimuli were presented by a purpose built device which was preset to deliver up to two stimuli per minute for five minutes, or additionally, stimuli could be initiated by the experimenter at any time by the pressing of a concealed foot switch. The presentation device also displayed the resultant reaction time to the nearest one-hundredth of a second for the experimenter to record. (A photograph of the device is included as Appendix 1.)

Personality Measures. At the conclusion of all videotape sessions for each subject the subjects were asked to recollect and rate their feelings at the time they were performing their Monologue and Mental Arithmetic tasks. Five ten-point rating scales were

Figure 1

A photograph of the setting of Experiment 1.

completed by each subject for each task. The extremities of these scales were labeled unhappy-happy, nervous-not nervous, not confident-confident, excited-calm, worried-not worried. (A sample rating sheet has been incorporated as Appendix 2.) Each subject's self-rating score for each task was computed by adding the scores across the five rating scales.

Several days after the conclusion of all sessions, each of the subjects completed the General Anxiety Scale for Children (GASC) and the Test Anxiety Scale for Children (TASC) (Sarason, Davidson, Lightfoot, Waite & Ruebush, 1960). Approximately one month later the children were individually tested on the Children's Embedded Figures

Test (CEFT) (Witkin, Oltman, Raskin & Karp, 1971), a measure of field-dependence.

The procedure employed by Kasl and Mahl (1965) was used to determine the number of speech disfluencies produced by the children during the Monologue. This procedure involves the transcribing of all Monologues, including the recording of all filled pauses, stutters etc.. The percentage of the total number of words spoken which were filled pauses ("umm" "ah" etc.) is known as the "ah-ratio", while the percentage of words involving one or more of the other speech disfluency categories is known as the "non-ah ratio". The eight categories of speech disfluency employed by Kasl and Mahl (1965) were employed here.

<u>Analysis of Hand Movements.</u> The Freedman et al. (1972) classification schema for body-focused movements was employed. The four continuous body-focused movement categories (i.e. those whose duration was greater than three seconds) were:

(a) <u>Finger-to-hand behaviour</u>, in which one hand (or both) manipulates the other, or rarely itself.

(b) <u>Direct body-focused movements</u>, in which one or both hands manipulate other parts of the body.

(c) <u>Indirect body-focused movements</u>, in which an object or an article of clothing is manipulated in a manner which does not relate directly to the context in any way; and

(d) <u>Total continuous body-focused movements</u>, which is simply the sum of the previous three.

The duration of each of these types of movement was scored from the videotape by use of a stopwatch during repeated viewing. Following Freedman et al. (1972), Direct and Indirect body-focused movements of less than three seconds duration were recorded as Discrete body-focused movements. The number of such movements was scored from the videotape.

This differentiation of the brief movements from continuous ones provides a much clearer indication of their frequency of occurrence than would overall movement totals. Many hand movements are of extended duration and these largely determine overall means. The brief movements produced by many subjects (a quick wipe of the nose, a scratch of the head etc.) provide little input to overall movement frequency totals due to their brevity. A supplementary score which indicates their numerical frequency without regard to duration therefore provides a useful addition to the description of an individual's body-focused movement performance (Friesen, Ekman & Wallbott, 1979).

Finger-to-hand scores were not divided into Continuous and Discrete movements. Initial observations made it plain that these movements were particularly difficult to partition into short sections as there was a tendency for the subjects to modify the movement over time, often associated with amplitude changes which resulted in the grading of one movement into the next. After a series of pilot observations it was felt that the distinction was operationally difficult to determine. By contrast the other movement types could very readily be divided into Discrete and Continuous categories.

Results.

Task effects and body-focused movements. Table 1-1 lists the mean frequencies for each of the body-focused movement categories. For Finger-to-hand (and Total continuous movement) categories there was a decrease in frequency from Monologue through Mental Arithmetic to Rest. This trend was not observed for the remaining categories, though generally the Monologue condition was characterized by the highest frequencies. The Discrete movements showed a similar trend. The Indirect body-focused movements observed for the Rest condition, while of a higher frequency, appeared to be of a qualitatively different kind, frequently involving manipulation of the adjacent equipment. This was not observed for the two conditions in which the experimenter remained in the room.

Table 1-1

Experiment 1. Mean frequencies of hand movements expressed as a percentage of task duration. Discrete scores are presented as the mean number observed in the five minute intervals.

	Monologue	Mental Arithmetic	Rest
Finger to hand	51.1	27.8	11.7
Direct	13.2	5.3	9.1
Indirect	7.4	0.3	11.0
Total continuous	71.7	33.4	31.8
Discrete (Number)	5.8	2.6	3.2

A repeated measures or random block design (Kirk, 1968) three way ANOVA was calculated on the three experimental tasks for the Total body-focused movement score and repeated for each of the body-focused movement subcategories (Table 1-2). It is apparent from this analysis that the task in which the subjects were engaged brought about major changes in the frequency and category of body-focused movement produced.

In order to explore the nature of these task effects in more detail planned comparisons (Hays, 1963) were computed using the SPSSX (SPSS inc., 1986) contrasts facility. The contrasts computed were between the Monologue and Mental Arithmetic and secondly between the Mental Arithmetic and Rest tasks. These analyses were conducted for each of the behaviour categories.

For the Total continuous measure the major task difference was between the Monologue and the Mental Arithmetic tasks with the former displaying the higher frequency ($t=8.1$ $p<0.01$). The Total continuous body-focused movement frequency in the Mental Arithmetic condition did not differ from that in the Rest condition ($t=0.3$ $p>0.1$).

Some caution must be exercised when interpretations are drawn from the analyses for the individual movement categories. These hand movement measures were recorded simultaneously from the same subjects and can therefore not be regarded as strictly independent of each other. None the less examination of the different movement categories demonstrates that these different measures responded somewhat differently to task changes. The planned comparisons computed for the <u>Finger-to-hand</u> movement frequencies indicate that the Monologue

Table 1-2

Experiment 1. Repeated measures design ANOVAs on the total body-focused movement frequencies for the three tasks. The same analysis is also provided for each of the body-focused movement categories.

Total continuous body-focused movements

Source	df	SS	MS	F
Tasks	2	189293.2	94646.6	33.1**

Finger-to-hand

Source	df	SS	MS	F
Tasks	2	148085.3	74042.7	16.8**

Direct

Source	df	SS	MS	F
Tasks	2	6010.2	3005.1	1.3

Indirect

Source	df	SS	MS	F
Tasks	2	11344.5	5672.3	6.7**

Table 1-2 (cont.)

Discrete (Number)

Source	df	SS	MS	F
Tasks	2	124.1	62.1	5.6**

*p<0.05 **p<0.01

frequency exceeded that for the Mental Arithmetic task ($t=4.8$ $p<0.01$) and also that the Mental Arithmetic score exceeded the Rest frequency ($t=2.6$ $p<0.05$). The task change produced no significant task effect for the Direct scores. No significant difference between Monologue and Mental Arithmetic was obtained for the Indirect score ($t=0.6$ $p>0.1$), however, the Rest condition Indirect score was higher than that observed for the Mental Arithmetic task ($t=4.1$ $p<0.01$). The task effects observed for the Total continuous measure therefore appeared largely to be a result of the Finger-to-hand movement frequency change. This category of body-focused movement was one of the ones which most clearly displayed the differences in frequency between the Stroop tasks in the Barroso et al. (1978) study.

The Discrete movement frequency was higher for the Monologue than for the Mental Arithmetic score ($t=2.8$ $p<0.05$). The Mental Arithmetic and Rest tasks did not differ in Discrete movement frequency ($t=0.8$ $p>0.1$).

Reaction times and the attention model. On the basis of the hypothesis that body-focused movements are related to attentional demands in stressful environments (Barroso et al., 1978) it would be expected that the reaction times for the Monologue condition would be greater than those for the Mental Arithmetic condition, in line with differences in body-focused movement frequencies. The mean Monologue reaction time of 0.88 seconds was significantly greater than the 0.74 second mean for the Mental Arithmetic condition ($t=3.08$ $p<0.01$). While this finding is in agreement with the comparison of Stroop interference and colour naming control task obtained by Barroso et al. (1978), it is difficult to attribute this finding to a direct relationship between body-focused movements and attentional demand, as these authors have suggested.

It is possible to compare mean RTs for stimuli associated with the simultaneous performance of a body-focused movement and those occurring between such movements. For both the Monologue (1.19 seconds and 1.11 seconds respectively) and Mental Arithmetic conditions (0.77 seconds and 0.75 seconds, respectively), the scores were quite similar and did not differ significantly ($t=0.26$ $p>0.5$, and $t=0.37$ $p>0.5$). While some caution needs to be exercised in interpreting the results of a small sample in which the number of observations contributed by each subject varies, the similarities in the means for each condition argues against the hypothesis that body-focused movements are associated with short-term shifts in attentional demand.

It is possible to either argue for a time lag between the onset of the attentional demand and the occurrence of a movement, or for the accumulation of the effects of attentional demand over a longer time scale before the onset of a body-focused movement. However, both of these similar hypotheses would predict a correlation between mean RT and movement frequencies. All correlations between these measures in both the Monologue and Mental Arithmetic conditions were statistically insignificant at the 0.05 level (Table 1-3).

Table 1-3

Pearson correlations between the mean probe reaction times and the body-focused movement frequencies for the Monologue and Mental Arithmetic tasks.

	Finger to hand	Direct	Indirect	Total Continuous	Discrete
Monologue RT	−0.27	0.07	−0.19	−0.25	0.15
Mental Arith. RT	0.02	0.05	−0.06	0.03	−0.17

Individual Consistencies and Personality Measures.

Spearman rank order correlation coefficients computed between the Total continuous body-focused movement scores for each setting (Table 1-4) were small and not statistically significant. This contrasts with the findings of Ruggieri et al. (1980), who obtained greater individual consistencies across tasks.

Looking in more detail at the movement categories, a somewhat different picture emerges. The Indirect movement category (despite the quantitative differences in its frequency across conditions) showed

Table 1-4

Experiment 2. Spearman rank order correlation coeffecients calculated for the three possible task comparisons and each of the body focused movement categories.

	Monologue with Mental Arith.	Monologue with Rest	Rest with Mental Arith.
Finger to hand	0.29	0.50*	0.04
Direct	0.48*	-0.04	0.34
Indirect	0.55**	0.39*	0.46*
Total continuous	0.10	0.30	0.32
Discrete (Number)	0.42*	-0.04	0.04

*p<0.05 **p<0.01

considerable ordinal consistency across subjects. A much less clear picture was apparent from the other movement categories.

While the Direct movements for the Monologue and Mental Arithmetic conditions showed significant ordinal consistency, this does not reach significance for the other two comparisons of conditions. A similar result was obtained for the Finger-to-hand scores for the Monologue and Rest conditions. Parallel correlations between body-focused movement scores for different tasks will be examined further in many of the experiments in subsequent chapters.

Correlations among the several anxiety measures employed were

Table 1-5

Experiment 1. Pearson correlations among the anxiety measures.

	GASC	TASC	MONOLOGUE NON-AH RATIO	MONOLOGUE AH-RATIO	MONOLOGUE SELF-RATING	MENTAL ARITH. SELF-RATING
GASC		0.68**	0.05	-0.14	-0.07	0.03
TASC			0.08	-0.28	-0.24	-0.14
MONOLOGUE						
NON-AH RATIO				0.11	-0.19	-0.30
AH-RATIO					0.21	-0.25
SELF-RATING						0.56**
MENTAL ARITH.						
SELF-RATING						

*P<0.05 **P<0.01

generally not significant (Table 1-5). The two related measures, the GASC and TASC scores, were significantly interrelated, as were the self-rating scores for the Mental Arithmetic and Monologue conditions. However there was little evidence for a significant relationship amongst the speech disturbance measures and the self-rating measures, nor between the state and trait measures.

Table 1-6 presents the correlation matrices for both the General

Table 1-6

Experiment 1. Pearson correlations of the body focused movement categories and trait anxiety measures.

Trait Anxiety Measures	Finger to hand	Direct	Indirect	Total continuous	Discrete
			Monologue		
GASC	0.53*	-0.40	-0.30	0.42*	-0.24
TASC	0.10	-0.08	0.05	0.16	0.27
			Mental Arithmetic		
GASC	0.00	-0.36	-0.04	-0.12	-0.07
TASC	-0.38	-0.32	-0.02	-0.49*	-0.16
			Rest		
GASC	0.47*	0.03	-0.22	0.25	0.06
TASC	0.22	-0.06	-0.38	-0.14	0.02

*P<0.05

and Test Anxiety Scales for Children (Sarason et al., 1960) with the body-focused movement frequencies for each of the categories. While Finger-to-hand behaviour did seem to correlate significantly with GASC score for two conditions, this was not true for the Mental Arithmetic condition. Similarly, the negative correlations between

Table 1-7

Experiment 1.

A. Pearson product-moment correlation coefficients calculated between the ah ratio, non-ah ratio and the anxiety self-rating score with the body-focused movement frequencies for the Monologue task.

	Finger to hand	Direct	Indirect	Total Continuous	Discrete
Ah ratio	0.24	-0.15	-0.10	0.16	-0.07
Non-ah ratio	-0.05	-0.01	-0.26	-0.29	-0.02
Self-rating	-0.14	0.11	-0.08	-0.15	0.23

B. Correlations between the self-rating score and the body-focused movement frequencies for the Mental Arithmetic task.

	Finger to hand	Direct	Indirect	Total Continuous	Discrete
Self-rating	0.14	-0.21	-0.03	-0.02	0.24

*p<0.05

TASC and the Total continuous body-focused movement frequency for the Mental Arithmetic condition was not observed for either of the other tasks.

On the basis of a simple arousal model one might wish to explain the generally higher frequencies of body-focused movement associated with the Monologue task as the result of the greater stress felt during this difficult and embarrassing task. In line with this expectation there was a significant difference between the self-rating scores for the Monologue and the Mental Arithmetic tasks ($t=2.09$ $p<0.05$). However when relationships between self-rating measures, the speech disturbance measures and body-focused movement frequencies were examined no significant correlations were observed (Table 1-7).

Table 1-8

Experiment 1. Partial correlations of movement categories with Children's Embedded Figures Test scores for each of the three tasks controlling for GASC score.

	Finger to hand	Direct	Indirect	Total continuous	Discrete
Monologue	0.54*	-0.60**	-0.06	0.08	-0.21
Mental Arithmetic	0.37	0.02	-0.15	0.37	-0.19
Rest	-0.41*	-0.07	0.18	-0.26	-0.27

*P<0.05 **P<0.01

Correlations of the Children's Embedded Figures Test scores with body-focused movement frequencies were not significant, except for a

negative correlation with Direct movements in the Monologue condition ($r=-0.47$ $p<0.05$). However, one such significant correlation in such a large matrix is close to the chance prediction and it seems safest to consider this relationship a product of chance at this stage.
However, when the relatively large influence of the GASC correlation was removed by a partial correlational procedure, a more interesting picture emerged (Table 1-8). Again, while a number of significant partial correlations were observed, particularly for Finger-to-hand behaviour, these differed markedly from task to task.

Discussion.

The marked significance of the observed task effects supports the general finding (Freedman et al., 1978; Krout, 1954a; Jones, 1943a, b; Barroso et al., 1978; LeCompte, 1981) of a close association between context and body-focused hand movement frequency.

The suggestion by Barroso et al. (1978) that this task consistency might be related to attentional demand was in part the result of their observations of significant differences in body-focused movement frequency between the Stroop colour confusion task and its colour naming control. In this experiment the Monologue task was found to produce the slowest probe reaction times and also the highest body-focused movement frequencies, in line with the Barroso et al. (1978) finding. However, attempts to demonstrate a more direct relationship by intercorrelating the attention measure and body-focused movement frequency were unsuccessful. In the light of this somewhat ambiguous finding further investigation of this relationship is warranted.

While the task effects appeared substantially to outweigh the effects of individual subject differences, some ordinal consistencies were found across situations, though these were somewhat irregular and appeared to interact with task differences. The existence of individual preferences in the form of body-focused movement production is perhaps not surprising, though its small contribution to overall variances might be less expected.

Due to the arousing circumstances in which body-focused movements are generally believed to occur, anxiety measures have frequently been related to body-focused movement frequencies. As previously noted, both clinicians (Raskin, 1962) and naive observers (Waxer, 1977) have reported the use of body-focused movement frequencies as a cue to the decoding of state anxiety. However, while Waxer (1977) reports a positive correlation between his paper-and-pencil anxiety measures and some types of body-focused movement, others have not confirmed this finding (Grand et al., 1977; Wiens et al., 1980).

The subjects in this study rated the Monologue as significantly more stressful than the Mental Arithmetic task. Body-focused movement frequencies were also higher for the Monologue task. However the state anxiety measures employed, the non-ah ratio and self-ratings, failed to correlate significantly with any of the body-focused movement measures. A similar result for the "ah-ratio" was found by Duncan and Fiske (1977). The GASC trait measure did somewhat better for at least the Monologue task and for some body-focused movement types. However, these correlations were not large and their lack of generality confirms the picture of only weak consistencies in individual body-focused movement preferences.

In Chapter 1 the difficulty authors have experienced in duplicating relationships between body-focused movement and personality measures was considered. In particular the finding by Freedman et al. (1972) of a relationship between body-focused movements and field-dependence has not always been replicated (Souza-Poza & Rohrberg, 1977; Wiens et al., 1980; Williams, 1973). While the youth of the present subject population may play a role in the failure to obtain a significant correlation in this study, the generally conflicting nature of the reported results in the literature points to a more general problem as the likely cause.

The finding that minor differences in the associated task can have significant effects on body-focused movement suggests that apparently minor variations in procedure or context may be implicated in the conflicting correlational results obtained by others. It would be informative to examine the performance of subjects when repeating the same task in order to determine how consistent such task influences are on personality and body-focused movement correlations.

Two of the three primary tasks employed here, Monologue (Freedman et al., 1972), and Mental Arithmetic (Jones, 1943a), have been previously reported to produce relatively high frequencies of body-focused movement. None the less, clear differences were obtained between tasks in the type and frequency of body-focused movement observed. These task influences appear to play a major role in determining the degree of correlation between personality and movement variables. If this is so then studies which intercorrelate body-focused movement frequency and a personality measure for a single task may be misleading if their results are unduly generalized.

While the finding of general and powerful task effects upon body-focused movement was not unexpected many of the other results obtained in this investigation were more surprising. The small contribution of individual difference effects for these three simple tasks, and the small and inconsistent personality correlations obtained were not entirely expected on the basis of previous work.

The failure to find any direct association between body-focused movement frequency and attentional demand, despite the general association between the more demanding task and higher body-focused movement frequencies, leaves the role of the attention model as an explanation of body-focused movements in an unclear situation.

The finding that the Monologue task was reported by the subjects to be the most stressful setting as well as the task with the highest body-focused movement frequency is in line with the arousal model. However, again correlations between the self-rating measure and body-focused movement frequencies were not significant. This finding also warrants further examination.

Experiment 2

Introduction.

The findings of Experiment 1 clearly indicated that context or task effects were more powerful predictors of body-focused movement frequency and form than were individual differences between subjects, at least for the three tasks examined. None the less weak subject consistencies were found across some tasks, and some weak correlations with personality measures were observed, though these in their turn appeared to be task dependent. Considering the common anecdotal belief in significant individual differences in body-focused movements, and previously reported findings of significant levels of individual consistency in body-focused movement production (Ruggieri, Guiliano & Fusco, 1980; Sainsbury & Costain, 1971), it was decided to examine this question further, employing a larger sample size, and repetitions of each of the tasks by each subject after an interval of six months. Such repetitions of the same task should provide maximum opportunity for the subjects to display long term preferences in body-focused movement characteristics.

The weak and somewhat inconsistent nature of the correlations between body-focused movement and the personality measures employed in Experiment 1 also warranted a re-examination. Considering the difficulty of replicating personality and body-focused movement correlations it is important to determine the long term stability and replicability of the weak relationships observed in Experiment 1.

The somewhat ambiguous nature of the findings concerning attention and body-focused movements also deserve further consideration. The failure to find significant correlations between body-focused movement production and RTs for the associated probe task may in part be due to the somewhat biased RT sampling procedure employed in Experiment 1. The attempt to detect simultaneous changes in attention and body-focused movement required the matching of body-focused movement with the occurrence of some of the RT stimuli. The more general question of an association between mean RT for the task and body-focused movement frequency may thereby have been obscured.

Experiment 2 therefore extended the sample size employed in Experiment 1, required the subjects to repeat the tasks after a six month interval, and examined again the possibility of an association between the probe reaction time measure and body-focused movement frequencies with randomly assigned reaction time stimuli. The two tasks, Monologue and Mental Arithmetic, which showed the most consistency in the rank ordering of individual body-focused movement performance were employed again here to allow comparison with Experiment 1.

Method.

Subjects. Fifty fifth-grade children attending Stirling East Primary School, Adelaide, were the subjects for this study. The mean age of the 23 boys and 27 girls was 10 years 3.1 months at the commencement of the study. Forty-eight subjects completed all aspects of the study. The two omissions were the result of prolonged absences from school. Ten-year-olds were again employed to allow ready comparison with Experiment 1.

Procedure. The procedure was similar to that of Experiment 1. Again, five-minute Monologues and Mental Arithmetic tasks were performed by each subject independently. No attempt was made to conceal the video equipment.

One variation in the procedure was added. In order to determine the possible influence of the experimenter on the subjects' behaviour, the subjects were divided into three groups. In the Experimenter condition the procedure of Experiment 1 was repeated. That is, the experimenter was visible and sat directly in front of the subjects behaving in a "warm" fashion. In the Screen condition the experimenter sat behind a screen throughout the Monologue and Mental Arithmetic tasks. The experimenter's nonverbal behaviour was therefore invisible to the subjects, though they were aware their speech could be heard. In the Absence condition the experimenter excused himself during the performance of the two tasks and left the room. Thus this last condition mimics the circumstances associated with the Rest condition in Experiment 1. The division of subjects into conditions was balanced over task order and sex.

Figure 2 is a photograph of the setting.

Attention Measure. While carrying out the Monologue and Mental Arithmetic tasks the subjects were required to perform the same probe reaction time task as outlined in Experiment 1. The subjects were again given an introductory practice with the RT task for five minutes before commencing either of the other tasks. However, this time the ten reaction time stimuli were randomly dispersed through the five-

Figure 2

A photograph the experimental setting

for Experiment 2.

minute periods with the restriction that only two were to occur in each one-minute block.

Apparatus. A National VHS video cassette recorder (NV-3000) and camera (WV3200N) recorded the movements and speech of all subjects. The reaction time equipment used in this study was the same as that employed in Experiment 1.

State-anxiety Measures. The state anxiety measures employed in Experiment 1 appeared to be unrelated to body-focused movement occurrence. One problem may have resulted from the delay between the conclusion of the first task and the subjects having an opportunity to report their reaction (Bedell, 1977). The rating scales during Experiment 1 were only filled out after all tasks were completed. In Experiment 2 the subjects were required to complete the same self-rating measure immediately after the conclusion of each task. Thus in Experiment 2 the delay between task completion and the opportunity to respond to the rating scales was only a few seconds.

As a second check on state anxiety levels the subjects were also asked to complete the Zuckerman Adjective Check List (ACL) (Zuckerman, 1960) after each task. This simple questionnaire required each subject to tick which of a list of adjectives applied to the way they felt during a task. On the basis of the pattern of ticked and not-ticked adjectives an overall state-anxiety measure is computed. The ACL, while asking similar questions to those employed in this author's self-rating measure, required a different type of response from the subjects. As such it should provide a check against artifactual difficulties which might be associated with the exact form of response required from the subjects and a check on the consistencies of the subjects' responses.

Test-Retest Measure. Six months after the completion of the above study the entire procedure was repeated using the same subjects, the same condition assignments, the same trial order, and the same equipment and setting. The same self-rating and ACL measures were completed by each subject for each task. Only two of the fifty subjects failed to be available for both performances.

Personality Measures. The GASC, TASC, and CEFT were completed by each subject after the conclusion of both performances of the tasks. To these were added the Otis Mental Abilities Test (Intermediate Form CD) (IQ) (Australian Council for Educational Research, 1952) and the Matching Familiar Figures Test (MFFT) (Messer, 1976), a measure of "impulsivity".

Analysis of Hand Movements. The hand movement classification schema employed in Experiment 1 was employed again here with only one minor addition. Both the number of Discrete movements and their durations were recorded during the analysis, rather than just the number.

Reliability. As a check on the reliability of the scoring procedure two reliability checks were conducted. Twenty of the five-minute tasks were randomly selected, with the restriction that they were balanced over tasks, sex and experimenter condition. The experimenter rescored this subsample several months after their initial scoring. No reference was made to the previous scoring, and it is considered most unlikely that the experimenter was able to remember previous scoring attempts at this small subsample, after an extended period, and after scoring such a large initial pool of performances. Such a procedure was designed to determine the experimenter's scoring consistency across this very large videotape sample.

Secondly, a more traditional reliability procedure was employed. This required an assistant to score the same twenty five-minute tasks. The assistant was provided with brief definitions of each of the movement categories and, after some initial practice, independently scored this subsample.

Results

Reliabilities.

The Pearson product-moment correlation coefficients for the first and second scorings by the experimenter varied from a low of 0.95 for the Finger-to-hand category up to 0.9998 for the Direct body-focused movement category. Correlations between the frequency measures for the two scorers varied from 0.83 for the frequency (duration) of the Discrete movements up to 0.998 for the Indirect body-focused movements. All correlations were significant at the 0.001 level. These results confirm other experimenters' findings that high reliabilities are readily obtained for the scoring of body-focused movement (Freedman et al., 1972; Friesen, Ekman & Wallbott, 1979).

Experimenter Effects.

An analysis of variance computed on the Total continuous body-focused movement means for the Experimenter, Screen and Absence groups and the two tasks produced no significant main or interaction effects associated with group assignment (Table 2-1). As a result the experimenter presence (Group) variable will not be considered further.

Task Consistencies and Repeated Performance.

Table 2-2 displays the means for each of the body-focused movement categories for each task for each performance. A repeated measures design analysis of variance was calculated on the Total continuous body-focused movement frequencies, the two tasks, and the two performances of each task (Table 2-3). Similar analyses for each of the body-focused movement categories are also provided in Table 2-3.

Table 2-1

Experiment 2. A repeated measures design ANOVA on the three tasks, the two performances and the total continuous body-focused movement frequencies.

Source	df	SS	MS	F
Experimenter group	2	832.1	416.0	0.7
Performances	1	184.5	184.5	0.4
Task	1	48301.8	48301.8	107.5**
Group X Perf.	2	224.6	112.3	0.3
Group X Task	2	675.6	337.8	0.8
Performance X Task	1	421.7	421.7	1.0
Group X Perf. X Task	2	670.4	335.2	0.8

*$p<0.05$ **$p<0.01$

For the Total continuous measure and each of its constituent categories the Task effect is significant but there were no significant Performance effects. The difference between performances on the Finger-to-hand measure did however approach significance ($F=4.1$ $p=0.051$).

The Discrete movement frequency while displaying the same Task differences produced a significant Performance effect. Examination of the means (Table 2-2) makes it clear that the Discrete movements were more common in the second performance.

Table 2-2

Experiment 2. Mean frequencies of hand movements expressed as a percentage of task duration.

	First Performance		Second Performance	
	Monologue	Mental Arithmetic	Monologue	Mental Arithmetic
Finger-to-Hand	41.5	13.0	29.4	10.5
Direct	5.4	2.7	7.2	5.6
Indirect	7.2	0.6	13.4	1.6
Total	54.5	16.2	49.4	17.6
Continuous				
Discrete (Number)	3.7	1.7	6.6	3.0
Discrete (Duration)	1.8	1.0	3.4	1.4

The overwhelming effect of the task requirements persisted across repetitions with essentially similar higher scores for the Monologue over the Mental Arithmetic task in both performances.

Spearman rank order correlations calculated on the movement scores for each combination of task and performance (Table 2-4) provide a second indication of the relative consistencies displayed by the subjects across performances and tasks. Across performances of the same task after a six month period there is relatively little consistency in the occurrence of the longer duration categories of

Table 2-3

Experiment 2. Repeated measures design ANOVAs on the total body-focused movement frequencies for the three tasks and two performances. The same analysis is also provided for each of the body-focused movement categories.

Total continuous body-focused movements

Source	df	SS	MS	F
Tasks	1	48301.8	48301.8	108.9**
Performances	1	184.5	184.5	0.5
Tasks x Performances	1	421.7	421.7	1.0

Finger-to-hand

Source	df	SS	MS	F
Tasks	1	23261.0	23261.0	62.6**
Performances	1	2116.6	2116.6	4.1
Tasks x Performances	1	1114.8	1114.8	2.4

Direct

Source	df	SS	MS	F
Tasks	1	187.5	187.5	1.8
Performances	1	295.5	295.5	2.5
Tasks x Performances	1	6.5	6.5	0.1

Table 2-3 continued.

Indirect

Source	df	SS	MS	F
Tasks	1	2941.1	2941.1	18.5**
Performances	1	453.5	453.5	3.0
Tasks x Performances	1	211.0	211.0	1.6

Discrete (Number)

Source	df	SS	MS	F
Tasks	1	372.1	372.1	21.5**
Performances	1	265.2	265.2	12.5**
Tasks x Performances	1	38.0	38.0	2.9

*$p<0.05$ **$p<0.01$

body-focused movement. For example high scoring subjects in the first performance did not necessarily display this rank six months later even for an identical task. Rank correlations across tasks within one performance showed considerably greater levels of consistency, particularly for the first performance.

By contrast the Discrete scores (those less than three seconds in duration) were noticeable more consistent than the longer duration movements across performances and tasks.

Table 2-4

Experiment 2. Spearman rank order correlation coefficients for the two tasks, the body-focused movement categories, and the two performances.

	First Monologue with Second	First Mental Arith. with Second
Finger to hand	.09	-.08
Direct	.09	.12
Indirect	.18	.02
Discrete (Duration)	.29*	.40**

	First Monologue with First Mental Arith.	Second Monologue with Second Mental Arith.
Finger to hand	.28*	.18
Direct	.24	.14
Indirect	.48**	.26*
Discrete (Duration)	.38**	.34**

*p<0.05 **p<0.01

RT and Body-Focused Movements.

Intercorrelations of the reaction time means for the probe task with the body-focused movement frequencies produced one significant correlation (Table 2-5). Only the Discrete movements for the second Mental Arithmetic performance ($r=-0.30$ $p<0.05$) correlated significantly with its respective reaction

Table 2-5

Experiment 2. Pearson correlations between the mean reaction times for the probe task in each setting with the respective body-focused movement frequency.

	Monologue		Mental Arithmetic	
Performance	1	2	1	2
Finger to hand	-0.08	0.00	-0.18	-0.02
Direct	0.12	0.00	-0.15	-0.03
Indirect	-0.05	-0.11	-0.14	-0.01
Total	-0.07	-0.12	-0.23	-0.03
Discrete (number)	-0.09	0.00	-0.08	-0.30*
Discrete (Duration)	0.10	-0.14	-0.13	-0.27*

*P<0.05

time. This appear to be best interpreted as the result of chance fluctuations in this large matrix.

Comparisons of the reaction time means for each of the tasks (Table 2-6) confirms the finding in Experiment 1 that slower probe reaction times were associated with the Monologue condition. However in this case the difference fails to reach significance. Contrasting the reaction times for the first and second performance of the two tasks showed that reaction times for the first performance were slower

Table 2-6

Experiment 2. Reaction times (sec) for each of the tasks and each performance.

	First Performance	Second Performance	t
Practice	0.550	0.528	1.1
Monologue	0.825	0.767	1.4
Mental Arithmetic	0.788	0.712	2.2*

than those for the second, but these differences only reach significance for the two Mental Arithmetic tasks ($t=2.2$ $p<0.05$). While the faster RTs for the second performance might be interpreted as indicating greater demand on the first performance it might equally be considered to be a consequence of repeated practice with the probe task itself.

Personality Measures and Body-Focused Movements.

Table 2-7 is a correlation matrix for the general personality measures. Considerable interdependence between some of the measures is apparent, particularly between the CEFT and the Otis Mental Ability Scale Score.

The large correlations between GASC and TASC were to be expected (Sarason et al., 1960) and they repeat the finding of Experiment 1. Similarly the significant correlations between the MFFT latency and

Table 2-7

Experiment 2. Pearson correlations between the personality measures

	GASC	TASC	IQ	CEFT	MFFT LATENCY	MFFT ERRORS
GASC		0.60	0.03	-0.13	0.01	-0.07
TASC			-0.26*	-0.39**	0.04	0.04
IQ				0.75**	0.06	-0.40**
CEFT					0.10	-0.45**
MFFT-LATENCY						-0.63**
MFFT-ERRORS						

*P<0.05 **P<0.01

error scores were to be expected (Messer, 1976). The negative relationship between the Otis IQ measure and MFFT error scores seems intuitively reasonable considering the nature of these measures.

The correlation matrix for the state and trait anxiety measures (Table 2-8) shows that there was considerable agreement between the self-rating scale and Zuckerman's Adjective Check List across all tasks and performances. The correlations between the state measures across tasks show similar consistency levels and similar significant correlations to those observed within a task but across performances. GASC was not significantly correlated with any of the state measures. TASC significantly correlated with the ACL score for the first Monologue and the second Mental Arithmetic score. As these

Table 2-8

<u>Experiment 2.</u> Pearson correlations amongst the state and trait anxiety measures.

	GASC	TASC	SELF RATING				ADJECTIVE CHECK LIST			
			Monologue		Mental Arith.		Monologue		Mental Arith.	
			1	2	1	2	1	2	1	2
GASC		−0.60’	−0.08	−0.04	−0.04	0.03	0.18	−0.11	0.07	0.13
TASC			0.13	0.01	0.15	0.21	0.25*	0.03	0.14	0.33*
SELF RATINGS										
MONOLOGUES										
1				0.60’	0.77’	0.35’	0.64’	0.51’	0.58’	0.38’
2					0.56’	0.65’	0.44’	0.59’	0.36’	0.31*
MENTAL AR.										
1						0.41’	0.50’	0.38’	0.56’	0.25’
2							0.46’	0.52’	0.48’	0.61’
A.C.L.										
MONOLOGUES.										
1								0.52’	0.71’	0.43’
2									0.42’	0.61’
MENTAL AR.										
1										0.46’
2										

*P<0.05 ’P<0.01

correlations were not matched by similar correlations with the self-rating measure it seems appropriate to consider these isolated significant correlations as likely to be the product of chance effects in this large matrix.

Pearson correlations between body-focused movement frequencies for each task and performance with each of the personality measures are provided in Table 2-9.

In particular it should be noted that of the nine significant correlations found between body-focused movement types and personality measures during the first performance only three appeared among the eleven significant correlations associated with the second performance. One of these three significant correlations was in the reverse direction in the second performance. The remaining two consistent correlations were both with the Direct body-focused movement category in the Monologue condition and involve the CEFT and IQ measures. As was noted previously the CEFT and IQ scores for this population are highly interrelated.

In Experiment 1 using virtually identical tasks and settings significant correlations between GASC and some body-focused movement frequencies for one task were found. These were not replicated here. However, the single significant correlation obtained between the CEFT measure and body-focused movements in Experiment 1 was replicated again in both performances in this study.

In Experiment 1 a highly significant correlation of -0.47 was obtained between the CEFT measure and the Direct body-focused movement frequency, though this was dismissed then as probably a chance

Table 2-9

Experiment 2. Pearson correlations of five personality measures and the body focused movement frequencies

A. General Anxiety Scale for Children

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	-0.08	0.20	-0.00	-0.32*
Direct	0.18	0.05	0.18	-0.10
Indirect	-0.23	-0.26	-0.10	-0.08
Total	-0.11	0.17	-0.03	-0.30*
Discrete	-0.35*	-0.20	-0.06	-0.12

B. Test Anxiety Scale for Children

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	-0.12	0.08	-0.05	-0.08
Direct	0.10	0.08	0.30*	-0.08
Indirect	-0.04	-0.28*	0.09	-0.13
Total	-0.14	-0.08	0.19	-0.13
Discrete	-0.39**	-0.26	0.14	-0.18

*p<0.05 **p<0.01

Table 2-9 continued

C. Children's Embedded Figures Test

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	0.22	0.33*	0.10	-0.11
Direct	-0.27*	0.11	-0.41**	-0.19
Indirect	-0.09	0.12	0.05	0.22
Total	0.10	0.35*	-0.06	-0.13
Discrete	0.20	0.12	-0.25	0.24

D. Otis Mental Abilities Scale

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	0.21	0.27	0.11	-0.13
Direct	-0.31*	0.08	-0.35*	-0.01
Indirect	-0.22	0.14	0.11	0.38**
Total	-0.12	0.28*	0.01	-0.03
Discrete	0.01	-0.00	-0.31*	0.04

*p<0.05 **p<0.01

Table 2-9 continued

E. Matching Familiar Figures Test

Latency Measure

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	0.02	0.18	0.09	-0.25
Direct	-0.10	-0.01	-0.26*	0.05
Indirect	-0.11	-0.20	0.03	0.11
Total	0.07	0.14	0.05	-0.14
Discrete	-0.04	-0.07	-0.01	-0.03

F. Matching Familiar Figures Test

Errors Measure

	First Performance		Second Performance	
	Monologue	Mental	Monologue	Mental
Finger-to-hand	-0.15	-0.29*	-0.15	0.28*
Direct	0.11	0.02	0.25*	0.03
Indirect	0.19	0.07	0.08	-0.14
Total	-0.04	-0.25	-0.00	0.20
Discrete	-0.04	0.10	0.00	-0.17

$^*p<0.05$ $^{**}p<0.01$

phenomenon. This relationship, having been replicated here in both performances, takes on a greater significance. It should be noted however that this association was only observed for the Monologue, and never in the Mental Arithmetic setting.

The relationship between IQ and CEFT scores and the Direct body-focused movement score is not coincidental. Partial correlations of IQ and Direct body-focused movement scores controlling for CEFT are insignificant (-0.06 and -0.09 for the first and second performances respectively). The partial correlations with CEFT controlling for IQ are somewhat larger but are still not significant at the 0.05 level (-0.20 and -0.26 respectively). These two personality measures therefore seem to be related to Direct body-focused movements through largely the same variance.

In Experiment 1 correlations between the state-anxiety measures and body-focused movement frequencies were not significant. Table 2-10 displays the correlations between the self-rating measure and the Zuckerman's Adjective Check List, and body-focused movement frequencies. No consistent pattern is apparent. While the Total continuous body-focused movement frequency correlates significantly with the self-rating measure for both the first and second Monologues these correlations are in opposite directions. No such correlations were obtained using the ACL measure. Again, while the number of significant correlations obtained was slightly greater than would be expected by chance the pattern that emerges is inconsistent and provides little guidance.

The differences in frequencies of body-focused movement observed for the Monologue and Mental Arithmetic tasks can not be attributed to

Table 2-10

Experiment 2. Pearson correlations between state-anxiety measures and body-focused movement frequencies for both of the tasks in both performances.

	SELF-RATING				ADJECTIVE CHECK LIST			
	Monologue		Mental Ar.		Monologue		Mental Ar.	
Performance	1	2	1	2	1	2	1	2
Finger to hand	-0.14	0.11	0.01	-0.10	0.14	0.04	0.12	-0.33*
Direct	-0.18	-0.19	0.11	-0.04	-0.06	-0.19	-0.17	-0.09
Indirect	-0.20	0.27*	0.19	0.18	-0.23	0.03	-0.05	0.03
Total continuous	-0.27*	0.31*	0.07	-0.06	-0.00	0.03	0.04	-0.28*
Discrete (number)	0.02	0.02	0.05	-0.05	-0.31*	0.01	-0.24	-0.12
Discrete (duration)	0.07	0.04	0.06	-0.13	-0.32*	-0.02	-0.27*	-0.14

*$p<0.05$

anxiety differences, at least in so far as the state-anxiety measures employed in this study accurately reflect the subjects' reactions (Table 2-11). A small but significant difference was observed between the self-rating scale scores for the Monologue and Mental Arithmetic

Table 2-11

Experiment 2. Means of the Self-Rating scores and the Zuckerman Adjective Check List (ACL) for each task and each performance.

	Monologue		Mental Arithmetic	
	First	Second	First	Second
A.C.L.	9.98	9.32	9.47	9.18
Self-rating	23.80	22.49	23.51	21.95

tasks in Experiment 1. In Experiment 2 the self-rating and ACL scores are in the same direction as in Experiment 1, with Monologue scores higher than Mental Arithmetic scores for both performances. Similarly the means for both measures are slightly higher for the first performance of each task. However t-tests computed on the mean scores for the self-rating and ACL measures, between performances of the same task, or between different tasks in the same performance all fail to reach significance at the 0.05 level.

Discussion

Task Differences, RT and Anxiety.

Even with a larger sample than that employed in Experiment 1 the contribution of individual preferences for body-focused movement performance is much smaller than the contribution of task differences.

The higher frequency of body-focused movement observed in the Monologue setting in Experiment 1 was replicated here for both performances. Despite the slight and statistically insignificant decrease in body-focused movement frequency from the first performance to the second, and an increase in Discrete movements, overall the repetition had little impact on the large task differences.

Attempts to explain these task differences in terms of an arousal model strike many of the same difficulties as experienced in Experiment 1. While the self-report and ACL measures are higher for the Monologues, the differences are not significant. Similarly the first performance of each task had a slightly higher self-rating mean, but again this does not reach significance. Correlations of anxiety measures and body-focused movement frequencies were not consistently significant.

Employing the attentional demand hypothesis generates similar difficulties. The RT means for the probe task are higher for the Monologue task for both performances, but not significantly so. Similarly the RT means for the first performance of each task are slightly higher, but this does not reach significance. Correlations of body-focused movements and RT are generally not significant.

Despite very high frequencies of body-focused movement occurrence, and the major differences observed between the body-focused movement frequencies recorded for the same subjects across two performances, neither the attention model nor the arousal model seem to provide a convincing explanation.

Individual Consistencies and Personality.

The lack of rank consistency across performances in the majority of the body-focused movement scores provides confirmation of the small scale of long-term individual subject body-focused movement preferences, at least for these two tasks and these young subjects. Given this low individual quantitative consistency across performances the lack of consistency of correlations between personality measures and body-focused movement frequency was to be expected. While again the overall number of correlations between the personality measures and body-focused movement was higher than might have been expected by chance the pattern of correlations was not consistent.

The conclusion reached in Experiment 1, that the lack of consistency in correlations across tasks of the personality measures and body-focused movements was due to the large task effects, seems difficult to sustain for the findings of Experiment 2. Again while large fluctuations in these correlations were observed across tasks even greater inconsistencies were observed for repetitions of the same task. Though the task effect is apparent in the results of both performances this is not reflected in consistencies of individual body-focused movement preferences for these tasks across performances.

There are a few interesting exceptions to the general picture outlined above. While most of the continuous movement categories showed little consistency in their correlations with personality measures, the single significant correlation between Direct body-focused movement for the Monologue and the Children's Embedded Figures Test score has been found on three occasions. While this may be a chance phenomenon, as suggested in Experiment 1, its regular re-occurrence makes this seem far less likely. The conclusion from Experiment 1 that tasks had significant influences on personality body-focused movement correlations is still supported by this isolated finding. The Direct body-focused movement score showed no pattern of significant correlation with the CEFT score for any of the other tasks in either experiment.

General Discussion.

The widely reported finding that body-focused movements are systematically associated with context changes has been replicated here over three settings. However, attempts to relate these differences to measures of anxiety or attentional demand have been unsuccessful. This lack of relationship may be due to inadequacies in the hypotheses or in the methodologies employed here to test them.

Even assuming that both the probe RT measure and the self-report measures of anxiety were relatively insensitive indicators of motivational and information processing activities the complete lack of consistent correlation among these measures, and the high frequencies of body-focused movement observed, seem surprising if we accept either the attention or arousal models as relevant explanations of body-focused movement occurrence during these tasks.

The low level of consistency in the subjects' performance of body-focused movements across both tasks and performances is also somewhat surprising considering the findings of Sainsbury and Costain (1971) and Ruggieri, Guiliano and Fusco (1980).

Both the attention and stress models have provided little insight into the consistent situational differences in body-focused movement that were observed in Experiments 1 and 2. In Chapter 3 an alternative approach was examined. While Experiments 1 and 2 involved a correlational approach, Experiments 3 and 4 explored the explanatory value of the attention model by experimentally manipulating the attentional demand of the tasks.

Chapter 3

Distraction and Body-Focused Movements.

Experiments 3 and 4.

Experiment 3

Introduction

The task effects and individual differences obtained in Experiments 1 and 2, reported in Chapter 2, can not be simply explained employing either the arousal or attention models. However, there was sufficient ambiguity in the results to question the sensitivity of the self-report method of assessing emotional state, or the reaction time probe procedure for assessing attentional demand.

As an alternative to the preceding correlational approach the research reported in this chapter employed an experimental approach. In particular the value of the attention model was further investigated.

The suggestion by Barroso et al. (1978) that attention focusing may have been implicated in body-focused movement occurrence was in part based on the observation that some types of body-focused movement were more frequent for the Stroop colour confusion task when contrasted with its colour naming control. The Stroop task itself is complex. It seems possible that the differences in the tasks may induce secondary motivational changes in the subjects which might account for the hand movement differences. A more direct manipulation of attentional demand seems to be required if the hypothesis is to be convincingly tested.

In order to test the attention model more directly a graded series of tasks was employed. These were designed to provide a wide range in the levels of distraction experienced by the subjects. On the basis of the attention model we would expect that subjects would produce the highest frequencies of body-focused movement while performing the task with the greatest amount of secondary distraction.

In the experiments outlined in this chapter the Stroop tasks, as employed by Barroso et al. (1978), were used. In order to manipulate the level of attentional demand experienced by the subjects secondary distractors were added to the basic Stroop tasks. In the case of Experiment 3 the secondary distractor was the reaction time probe task employed in Experiment 2. In Experiment 4 the distractor was a series of loud noises.

If indeed attention focusing under distraction is a significant factor in body-focused movement production then a graded difference in the frequencies of these movements should be observed, across the simple colour naming task, through the colour naming task with distraction, to the Stroop confusion task, to finally the highest frequencies for the Stroop confusion task with distraction.

Method

Subjects. The subjects were forty-nine fifth grade children attending The Heights school, Modbury, Adelaide. The mean age of the 28 boys and 21 girls was 10 years and 0 months at the commencement of the study.

Procedure. Each of the subjects completed two tasks. These were the Stroop colour confusion task (Stroop) and the Stroop colour naming task (Control) (Stroop, 1935). In the Stroop task the subjects were required to indicate the colour ink in which a series of colour words were written. The colour word and the colour of the ink in which it was written never corresponded, though the same four colours were employed for both the words and the colours of the inks - red, green, yellow and blue. Many variations on the basic Stroop confusion task exist (Jensen & Rohwer, 1966). In the current study the lettering was presented on a large white card (50cm x 50 cm) so that it could be read easily at a distance without pointing. The letters were printed one half cm in height, in 10 rows of 10 words. The order of the stimuli on the card was randomly determined, with the restrictions that the same number of each colour occurred across the card and no adjacent serial repetitions of the same colour inks were permitted. The standard Stroop instructions were employed. These required the subjects to identify as quickly and as accurately as possible the colour of the ink in which the words were written, while ignoring the words themselves.

Prior to the performance of the Stroop task the subjects were required to complete successfully two 10-item rows of Stroop stimuli, both to ensure their understanding of the instructions and to provide an opportunity for practice. The same Stroop card and practice examples were employed for all subjects. This task is virtually identical to that employed by Barroso et al. (1978).

The Control task was very similar to the confusion task. The same size card and colours of ink were employed. The order of the coloured inks in the matrix was identical to that of the Stroop card. However, rather than the coloured inks taking the form of distracting colour words, they were asterisks. The number of asterisks in each item in the 10 x 10 matrix corresponded to the number of letters in the corresponding colour word on the Stroop card.

The cards were presented on a stand so that they were approximately at the subject's eye level.

In most Stroop studies the subject is required to read once through the stimulus items for each of the tasks (Jensen & Rohwer, 1966). This was the practice employed by Barroso et al. (1978). The universal finding is that the colour confusion task is completed much more slowly than the colour naming task. This led to the possibility of complications for the study of associated hand movements. Pilot observations by the author suggested that the frequency of hand movement observed may be influenced by the duration of the task.

In order to allow for this possible secondary influence the subjects were required to continue through the card for five minutes. If, as all did, they completed the card before the five minute interval had elapsed they were to return to the beginning of the card and read it through again. While this lead to some repetition of items it was felt unlikely that the subjects would be able to remember sequences of such repetitive items from the few previous passes through the card.

No attempt was made to correct the subjects if they made errors in their Stroop task responses. The number of such errors was determined subsequently from the videotape record.

Anxiety Measures. All the subjects were required to complete the Zuckerman Adjective Check List (ACL) and the self-rating measure employing the procedure described for Experiment 2.

Secondary Distraction Task. The complexity of the Stroop task makes it unlikely that the only difference between the two Stroop tasks is one related to information processing. The frustration and thwarting associated with the Stroop task might well be argued to be a significant influence on the subject's hand movements. One wây of attempting to elucidate the relationship between hand movements and attentional processes was to systematically increase the level of distraction experienced by the subjects by application of a secondary distraction to the already difficult Stroop tasks.

The probe reaction-time task described in Chapter 2 provides a simple and convenient means to vary the distraction level experienced by the subjects. The subjects were randomly assigned to three groups. The No-RT group performed the Stroop and Control tasks without the secondary distraction of a RT task. The 10-RT group experienced 10-RT stimuli during their five-minute tasks. The ten stimuli were preset to a random occurrence with the restriction that only two occurred in each minute, and that stimuli were separated by a minimum of 5 sec. Each subject experienced the same sequence of stimuli for both tasks. The 20-RT group experienced 20-RT stimuli during their five-minute performance, four in each minute. For both RT conditions the subjects were instructed that they must press the foot-button as soon as possible after the onset of the light. If after five seconds of stimulus onset the subjects had not pressed the foot-button they were verbally reminded of this requirement. No subject needed to be reminded more than once.

All subjects, including those in the No-RT group, were required to complete a five-minute practice with 10-RT stimuli presented as for the practice sessions in Experiment 2. This five minutes of RT practice was carried out prior to the conducting of the Stroop tasks.

The light for the RT task was mounted to the subject's right at approximately 30 degrees. The cards were mounted approximately 30 degrees to the subject's left. Thus the stimulus light was visible in the periphery of the subject's vision. While the clicking sound of the relay which switched the light on was again present in this study, the device was mounted further from the subjects than in previous studies, and was probably not readily audible.

Throughout the performance of the Stroop tasks the experimenter was concealed behind a screen.

Figure 3 is a photograph of the setting.

Apparatus. A National VHS video cassette recorder (NV-3000) and camera (WV3200N) recorded the movements and speech of all the subjects. The sound was recorded with an AKG microphone. The RT device was the same as that employed in Experiments 1 and 2.

No attempt was made to conceal the video camera.

Hand Movement Analysis. The same hand movement analysis schema employed in Experiment 2 was employed here. The duration of each movement bout was again measured by the experimenter using a stopwatch during repeated viewing of the videotapes.

The requirement that the subjects continue each of the tasks for a five-minute period may make comparison between the results obtained here and those of Barroso et al. (1978) difficult. In order to

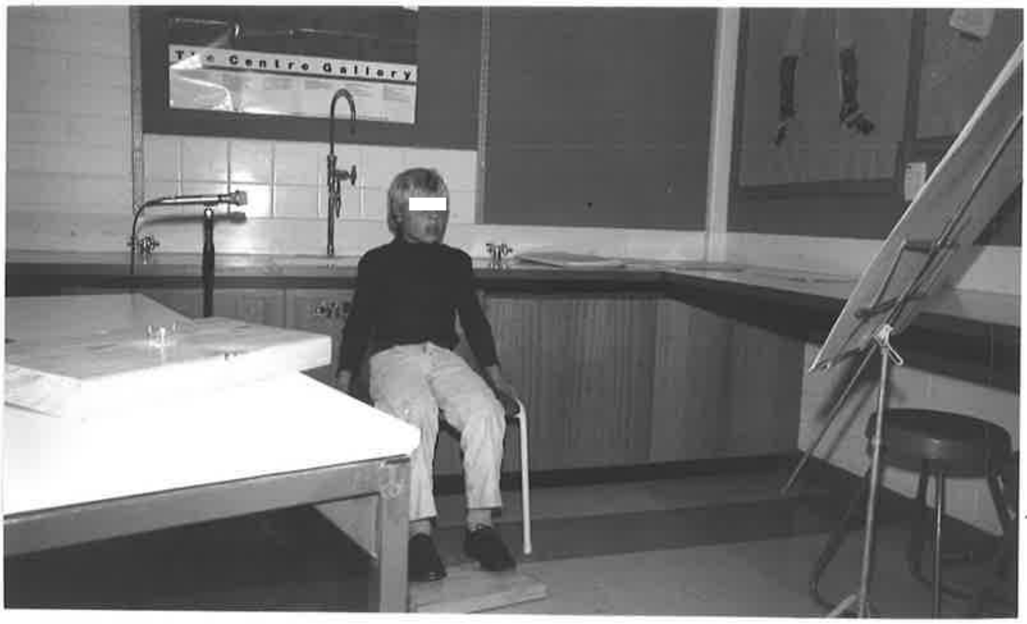


Figure 3

A photograph of the setting of Experiment 3.

overcome this difficulty the hand movement scores were computed both for the full five-minute interval and for the first pass through the card. This second score directly corresponds to the measure used by Barroso et al. (1978).

Results.

The mean frequencies of each of the categories of hand movement for each of the two tasks, and each of the three groups, is displayed in Table 3-1. It is clear from examination of the means that there is no simple increase in body-focused movement frequency with level of distraction.

Table 3-1

Experiment 3. Body-focused movement frequencies for both the Stroop and Control tasks, for each of the three distraction conditions. Values are expressed as a percentage of the time available, except for the Discrete (No.) which is the mean number of movements observed.

Stroop

	No-RT	10-RT	20-RT
Finger-to-hand	28.4	17.9	30.0
Direct	3.7	4.3	4.0
Indirect	8.5	7.0	11.2
Total Continuous	40.6	29.2	45.2
Discrete (No.)	5.7	5.6	5.5
Discrete (Duration)	2.9	2.8	3.2

Control

	No-RT	10-RT	20-RT
Finger-to-hand	30.9	14.2	19.6
Direct	2.2	3.4	3.5
Indirect	11.1	7.2	13.6
Total Continuous	44.2	24.8	36.7
Discrete (No.)	4.7	6.3	7.7
Discrete (Duration)	2.4	2.8	3.2

Table 3-2

Experiment 3.

A. A repeated measures design ANOVA calculated on the total continuous body-focused movement frequencies, the three distraction level groups and the two Stroop tasks.

Source	df	SS	MS	F
Group	2	5150.5	2575.2	2.8
Tasks	1	271.5	271.5	1.2
Group X tasks	2	1094.6	547.3	2.4

B. Repeated measures design ANOVA on the total continuous body-focused movement frequencies, the three distraction level groups and two Stroop tasks for the first pass through the relevant card.

Source	df	SS	MS	F
Group	2	2877.4	1438.7	1.3
Tasks	1	24.2	24.2	0.1
Group X tasks	2	945.8	472.9	1.4

**p<0.01

A repeated measures design ANOVA calculated on the Total continuous body-focused movement frequency, the two Stroop tasks, and the distraction level group is shown in Table 3-2. Similar analyses

Table 3-3

Experiment 3. Repeated measures design ANOVAs calculated on the frequencies of each the body-focused movement categories, the three distraction level groups and the two Stroop tasks.

Finger-to-hand

Source	df	SS	MS	F
Group	2	3584.8	1792.4	2.6
Tasks	1	302.5	302.5	1.0
Group X tasks	2	1048.0	524.0	1.8

Direct

Source	df	SS	MS	F
Group	2	24.3	12.1	0.2
Tasks	1	33.3	33.3	2.5
Group X tasks	2	4.0	2.0	0.2

Indirect

Source	df	SS	MS	F
Group	2	451.4	225.7	0.3
Tasks	1	51.2	51.2	0.5
Group X tasks	2	42.9	21.5	0.2

$*p<0.05$ $**p<0.01$

Table 3-3 cont.

Discrete (Duration)

Source	df	SS	MS	F
Group	2	22.2	11.1	0.4
Tasks	1	0.6	0.6	0.1
Group X tasks	2	8.3	4.1	0.7

**p<0.01

are also presented for each of the body-focused movement categories in Table 3-3. In all the ANOVAs the Group and Task effects failed to reach significance. More specifically the higher frequency of Finger-to-hand movements reported by Barroso et al. (1978) for the Stroop confusion task was not replicated here.

These failures to find the expected task and distraction effects were not due to the failure of the Stroop and Control tasks to differ in task demand. As has been reported by all investigators of the Stroop phenomenon (Jensen & Rohwer, 1966) the colour confusion (Stroop) card is always completed more slowly than its colour naming control. In all cases in this investigation the subjects were slower to complete the Stroop card on the first pass ($t=17.6$ $p<0.001$) and the number of items completed by the subjects in 5 minutes was much greater for the control task ($t=18.8$ $p<0.001$). As was previously noted this experiment differed from that of Barroso et al. (1978) in that the subjects continued both tasks for 5 min. rather than making one simple

Table 3-4

Experiment 3. Body-focused movement frequencies for both the Stroop and Control tasks, for each of the three distraction conditions, for the first pass through the respective cards. Values are expressed as a percentage of the time taken, except for the discrete (No.) scores.

	Stroop		
	No-RT	10-RT	20-RT
Finger-to-hand	22.7	19.4	29.2
Direct	3.8	5.3	4.9
Indirect	11.0	7.2	11.4
Total Continuous	37.5	31.9	45.3
Discrete (No.)	4.7	5.3	3.3
Discrete (Duration)	4.0	3.6	2.8

	Control		
	No-RT	10-RT	20-RT
Finger-to-hand	32.3	15.0	23.6
Direct	3.2	3.8	2.6
Indirect	10.1	8.7	12.7
Total Continuous	45.6	27.6	38.9
Discrete (No.)	2.0	2.7	2.2
Discrete (Duration)	1.8	2.8	2.5

pass through the one-hundred items. The mean frequencies of the body-focused movement categories for the first pass through their respective cards are given in Table 3-4. An analysis of the frequencies of the Total continuous body-focused movements for this first pass through the card is given in Table 3-2. The distinction between the total interval and the first pass through the card appears to have made no substantive difference to the outcome. An ANOVA computed on the duration of the Discrete scores also fails to show any significant impact of distraction group assignment ($F=0.09$ $p>0.1$). The means for the Discrete movements for the Stroop task, while generally higher, fail to differ significantly from the Control task scores ($F=3.3$ $p>0.05$). The distraction group assignment had no significant impact ($F=0.27$ $p>0.1$).

Though the task differences appear to have had little effect on body-focused movement scores it may be that the general level of performance of the subjects on the Stroop tasks is influenced by the body-focused movement frequency, or indeed that both are the product of some intervening variable, such as selective attention level or anxiety. Table 3-5 shows the correlations between the body-focused movement scores and the measures of Stroop task performance for both the Control and Stroop tasks. As the distraction group differences appear to have had little influence they have not been considered here. While all the correlations observed are small the significant correlations between the number of Discrete movements and the time taken to complete the first pass through the card are interesting. The correlations are slightly greater for the apparently less difficult colour naming Control task.

Table 3-5

Experiment 3. Pearson Correlations between the body-focused movement frequencies for both the Stroop and Control tasks and both the number of items reported by the subjects in five minutes (Number) and the time taken to complete the first pass through the card (Time).

Stroop

	Number	Time
Finger-to-hand	0.04	-0.15
Direct	-0.10	0.11
Indirect	0.04	0.00
Total Continuous	0.04	-0.10
Discrete (No.)	-0.22	0.30*
Discrete (Duration)	-0.24	0.31*

Control

	Number	Time
Finger-to-hand	0.27*	0.28*
Direct	-0.25*	0.24
Indirect	0.15	-0.13
Total Continuous	-0.16	0.17
Discrete (No.)	-0.31*	0.35**
Discrete (Duration)	-0.30*	0.36**

*$p<0.05$ **$P<0.01$

Despite the similarities of movement scores, setting, tasks and ages of subjects the scores obtained in this study were somewhat lower than the frequencies obtained by Barroso et al. (1978) for both tasks, and for the comparable movement categories. For the No-RT group the Finger-to-hand score is actually higher for the Control task in this study. The Direct scores seem to show little systematic variation across tasks or distraction level groups. For the two groups that did experience reaction-time distractors there was a slight tendency for the body-focused movement scores for the Stroop task to be higher than for the comparable control group. However, none of these reach significance. Perhaps the simplest demonstration of the limited predictive value of the attention model for this investigation is the comparison of the two extreme scores.

The No-RT control subjects had only to read the repetitive colour names of the asterisks for five minutes. The 20-RT Stroop task required the subjects to complete the difficult Stroop confusion task while simultaneously attending to frequent stimuli presented in their visual periphery. The body-focused movements for the No-RT Control condition and the 20-RT Stroop condition are virtually identical and there are no significant differences for any of the behavioural categories at the 0.05 level.

One of the problems in attempting to understand body-focused movements is their extraordinary variability. For example the mean scores for the Finger-to-hand measure in the 10-RT Control condition are about half of that of the No-RT Control. The 20-RT Control task however yields a slightly higher score. The Finger-to-hand score for the Stroop 10-RT group is similarly somewhat lower than that for either the No-RT or the 20-RT group. None of these comparisons are statistically significant, however.

Anxiety Measures. Table 3-6 provides the Pearson correlation coefficients amongst the self-rating and adjective check list measures. As in Experiment 2 the two measures show a good deal of agreement.

Table 3-6

Experiment 3. Pearson correlations amongst the Self-rating and Adjective check list (A.C.L.) measures.

	SELF RATING		ADJECTIVE CHECK LIST	
	STROOP	CONTROL	STROOP	CONTROL
SELF RATINGS				
STROOP		0.67**	0.60**	0.47**
CONTROL			0.29*	0.67**
A.C.L.				
STROOP				0.59**
CONTROL				

*P<0.05 **P<0.01

Separate ANOVAs calculated on the self-rating and ACL measures with two tasks and the distraction level groupings provided some surprising findings. Neither measure was significantly influenced by the distraction level manipulation ($F=1.38$ $p>0.1$, and $F=0.75$ $p>0.1$, respectively). When the effect of the tasks on the subject's self-rating score was examined there was a significantly higher mean for the control task ($F=5.19$ $p<0.05$). This unexpected finding was repeated with the ACL scores though the difference did not quite reach significance ($F=3.43$ $p=0.07$). Informal discussions with the subjects after completion of the study suggested that the monotonous nature of the five minutes of colour naming may have been a significant factor in this anxiety assessment.

Correlations between the self-rating and ACL measures, and body-focused movement frequencies for the relevant task are displayed in Table 3-7. Only two of the correlations were significant at the 0.05 level using the behaviour scores for the full five minutes. An essentially similar result was obtained if the behaviour scores for the first pass through the card were employed. These isolated and small significant correlations are best regarded as random fluctuations at this stage.

Individual Consistencies. Spearman rank order correlations between the subjects performances on the Stroop and Control tasks are provided in Table 3-8. These show a quite high level of individual consistency in body-focused movement performance across these two tasks whether the first pass through thc card is considered or the total scores for the five-minute interval are used.

Table 3-7

Experiment 3. Pearson Correlations Between the Self-rating and Adjective Check List Measures and the Body Focused Movement Frequencies for the Relevant Task.

Total Scores (five minute duration).

	STROOP		CONTROL	
	Self-rate	A.C.L.	Self-rate	A.C.L.
Finger-to-hand	-0.12	0.03	-0.12	0.09
Direct	0.08	-0.10	0.33*	0.18
Indirect	0.19	0.10	-0.14	-0.29*
Total	0.06	0.08	-0.16	-0.14
Discrete (Number)	0.21	0.04	0.19	-0.03
Discrete (Duration)	0.17	-0.00	0.14	-0.06

Table 3-7 continued.

Scores for the First Pass Through the Card.

	STROOP		CONTROL	
	Self-rate	A.C.L.	Self-rate	A.C.L.
Finger-to-hand	-0.23	-0.10	-0.14	-0.03
Direct	0.09	-0.08	0.26*	0.18
Indirect	0.18	0.10	-0.04	-0.17
Total	-0.05	-0.05	-0.10	-0.10
Discrete (Number)	0.20	0.03	0.18	-0.09
Discrete (Duration)	0.26*	0.05	0.20	-0.04

Table 3-8

Experiment 3. Spearman rank order correlation coefficients for the body-focused movement scores for the two Stroop tasks.

	Total Scores	First Pass through the card.
Finger-to-hand	0.41**	0.29*
Direct	0.51**	0.46**
Indirect	0.52**	0.48**
Discrete (Duration)	0.63**	0.35**
Discrete (Number)	0.58**	0.44**

*P<0.05 **P<0.01

Discussion

The reported finding by Barroso et al. (1978) that the Stroop colour confusion task differed from its colour naming control in terms of its effect upon some body-focused movement frequencies was not confirmed. It is difficult to assign this lack of confirmation to methodological difficulties as these two studies used very similar procedures, subjects, and body-focused movement categories.

The finding that the subjects gave higher self-ratings of anxiety for the repetitive colour naming control task provides an indication of the motivational complexity of the Stroop setting. It is not possible to assume that the more difficult task is the more anxiety producing and it may be that some such motivational difference in the subjects' responses to these tasks may be implicated in the difference between the results obtained by Barroso et al. (1978) and those reported here. However, it should be noted in this context that the motivational differences reported here for the two tasks did not in fact result in any systematic changes in body-focused movement frequencies. However the possibility of such motivational effects can not be ruled out. The finding that Stroop and Control task performances were correlated with the frequency of the Discrete movements is suggestive of such a motivational influence but the effect is small and will need confirmation from further investigations.

The failure in this experiment to replicate the Barroso et al. (1978) finding raises the question of whether cultural differences between these cultural groups may have influenced body-focused movement performances. Such cultural differences might be related to differences in nonverbal expectations (display rules) or indirectly through differing motivational reactions to the Stroop tasks.

The failure to confirm the Barroso et al. (1978) task differences should not be seen as evidence that there is little cross-cultural consistency in body-focused movement performance. It is clear from a simple comparison of the comparable mean frequencies for the Barroso et al. (1978) study and those for the current Experiment that the performance of these two groups of children was similar despite small but theoretically important quantitative fluctuations.

Increasing the attentional demands required of the subject seems to have had no significant effect either upon the subjects' reported anxiety level or on body-focused movement frequencies. This seems difficult to reconcile with a simple attentional demand model. Informally the subjects reported that the 20-RT condition stretched their ability to perform the Stroop task to its limit, while the No-RT colour naming task was regarded as boring and too simple. Yet no significant difference in body-focused movement between the two tasks at the extremes of this attentional demand spectrum was observed.

As in Experiments 1 and 2 both the attention and anxiety models of body-focused movements appear to have little predictive value for these quite different tasks.

When the frequencies of body-focused movement produced by the subjects during performance of the two Stroop tasks were examined substantial consistencies were obtained. While this result was in line with expectations based on previous investigations (Ruggieri, Guiliano, & Fusco, 1980; Sainsbury & Costain, 1971) it differs substantially from the extensive results of Experiments 1 and 2 where relatively little consistency was obtained, even for repetitions of the same task.

In the previous investigations substantial task effects were obtained, but very little individual consistency. For these Stroop tasks no significant task effects were obtained but substantial individual consistencies were observed. It is interesting to speculate that these phenomena are related. However finding that repetitions of the same task after six months produced few significant consistencies suggests that any motivational factors involved in the production of these task effects must be short lived. The finding of somewhat higher inter-task correlations for the first two dissimilar tasks in Experiment 2, as compared with the same tasks separated by six months, is in line with this interpretation. Similar tasks separated by a shorter time scale, such as the Stroop and Control tasks of Experiment 3, may be ideal for displaying individual preferences in body-focused movements. These questions will be examined further in later experiments.

The failure to replicate the Barroso et al. (1978) study in terms of task differences in movement frequencies warrants a repetition of these Stroop tasks to re-examine this question.

Despite the apparent attentional demand differences of the tasks performed by the subjects in this experiment it might be argued that other, perhaps more effective, distractors could be employed. Studies by a number of authors (Hartley and Adams, 1974; Houston, 1969; Houston and Jones, 1967; Mathews and Brunson, 1979) have shown that the playing of loud distracting sounds to subjects can in some cases actually improve Stroop confusion task performance even though it never reaches the levels obtained for the colour naming control. This enhancement effect is small, however, and not always observed (Mathews and Brunson, 1979).

In Experiment 4 the Stroop part of this study is replicated, and the loud noise distractor is employed, to determine its effect upon body-focused movement frequency.

Experiment 4.

Introduction.

The Stroop tasks employed in Experiment 3, while not producing the expected task differences in associated body-focused hand movements, showed relatively high levels of individual consistency across the tasks. This differs markedly from the findings of chapter 2. This again raises the question of whether consistent differences in hand movements between individuals are associated with differences in personality characteristics.

There is some evidence that subjects display differing reactions to the complex Stroop task plus distraction setting. Mathews and Brunson (1979) found that the effects of distraction on Stroop task performance appeared to be associated with individual differences in information processing characteristics. These differences were in turn associated with the Type A and Type B personality measures widely known for their apparent association with cardiovascular disease. Type A subjects were superior to type B subjects in coping with distraction while performing the Stroop task. Indeed type B subjects were observed to deteriorate in performance on the Stroop task under distraction, while the type A subjects improved.

In examining this association between distraction and performance various distractors were presented by Mathews and Brunson (1979) to subjects engaged in the standard Stroop tasks. These distractors included a reaction time task, and the playing of loud sounds. In Experiment 4 a loud sound distractor, similar to that employed by Mathews and Brunson (1979), was used to explore its possible influence on body-focused movement frequencies. These tasks also provided an opportunity to re-examine the Barroso et al. (1978) finding that the Stroop colour confusion task is associated with higher body-focused movement frequencies than its colour naming control.

The finding that irrelevant loud sound stimuli presented to subjects during Stroop task performance can enhance performance is important for the attention and body-focused movement discussion. The finding that irrelevant stimulation can aid in task performance under distraction could be seen as a model for relating irrelevant body-focused (self-stimulating?) movements to task performance. However the experiments outlined above have shown that such an attention model has not displayed substantial predictive value. If, indeed, the loud noise distractor can aid in Stroop confusion task performance, is it also associated with higher frequencies of body-focused hand movements?

One should not, however, draw conclusions too broadly on the basis of this apparent facilitating effect of loud sounds. Firstly, the effect is a small one and appears to be sensitive to the personality characteristics of the subjects (Mathews & Brunson, 1979), and secondly other types of irrelevant stimuli such as reacting to a secondary reaction time task (Mathews & Brunson, 1979) do not produce this effect. Nor do arousing settings such as the threat of shock necessarily produce this sort of facilitation (Mathews & Brunson, 1979).

The unexpected finding of much greater individual consistency across tasks in body-focused movement frequency during the Stroop task procedure of Experiment 3 reopens the question of possible associations between personality measures and body-focused movement frequencies. While it was concluded in Chapter 2 that there was little evidence for such consistent associations the higher consistencies obtained with the Stroop tasks suggests that such potential associations should be re-examined for these contexts. In particular the Children's Embedded Figures Test, a measure of field-dependence, seems relevant to this type of distraction task, and was the only personality measure to be associated with body-focused movements (Direct movements) on a consistent basis across experiments, for at least one of the chapter 2 tasks (Monologue).

Method

Subjects. 48 fifth-grade children from Flinder's Park Primary School, Adelaide participated in this study. The mean age of the 30 boys and 28 girls was 10 years and 3 months at the commencement of the study.

Procedure. Each of the subjects completed the Stroop colour confusion (Stroop) and Colour naming control (Control) tasks. The instructions, Stroop cards and equipment were identical to those employed in Experiment 3.

Noise Distraction. The subjects were divided into two groups which were balanced over trial order and gender. The first group received a loud and continuous series of irrelevant sounds during their performance of the two tasks (Noise group) while the second group experienced no such sound distraction (No-Noise group).

The series of noises were played to the Noise group subjects through headphones which they wore during both tasks. The sounds were designed to resemble closely those employed by Mathews and Brunson (1979). The tape contained extensive sections of electronic music, frequently interspersed with irrelevant but not unpleasant sounds such as a clock ticking, crowd noises, fairground sounds and a cattle auction. The sound level at the headphones was checked regularly. The average intensity of the sound was about 80 dB(A), 3000 Hz. The range employed was rather greater than that employed by Mathews and Brunson; it was about 60 to about 95 dB(A).

The No-Noise group wore the same headphones, but no sound was played.

Anxiety Measures. Again the self-report and Zuckerman Adjective Check List tests were employed as self-report indicators of emotional state. As in Experiment 3 the subjects were required to fill out these reports on completion of each task rather than at the conclusion of their participation.

Difficulty and Comfort. In view of the finding in Experiment 3 that subjects seem to find the Control task more stressful than the Stroop task, it was decided to expand the range of self-reports required of the subjects. After responding to the anxiety self-report measures the subjects were asked to complete one or two ten-point rating scales. The first asked the subjects "how comfortable or uncomfortable were the sounds". The 1 end of the scale was labeled "uncomfortable", and "comfortable" was associated with the 10 end. The question was only relevant to the Noise group subjects and was omitted for the No-noise group.

Similarly the subjects were asked "how difficult was the task?". The 1 end of the 10-point scale was labeled "very easy" while the 10 end was labeled "very difficult".

Figure 4

A photograph of the setting of Experiment 4.

Children's Embedded Figures Test (CEFT). Approximately three weeks after the conclusion of all experiments 43 of the original 48 subjects were individually tested using the same procedure as outlined in Experiments 1 and 2. The 5 missing subjects had prolonged absences from school.

<u>Hand Movement Scores.</u> The same hand movement scoring procedure was employed here as in Experiments 2 and 3. As there was little difference between the behaviour scores for the first pass through the card and the full 5 minutes, only the total 5-minute scores were analyzed.

<u>Equipment.</u> The tasks were videotaped using a National VHS video cassette recorder (NV180A) and a Canon VC10 video camera. The sound was recorded using an AKG microphone on a microphone stand to the subjects right. As in Experiment 3 the Stroop cards were displayed at eye level to the subjects on a stand. The sounds were played back to the subjects through a Sony reel-to-reel tape recorder (TC 630). The sound level at the headphones was intermittently checked using a Bruel and Kjaer type 2225 integrating sound-level meter.

No attempt was made to conceal the video camera and recorder. The experimenter was concealed behind a screen during task performance.

Figure 4 is a photograph of the setting.

Results.

The mean frequencies of the body-focused hand movement categories are given in Table 4-1. An ANOVA calculated on the Total continuous movement frequencies, the 2 sound groups and the two tasks is presented in Table 4-2. Similar analyses for the other body-focused movement measures are provided in Table 4-3. Again the differences observed between Stroop and Control tasks were not significant for any of the continuous movement measures. Nor is there any apparent effect of the noise condition upon these frequencies.

Similar ANOVAs calculated for the Discrete scores gave a less

Table 4-1

Experiment 4. Body-focused movement frequencies for both the Stroop and Control tasks for each of the two Noise conditions.

Stroop

	Noise	No-Noise
Finger-to-hand	39.7	32.6
Direct	6.0	6.5
Indirect	1.8	6.4
Total Continuous	47.5	45.5
Discrete (No.)	3.0	6.4
Discrete (Duration)	1.6	3.6

Control

	Noise	No-Noise
Finger-to-hand	30.6	33.7
Direct	7.1	5.4
Indirect	2.6	6.5
Total Continuous	40.3	45.6
Discrete (No.)	2.5	4.8
Discrete (Duration)	1.5	2.3

Table 4-2

Experiment 4. A repeated measures design ANOVA on the total continuous body-focused movement frequencies, the two Noise groups and the two Stroop tasks.

Source	df	SS	MS	F
Group	1	66.1	66.1	0.1
Tasks	1	308.8	308.8	1.0
Group X tasks	1	306.4	306.4	1.0

**p<0.01

clear-cut picture. When the number of Discrete movements was employed as the dependent variable then a weak Noise condition effect was observed (F=4.2 p=0.048). However, when the Total duration of the Discrete movements was employed the result did not quite reach significance (F=3.95 p=0.053). The difference in the tasks was not a significant influence on Discrete movement scores whichever measure was employed (F=1.37 p>0.1 and F=0.77 p>0.1 respectively).

The difficulty rating, the comfort rating, the self-rating and ACL scores for each task and group are provided in Table 4-4. The subjects' report on the "comfort" level of the noise does not appear to have been influenced by the nature of the ongoing task (t=0.16 p>0.1). However, an ANOVA calculated on the groups, Stroop tasks and the difficulty rating shows that the difficulty rating was apparently

Table 4-3

Experiment 4. A repeated measures design ANOVA on the total continuous body-focused movement frequencies, the two Noise groups and the two Stroop tasks.

Finger-to-hand

Source	df	SS	MS	F
Group	1	96.1	96.1	0.1
Tasks	1	384.4	384.4	1.2
Group X tasks	1	613.3	613.3	2.0

Direct

Source	df	SS	MS	F
Group	1	7.8	7.8	0.02
Tasks	1	0.0	0.0	0.0
Group X tasks	1	29.7	29.7	0.5

Indirect

Source	df	SS	MS	F
Group	1	429.1	429.1	3.4
Tasks	1	4.3	4.3	0.1
Group X tasks	1	3.3	3.3	0.1

*P<0.05 **P<0.01

Table 4-4

Experiment 4. Means of the Self-Rating scores, the Zuckerman Adjective Check List (ACL), the Difficulty Rating, and the "comfort" rating for each of the Stroop tasks and each of the Noise groups.

	Noise		No-Noise	
	Stroop	Control	Stroop	Control
A.C.L.	9.9	9.0	9.7	8.7
Self-rating	34.2	20.2	24.6	21.3
Difficulty	6.2	3.9	6.6	5.8
Comfort	5.5	5.7	-	-

influenced by both the Noise group assignment ($F=4.7$ $p<0.05$) and the task ($F=19.35$ $p<0.001$). Higher means were obtained both for the Stroop task in comparison with the Control and for the Noise condition in contrast with the No-noise condition.

Interestingly, in the light of the findings of Experiment 3, the self-rating scores were significantly higher for the Stroop over the Control task for this experiment ($F=9.6$ $p<0.01$). This was the reverse of the Experiment 3 finding. The Noise group assignment appears to have had no influence ($F=0.1$ $p>0.1$). As in Experiment 3 the ACL mean scores, while in the same direction as

Table 4-5

Experiment 4. Pearson correlations amongst the subjects self-report measures. (The Comfort scores are only available from those subjects in the Noise group.)

	Stroop				Control			
	ACL	Self-Rate	Diff.	Comfort	ACL	Self-Rate	Diff.	Comfort
Stroop								
ACL		0.49**	0.10	-0.56**	0.54**	0.25*	0.19	-0.12
Self-Rating			0.00	-0.20	0.21	0.50**	0.02	0.06
Difficulty				-0.24	0.11	0.15	0.37**	-0.16
Comfort					-0.46**	0.30	-0.27	0.22
Control								
ACL						0.56**	0.15	-0.68**
Self-rating							-0.22	0.45**
Difficulty								-0.14
Comfort								

*P<0.05 **P<0.01

the self-rating score, did not achieve significance ($F=3.2$ $p=0.08$).

Pearson correlations between the anxiety, difficulty and comfort measures are displayed in Table 4-5. The expected correlations between the relevant ACL and self-rating scores were again observed. The difficulty measure however failed to correlate with the other measures. There is apparently a strong inverse relationship between the Adjective Check List score provided by the subjects and their rating of the degree of comfort associated with the loud noise for both the Stroop and Control tasks. The similar comparison of self-rating and comfort supported this inverse relationship though it did not achieve significance for the Stroop task. It does not seem unreasonable nor unexpected to suggest that where the loud sounds are viewed as uncomfortable this has an effect upon the subjects' reports of their anxiety levels.

Table 4-6

Experiment 4. Spearman rank order correlation coefficients for the body-focused movement scores for the two Stroop tasks.

Finger-to-hand	0.71**
Direct	0.60**
Indirect	0.47**
Discrete (Duration)	0.63**
Discrete (Number)	0.61**

*P<0.05 **P<0.01

In order to examine the level of consistency individuals displayed in their relative body-focused movement frequencies Spearman rank order correlation coefficients between the subjects performances on the two tasks have been provided in Table 4-6. It is apparent that the very high consistencies observed in Experiment 3 for the two Stroop tasks have been replicated here despite the fact that Table 4-6 does not differentiate the results by Noise grouping.

Pearson correlations between the personality measures and the body-focused movement frequencies are provided in Table 4-7. The Children's Embedded Figures Test, which showed limited association with one category of body-focused movement for one of the settings in Chapter 2, shows no such relationship for the Stroop settings. The picture is similarly negative for the association between body-focused movement and the comfort rating associated with the noise condition. The anxiety and difficulty measures similarly have no obvious association with body-focused movements for the Stroop tasks. However the Control condition provided some unexpected relationships. The Finger-to-hand scores for the control task showed a weak but significant association with the Adjective Check List Rating, though this did not achieve significance for the similar self-rating measure. A similar significant association with Finger-to-hand score was found for the difficulty measure during the Control task.

However, most surprising was the significant negative association between the Discrete score in the control condition and both the ACL and self-rating measures. As no such association between these measures was observed during Experiment 3 it might seem sensible to postulate that the noise condition itself is perhaps influencing these

Table 4-7

Experiment 4. Pearson Correlations for the Self-Report Measures and Personality Measures with the Body-Focused Movement Frequencies.

Adjective Check List

	Stroop	Control
Finger-to-hand	0.07	0.28*
Direct	0.15	-0.09
Indirect	-0.03	-0.05
Total	0.12	0.20
Discrete(number)	-0.02	-0.31*
Discrete(duration)	-0.06	-0.31*

Self-Rating

	Stroop	Control
Finger-to-hand	-0.09	0.20
Direct	0.15	-0.19
Indirect	0.01	-0.19
Total	-0.03	0.03
Discrete(number)	-0.17	-0.40**
Discrete(duration)	-0.16	-0.39**

Table 4-7 continued.

Difficulty

	Stroop	Control
Finger-to-hand	0.20	0.26*
Direct	0.11	0.02
Indirect	-0.06	0.04
Total	0.23	0.23
Discrete(number)	0.21	-0.14
Discrete(duration)	0.16	-0.18

Comfort

(only for subjects in the Noise group)

	Stroop	Control
Finger-to-hand	-0.04	-0.07
Direct	0.15	-0.09
Indirect	-0.25	0.20
Total	-0.08	-0.02
Discrete(number)	0.16	0.25
Discrete(duration)	0.27	0.24

Table 4-7 continued

Children's Embedded Figures Test

	Stroop	Control
Finger-to-hand	0.02	0.02
Direct	-0.06	-0.02
Indirect	0.12	-0.04
Total	0.07	0.13
Discrete(number)	-0.03	-0.03
Discrete(duration)	-0.01	-0.01

*p<0.05 **P<0.01

Discrete movements. Unfortunately this hypothesis can not be sustained. If the correlations for these measures are compared for the subjects in the No-noise and Noise condition (Table 4-8) it is clear that it is during the No-noise control task that this relationship is most apparent. As this situation in this study differed from the control task in Experiment 3 only in the presence of headphones, it is difficult to see why such a different result should have been obtained.

Not only was this weak but significant association between Discrete movements and the anxiety measures unique to this study in the series but its direction was also anomalous. One might argue for a direct association between Discrete movements and anxiety ratings, however the observation here was in the opposite direction. It is difficult to see why in the Control condition alone subjects should

Table 4-8

Experiment 4. Pearson correlations between the ACL and Self-rating measures and the discrete (duration) body-focused movement frequencies for the Noise and No-Noise conditions.

	Noise		No-Noise	
	Stroop	Control	Stroop	Control
ACL	0.09	-0.37*	-0.12	0.34
Self-Rating	0.07	0.10	-0.34	-0.58**

*p<0.05 **p<0.05

find that higher anxiety reduces Discrete body-focused movement frequencies. This result seems inconsistent with previous findings and must therefore give rise to the suspicion that it may represent a random association in a large matrix.

An ANOVA computed on the number of colour word responses to the two tasks, and the two Noise conditions (Table 4-9) showed the expected major difference in tasks, but the improvement in performance sometimes associated with such sounds (Mathews and Brunson, 1979) was not observed here. Similar results were obtained if the time taken to complete the first pass through the card was employed as the dependent measure.

<u>Table 4-9</u>

<u>Experiment 4.</u> Repeated measures design ANOVA on the number of colour word responses for the two Stroop tasks, and the two Noise groups.

Source	df	SS	MS	F
Group	1	4069.0	4069.1	1.4
Tasks	1	189126.3	189126.3	329.3**
Group X tasks	1	1183.0	1183.0	2.1

**$p<0.01$

Correlations between the number of colour word responses performed by the subjects in five minutes, the time taken to complete the first pass through the card and the body-focused movement frequencies are reported in Table 4-10. As in Experiment 3 a number of significant associations between task performance measures and body-focused movement frequencies were observed. Again the effect was most striking with the Discrete movement scores for the Control task indicating that as the subjects performance level drops off the frequency of the briefer body-focused movements increases. Such a model might well be consistent with a model which postulated an increase in anxiety level as subjects experience difficulty with the particular task. However the subjects self-reports were not consistent with this interpretation (Table 4-7). Similarly the attention model is difficult to employ as an explanation in view of the lack of differences observed between groups and the Stroop tasks.

Table 4-10

Experiment 4. Pearson Correlations between the body-focused movement frequencies for both the Stroop and Control tasks and both the number of items reported by the subjects in five minutes (Number) and the time taken to complete the first pass through the card (Time).

Stroop

	Number	Time
Finger-to-hand	-0.16	0.17
Direct	-0.20	0.07
Indirect	-0.25*	0.15
Total Continuous	-0.31*	0.24*
Discrete (No.)	-0.10	0.13
Discrete (Duration)	-0.09	0.15

Control

	Number	Time
Finger-to-hand	-0.09	0.03
Direct	-0.07	0.08
Indirect	-0.35**	0.35**
Total Continuous	-0.27*	0.22
Discrete (No.)	-0.32*	0.39**
Discrete (Duration)	-0.31*	0.40**

*P<0.05 **P<0.01

Discussion

Again the Barroso et al. (1978) finding of a difference between the frequency of some body-focused movements for the two Stroop tasks was not confirmed. Also, attempts to increase systematically the level of distraction inherent in the tasks through the use of loud noises produced generally negative results similar to those found with the RT distractor, despite the report by the subjects that they found the Noise increased the difficulty of the task. The only exception was a marginally higher level of Discrete movements associated with the Noise condition. It is hard to see how such findings can be aligned with a model which suggests that difficulty in coping with distraction may be associated with body-focused movement production.

Upon re-examining the question of individual consistencies in body-focused movements it is apparent that the subjects were again highly consistent in their production of body-focused movements during the two Stroop tasks. However the Children's Embedded Figures Test, which achieved some limited associations with body-focused movements in earlier investigations, was not observed to correlate significantly with body-focused movement frequencies for either task.

Correlations between the various self-report measures and body-focused movement frequencies were generally small and varied, forming no clear cut patterns.

The finding in both Experiment 3 and 4 of significant associations between the frequency of some body-focused movements and performance measures is interesting. The observation that this was most true for the Discrete movements during the Control task was unexpected, and is at present unexplained. However, it should be noted that the Discrete movement frequencies have shown other differences from the continuous body-focused movement frequencies in previous experiments. Most notably it was the Discrete movements that showed the greatest signs of consistency in Experiments 1 and 2. It may be that these brief movements will require a different explanation from the dominant continuous category.

General Discussion.

This series of experiments was designed to explore several issues. The first concerned the value of the attention model of body-focused movement occurrence. The second concerned the level of task relatedness of the body-focused movement frequencies observed. The third was concerned with the question of individual consistency in body-focused movement performance. Some answers to these questions are now apparent.

The attention model of body-focused movement occurrence postulated by Barroso et al. (1978) in an attempt to explain differences in the occurrence of these movements that did not seem to be simply arousal effects has not proved to have predictive value. While many factors may influence body-focused movement form and frequency it is difficult to see in the light of these investigations how coping with distraction can be one of these. Attempts to correlate attentional demand measures and body-focused movement frequencies have been consistently unsuccessful. Substantial task differences in body-focused movement frequencies do not seem to correspond clearly to differences in attentional demand as measured by the reaction time probe procedure. An alternative experimental approach which sought to vary systematically attentional-demand and thereby, body-focused movement frequency, similarly produced consistent negative results. Even when quite extreme tasks are compared, such as the No-RT Control and the 20-RT Stroop tasks of Experiment 3, no sign of a difference could be observed. It is difficult to see how the attention model can survive such findings in its present form and it may be necessary to look elsewhere for an explanation of the anomalous task differences in body-focused movement frequencies that have been observed (e.g. Wild et al. 1983).

Similarly the disinhibition model postulated to explain similar types of irrelevant comfort movements in nonhuman vertebrates fares poorly when applied to the data of Chapter 3. We would expect that the Stroop task would closely resemble the thwarting tasks (McFarland, 1966a) which have succeeded in increasing irrelevant movement frequencies in a number of species. It would appear that the disinhibition model can not be called upon to replace the attention model as an explanation of body-focused movement occurrence for these tasks.

Many authors have drawn attention to the task consistent nature of body-focused movement occurrence. It is probably this phenomenon that has sustained interest in body-focused movements in spite of the lack of success most authors have had to admit in explaining their occurrence. In Experiments 1 and 2 such consistent task differences in body-focused movements were observed. No such differences were observed for Experiments 3 and 4 with the two Stroop tasks despite previous reports of such differences (Barroso et al. 1978). Repeating tasks with the same subjects after an interval of six months had little effect on the task differences. It is tempting to ascribe such substantial and consistent task effects to features of the task such as its difficulty or amount of attentional demand. However, it might also be a consistent motivational reaction to the task requirements that produced such task consistencies. Some indication that this might be so is found in the examination of the third question, the level of individual consistencies displayed by the subjects in their body-focused movement production.

Unlike the reports of some previous investigators (Ruggieri et al., 1980; Sainsbury & Costain, 1971) the findings of Experiments 1 and 2 failed to show very much individual consistency in body-focused movement production. While the frequency of briefer Discrete movements did show common ordinal ranking across subjects regardless of the task this was not so for the vast bulk of the body-focused movements observed. When the subjects performed the same tasks after a six month period it was apparent that ordinal consistencies were much greater within one session and across tasks than they were for the same task across a six month gap. This can be viewed as consistent with the idea that rather than specific task demands determining body-focused movement performance such task influences were mediated through similar motivational reactions to the tasks. These task influences on motivation would be viewed as short lived in nature. The consistent task differences observed for Experiments 1 and 2 might then be viewed as the product of consistent motivational reactions to these tasks.

The absence of task differences observed in Experiments 3 and 4 might then be the result of similar motivational reactions to the tasks despite their marked differences in difficulty and attentional demand. The differences between the Barroso et al. (1978) Stroop finding and that obtained here, despite great similarity in task requirements, might be understood as a difference in motivational reaction to the experimental setting and the task requirements. Unfortunately attempts to measure such plausible intervening motivational variables as anxiety and perceived difficulty did not result in successful prediction of body-focused movement occurrence.

Throughout all the preceding studies many of the interpretations have been based upon research conducted in many areas of the world. The gross similarities of the movements described in many locations around the world (e.g. Feyereisen, 1977; LeCompte, 1981; Ruggieri, Guilliano, & Fusco 1980; Seiss, 1965) are striking. However, as has been previously noted, to date there have been no detailed cross-cultural comparisons of body-focused movements. While continuing with an interest in the questions of individual consistencies in body-focused movement form and frequency, and the factors within a situation which might influence body-focused movement occurrence, the remainder of this thesis will direct its attention to the issue of cross-cultural consistencies in body-focused hand movements. Chapter 4 will deal with a continuation of the experimental approaches considered to date while Chapter 5 will concern itself with a more naturalistic observational strategy and a wider variety of subjects.

Chapter 4

A Cross-Cultural Study of Body-Focused Movements.

An Experimental Approach

Experiment 5.

Introduction.

In the discussion of hand movements entered into in the preceding chapters data concerning the occurrence of body-focused hand movements was presented from a diverse range of authors observing subjects from many cultural backgrounds (e.g. Barroso et al. 1978; Jones, 1943a,b; LeCompte, 1981; Ruggieri, Celli, & Crescenzi, 1982; Seiss, 1968). It is clear from many of the descriptions provided by these authors that the body-focused movements described show distinct qualitative similarities to those described here for Australian children. These similarities have been observed despite a wide range of age groups and contexts. However, no author to date has reported direct quantitative comparisons of body-focused movements for identical contexts in a range of cultures. Without such a comparison it is difficult to begin to attribute causes to differences in quantitative findings from authors working in different parts of the world.

Most of the published quantitative studies of body-focused movements have observed subjects in experimental settings (e.g. Kimura, 1973a,b; Krout, 1954a,b; Ruggieri, Guiliano & Fusco, 1980; Souza-Poza, Rohrberg & Mercure, 1979; Williams, 1973). The majority of such studies concern themselves only with subjects who come from Britain, Europe and the United States. Even within these related cultures there appear to be no examples of investigators quantitatively comparing the body-focused movement production of culturally different populations across several differing tasks. This study is concerned with just such a comparison.

The nonverbal communication literature contains many examples of significant cross-cultural differences in movement form or frequency (e.g. Collett, 1971; Eibl-Eibesfeldt, 1972; Hall, 1969; Watson, 1970). More specifically, the hand movements that are associated with speech or replace speech show marked variations in frequency and form with changes in the performer's cultural background (Efron, 1941; Graham, Bitti & Argyle, 1975; Morris et al., 1979; Sainsbury & Wood, 1977). In particular the production of speech related movements appears to be higher in frequency in French (Sainsbury & Wood, 1977) and Italian (Graham, Bitti & Argyle, 1975) subjects than it is in English-speakers. Thus there appear to be grounds to suspect the existence of significant quantitative cultural variation in hand movement frequencies. Comparison of the findings reported in the preceding chapters and those obtained by researchers in Europe, America or more culturally remote locations may therefore contain differences attributable to cultural influences.

Ekman (1977) suggested that some forms of hand movement, those which seemed to be associated with nervousness and arousal, might show similar cross-cultural consistencies to those displayed in studies of facial expression affect decoding. However, at the date of his writing he could not report any relevant cross-cultural studies.

Relatively recently a comparison has been made between Japanese and English subjects on the form and frequency of face touching when observed in a variety of contexts (Hatta & Dimond, 1984). Some differences were found in the area of the face touched though there were no statistically significant differences between the Japanese and English subjects in the overall frequency of face touching for any of the settings. Unfortunately there were also no significant differences amongst the face touching frequencies for any of the tasks employed. As a result it is not possible to establish whether task effects persist across cultural barriers. While these results are suggestive the more restricted range of the behavioural categories employed make comparisons with the results obtained in the above reported experiments difficult.

The studies reported in this chapter experimentally examine the question of cross-cultural similarities and differences in body-focused hand movements employing the methodology developed in earlier chapters.

As in all cross-cultural studies it is difficult to make comparisons of exactly equivalent circumstances. Even where it is possible to completely replicate the tasks, physical surroundings and instructions, the subjects' response to the task may vary due to the presence of culture specific values associated with the tasks. In remote cultures similar tasks may be perceived by subjects quite differently. It is therefore important to try to select tasks which are likely to be perceived in a similar fashion by the range of subjects in the experiment.

In the light of these concerns four tasks were selected from those employed in the preceding experiments. These included the Monologue, the two Stroop tasks and the Rest. A Monologue task resembling that employed here has been associated with body-focused movement production in many settings and with subjects from several cultural origins (Dalby, Gibson, Grossi & Schneider, 1980; Freedman et al. 1972; Seiss, 1968).

The Stroop effect has been tried with many culturally diverse groups of subjects and the effects of the confusion task upon speed of performance do not appear to be limited to any particular language background (Jensen & Rohwer, 1966). The use of the Stroop tasks may also provide an insight into whether or not the differences in findings between the results of Experiments 3 and 4 and those of Barroso et al. (1978) can reasonably be attributed to cultural differences.

It is more difficult to find examples of the previous use of a context resembling the Rest task. Jones (1943a,b) did however use such a task as a control condition. The Rest task provides an opportunity for the subjects to perform body-focused movements without the presence of secondary task demands. No doubt being videotaped while having no specific task is in itself demanding. None the less attentional demands, and the constraints potentially produced by the need to concentrate on a demanding performance, are absent.

In order to begin to answer the question posed by Ekman (1977) concerning the universality of body-focused movements it would be necessary to examine remote cultures in a manner analogous to the work that has been done with facial expressions (Ekman, 1982). The following experiments have a less ambitious goal of attempting to determine cross-cultural similarities and differences in body-focused movement form and frequency between European and Australian populations. These populations allow comparison across a range of language and cultural differences while still employing subjects whose cultural biases in relations to the tasks can be expected to be similar. It is also largely from these populations, together with that of America, that most of the literature concerning body-focused movements has come.

Experiment 5 was an investigation which examined body-focused movements using four previously employed contexts and children of four different nationalities, Australian, Belgian (French-speaking), Italian and English. The subjects for this experiment were drawn from children attending local state elementary schools in the relevant countries.

If the performance of body-focused movements is cross-culturally consistent then we would expect to see similar frequencies of each of the body-focused movement categories for each task for children from each city. In particular the large and consistent task differences observed between the Monologue and Rest conditions in Experiment 1 would be predicted to be displayed by each group of children. Similarly if the results of Experiments 3 and 4 have cross-cultural relevance then we would expect to observe very similar body-focused movement frequencies for these two tasks for all four nationality groups. While the Stroop, Monologue and Rest tasks have not been combined in the preceding experiments comparisons of the mean frequencies obtained in Experiments 1, 3 and 4 suggest that the two Stroop tasks should be associated with body-focused movement frequencies intermediate between those observed for the Monologue and Rest tasks.

Method

Subjects. The subjects were children of similar age attending state elementary schools in a major city. In all cases the schools drew their students from middle class areas. All children were native speakers of the language of instruction employed at the school.

1. Adelaide. The subjects were 48 fifth grade children attending the Magill Primary School in Adelaide. The mean age of the 25 boys and 23 girls was 10 years and 3 months at the commencement of the study.

2. Brussels. The 47 French-speaking subjects employed in this study attended the Evere school in Rue du Tilleul, Brussels. The mean age of the 24 boys and the 23 girls was 9 years and 9 months.

3. Rome. All of the 48 subjects engaged in this study attended the Scuolo Brasile in Via Nomentana. The mean age of the 27 boys and the 21 girls was 10 years and 3 months.

4. Sheffield. The 48 subjects attended Nethergreen Middle School in Sheffield. Unfortunately the failure of video-equipment near the conclusion of this study meant that successful video-recordings were only obtained for 41 subjects. The mean age of the 20 boys and the 21 girls in the resulting sample was 10 years and 3 months.

Procedure. Each of the subjects performed four tasks. These included the Monologue and Rest from Experiment 1 and the Stroop Colour Confusion task (Stroop) and the Colour Naming Control task (Control) from Experiments 3 and 4. The procedures employed followed precisely those outlined for these tasks in the earlier studies in the current project in which they have been employed.

The Stroop card colour-words were translated into the appropriate language for the French- and Italian-speaking subjects. Otherwise the cards were identical to those presented to the Adelaide and Sheffield subjects, both in general form and in the exact order of the colour items. The Colour-Naming Control card was the same for all subjects.

As the experimenter is not fluent in Italian and French an assistant was hired in each location to provide the instructions in the local language and dialect and to answer any questions that might arise. Both assistants were post-graduate students in Psychology at local universities. The assistants were provided with the English instructions used with the Adelaide subjects and were required to adhere as closely as possible to these. The assistants were instructed to maintain a "warm" nonverbal manner towards the subjects in order to parallel the experimenter behaviour employed with the Adelaide subjects. The experimenter was present for every task performance by every subject in order to ensure consistency in presentation of the procedure. Videotaped examples of the presentation of the instructions by each assistant have been retained as an indication of this consistency in delivery.

Each subject was videotaped during each task. No attempt was made to conceal the video-recording equipment. The order of presentation of the four tasks was balanced over subjects and sex.

No secondary distractors were presented.

Apparatus. A National VHS videocassette recorder (NV180A) and a Canon VC20 videocamera recorded the subjects' performances. During the performance of all tasks the experimenter(s) remained concealed behind

Figure 5

ADELAIDE - A photograph of the

experimental setting

Figure 6

BRUSSELS - A photograph of the

experimental setting

Figure 7

ROME - A photograph of the

experimental setting

Figure 8

SHEFFIELD - A photograph of the

experimental setting

a screen.

Figures 5 to 8 are photographs of the setting for each city.

Results

The mean Total body-focused movement frequency observed for each city and each task is presented graphically in Figure 9. These have been further broken down into the constituent movement categories for each city (Figure 10). Repeated measures design ANOVAs were computed for the Total continuous movement scores for the four cities (Table 5-1A). In order to explore the general consistency of the task effects

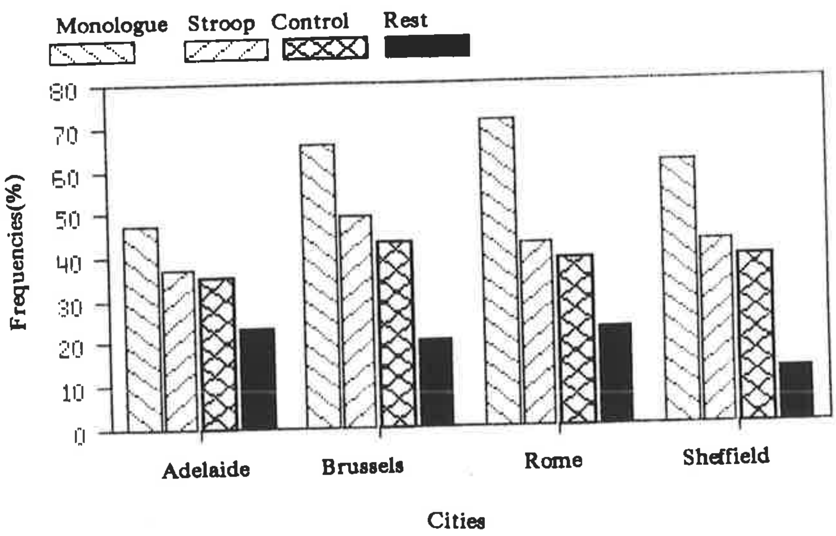


Figure 9

Total body-focused movement frequencies
for each task in each city.

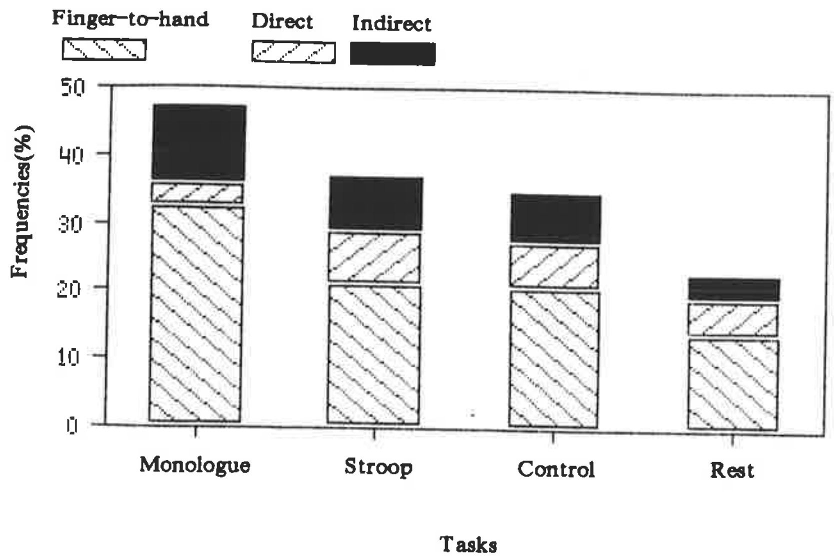


Figure 10A

ADELAIDE - Continuous body-focused movement frequencies for each task.

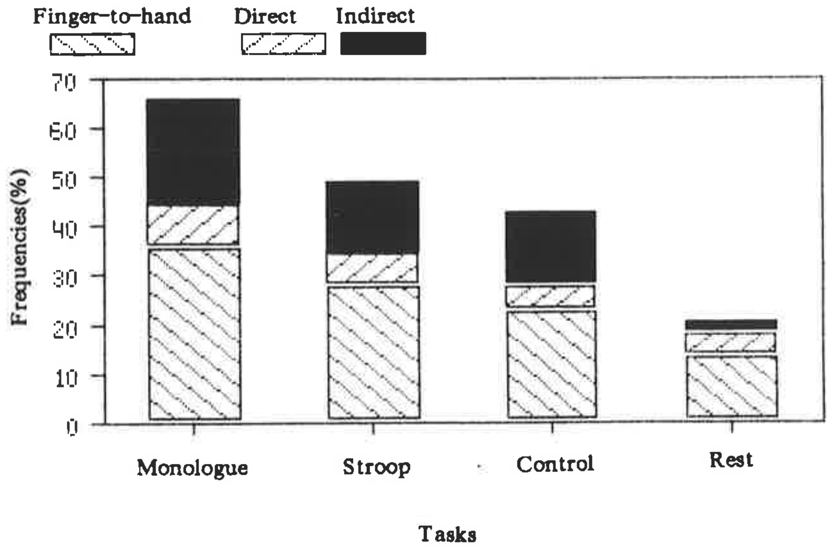


Figure 10B

BRUSSELS - Continuous body-focused movement frequencies for each task.

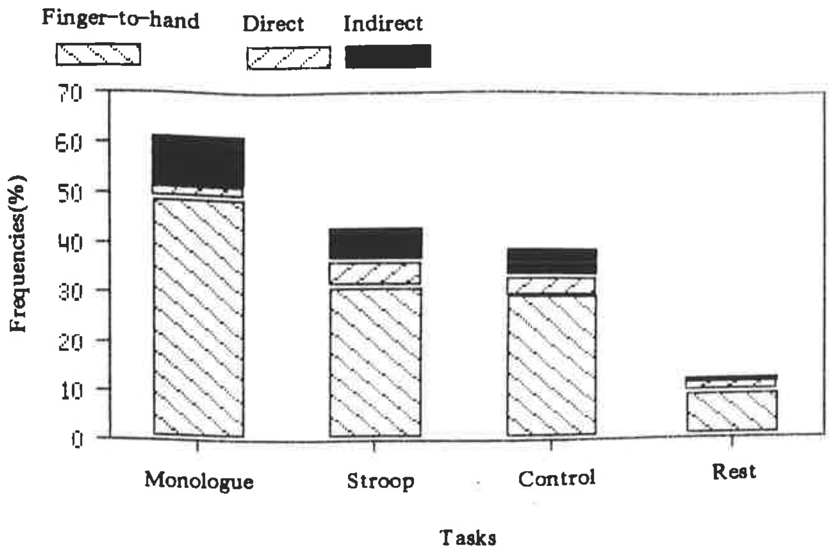


Figure 10C

SHEFFIELD - Continuous body-focused movement frequencies for each task.

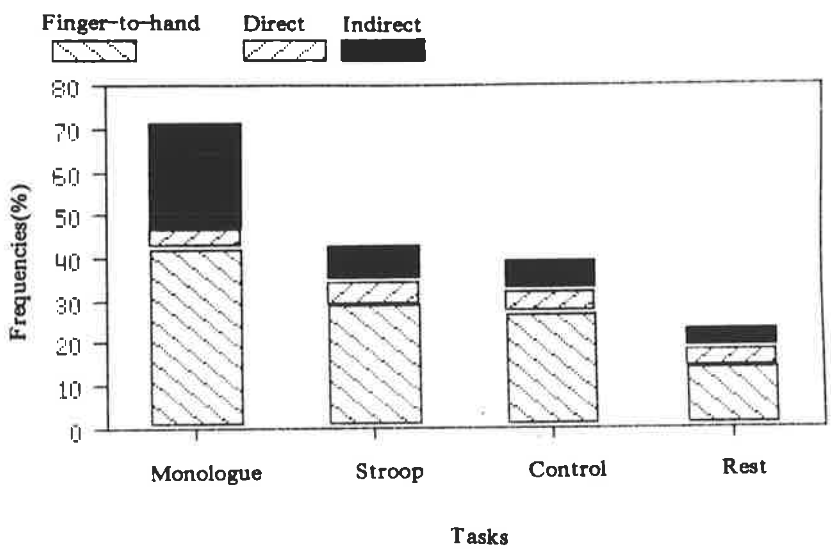


Figure 10D

ROME - Continuous body-focused movement frequencies for each task.

Table 5-1

Experiment 5.

A. A repeated measures design ANOVA computed on the total continuous body-focused movement totals for the four tasks and all four city groups.

All four cities

Source	df	SS	MS	F
Tasks	3	151249.1	50416.4	142.7**
Cities	3	11884.1	3961.4	4.0**
Tasks by Cities	9	16499.0	1833.2	5.2**

B. Separate ANOVAs computed on the total continuous body-focused movement frequencies and the tasks for each of the three cities.

1.Adelaide

Source	df	SS	MS	F
Tasks	3	14007.4	4669.1	12.7**

1.Brussels

Source	df	SS	MS	F
Tasks	3	48684.5	16228.2	45.6**

Table 5-1 cont.

2.Rome

Source	df	SS	MS	F
Tasks	3	58653.8	19551.3	62.5**

3.Sheffield

Source	df	SS	MS	F
Tasks	3	49725.7	16575.2	42.7**

*p<0.05 **p<0.01

obtained,similar ANOVAs were computed for each of the four cities considered separately. (Table 5-1B).

A simple examination of the means shows that the gross features of the body-focused movement characteristics of the children were largely replicated in the four groups of subjects. Nevertheless both the City factor and its interaction with Task were significant. Not only did the subjects display general differences in their propensity to produce body-focused movements from city to city but specific tasks appear to have had differential effects on body-focused movement frequencies from city to city. In order to examine these effects in more detail planned comparisons were calculated for the task effects for the Total continuous measure employing the SPSSx contrast facility (SPSS inc., 1986).

The task planned comparisons employed in Experiment 5 were based upon the expectations outlined in the introduction. The Monologue was contrasted with the Rest condition and the Stroop confusion task was contrasted with its colour naming control.

The contrast between the Monologue and Rest tasks produced the expected large differences in Total continuous body-focused movement frequency ($t=15.6$ $p<<0.01$). The Discrete movement scores showed no such difference ($t=1.2$ $p>0.1$).

The contrast between the Stroop and Control tasks was small but significant ($t=2.5$ $p<0.05$) for the Total continuous measure across the four populations of children. This is the first finding of a significant difference between these tasks in several experiments and will be examined in more detail below. Again the Discrete scores failed to reflect this task difference ($t=0.2$ $p>0.1$).

The significant difference between the cities in Total continuous body-focused movement frequencies also deserves detailed examination. Planned comparisons were constructed which were based on the expectation that French- and Italian-speaking subjects might differ from English-speaking subjects in much the same way as has been observed for object-focused movements. The following contrasts were employed:

(1) English and Australian subjects versus Italian subjects

(2) English and Australian subjects versus French-speaking subjects (Brussels).

(3) English versus Australian subjects.

Contrasts between English-speaking subjects and Italian ($t=2.5$ $p<0.05$) and French subjects ($t=2.7$ $p<0.01$) did demonstrate significant differences in body-focused movements. The direction of these differences is in line with similar differences that have been

Table 5-2

Experiment 5. Planned comparisons calculated on the task differences observed in the body-focused movement frequencies for the four cities.

	Body-Focused Movements (t values)				
	Finger-to hand	Direct	Ind.	Discrete (Duration)	Discrete (No.)
Planned Comparisons					
1. Monologue versus Rest	8.4**	-0.7	6.4**	1.2	0.8
2. Stroop versus Control.	1.3	1.0	0.6	1.3	1.8

*p<0.05 **p<0.01

observed for object-focused movements as previously discussed. Significant differences between Adelaide and Sheffield were not observed for the Total body-focused movement measure ($t=1.2$ $p>0.1$).

The discussion above examined the Total continuous body-focused movement frequencies. However it is quite possible that the different categories of body-focused movement have responded differently to the tasks. Planned comparisons were therefore calculated on the tasks for each of the body-focused movement categories (Table 5-2). On the basis of these comparisons it appears that it was the Finger-to-hand and Indirect scores that produced the significant Total body-focused movement differences for the Monologue and Rest tasks. No such significant differences were observed for the Direct or Discrete movement categories.

Despite the slightly greater overall frequency of continuous body-focused movements observed when the Stroop task was contrasted with

Table 5-3

Experiment 6. Planned comparisons (t values) calculated amongst the city differences for each of the body-focused movement categories.

	Sheffield + Adelaide versus Brussels	Sheffield + Adelaide versus Rome	Adelaide versus Sheffield
Finger-to-Hand	0.2	-0.8	-2.4*
Direct	-1.6	-0.4	1.7
Indirect	-3.1**	-2.1*	0.8
Discrete (Duration)	-3.4**	-2.1*	-0.2
Discrete (Number)	-3.1**	-2.9**	-0.8

*p<0.05 **p<0.01

the Control, when individual movement categories were subjected to the same analyses none of the categories produced any significant differences between these two tasks. The Discrete movement scores also failed to differentiate between the Stroop and Control tasks.
Similar planned comparisons for the city effects for each behaviour category are provided in Table 5-3. The greater frequency of Total body-focused movements for the French- and Italian-speaking subjects appears to have been largely a consequence of the Indirect movement scores. The Discrete scores also displayed higher frequencies for the French and Italian subjects.

Individual Consistency

Table 5-4 presents the Spearman rank order correlation coefficients amongst the body-focused movement frequencies for each of the task combinations for the four groups of subjects. The results are quite variable. Never the less some similarities can be observed.
While the Rome population showed a relatively low level of across task consistency generally, and a surprisingly low level of agreement between its Monologue and Stroop performances, the Stroop and Control tasks show the high level of agreement that was observed with the children of Experiments 3 and 4. Indeed the highest of the correlations amongst the continuous movement totals for every subject group is this Stroop-Control task combination. Similar also is the poor showing of the interactions of the body-focused movement scores for the Monologue and the Rest task scores, replicating the general finding of Experiment 1.

Table 5-4

Experiment 5. Spearman rank order correlation coefficients between each of the behaviour category scores for each combination of tasks for the Adelaide subjects.

1.Adelaide

	Monologue with Stroop	Monologue with Control	Monologue with Rest	Stroop with Control	Stroop with Rest
Finger-to-hand	0.39**	0.23	0.13	0.51**	0.35**
Direct	0.16	0.37**	0.34**	0.23	0.29*
Indirect	0.49**	0.26*	0.25*	0.35**	0.14
Total continuous	0.28*	0.28*	0.10	0.45**	0.28*
Discrete (No.)	0.46**	0.29*	0.28*	0.53**	0.37**
Discrete (Duration)	0.39**	0.20	0.27*	0.48**	0.37**

	Control with Rest
Finger-to-hand	0.33**
Direct	0.06
Indirect	0.38**
Total continuous	0.30*
Discrete (No.)	0.31**
Discrete (Duration)	0.24*

Table 5-4 cont.

2.Brussels

	Monologue with Stroop	Monologue with Control	Monologue with Rest	Stroop with Control	Stroop with Rest
Finger-to-hand	0.43**	0.35**	0.27*	0.32*	0.12
Direct	0.37**	0.26*	0.10	0.48**	0.12
Indirect	0.29*	0.29*	0.11	0.30*	0.16
Total continuous	0.59**	0.39**	0.32*	0.64**	0.12
Discrete (No.)	0.68**	0.62**	0.35**	0.65**	0.21
Discrete (Duration)	0.62**	0.52**	0.31*	0.64**	0.23

	Control with Rest
Finger-to-hand	0.29*
Direct	0.15
Indirect	0.22
Total continuous	0.12
Discrete (No.)	0.29*
Discrete (Duration)	0.22

Table 5-4 cont.

3.Rome

	Monologue with Stroop	Monologue with Control	Monologue with Rest	Stroop with Control	Stroop with Rest
Finger-to-hand	0.11	-0.00	0.13	0.49**	0.33*
Direct	0.12	0.32*	0.14	0.28*	0.18
Indirect	0.36**	0.42**	0.33*	0.34**	0.10
Total continuous	0.22	0.30*	0.41**	0.69**	0.15
Discrete (No.)	0.30*	0.41**	0.20	0.47**	0.23
Discrete (Duration)	0.09	0.43**	0.15	0.38**	0.26*

	Control with Rest
Finger-to-hand	0.21
Direct	-0.13
Indirect	0.21
Total continuous	0.22
Discrete (No.)	0.19
Discrete (Duration)	0.15

Table 5-4 cont.

4.Sheffield.

	Monologue with Stroop	Monologue with Control	Monologue with Rest	Stroop with Control	Stroop with Rest
Finger-to-hand	0.38**	0.47**	-0.19	0.51**	-0.05
Direct	0.32*	0.30*	0.28*	0.23	0.31*
Indirect	0.31*	0.50**	0.33*	0.29*	0.07
Total continuous	0.29*	0.33*	-0.21	0.55**	0.06
Discrete (No.)	0.40**	0.49**	0.21	0.41**	0.36*
Discrete (Duration)	0.43**	0.53**	0.25	0.37**	0.42**

	Control with Rest
Finger-to-hand	-0.24
Direct	0.24
Indirect	0.38**
Total continuous	-0.15
Discrete (No.)	0.23
Discrete (Duration)	0.19

*p<0.05 **p<0.01

While the use of rank order correlations amongst the possible task pairs provides a detailed look at intertask similarities, the use in this study of four tasks, and the likelihood of obtaining a number of significant spurious correlations between hand movement measures as a result, make overall patterns harder to perceive. Kendall's Coefficient of Concordance (*W*)(Siegel, 1956) allows the comparisons of ranked scores across several raters in order to determine consistencies, and is therefore able to provide an overview for each

Table 5-5

Experiment 5. Kendall's Coefficient of Concordance (*W*) values for each of the body-focused movement measures across the four tasks for each of the four city groups.

	Body-Focused Movements (*W* values)					
	Finger-to hand	Direct	Ind.	Discrete (Duration)	Discrete (No.)	Total Continuous
1.Adelaide	0.11*	0.03	0.08*	0.10**	0.10**	0.19**
2.Brussels	0.10*	0.01	0.16**	0.09**	0.08**	0.44**
3.Rome	0.17**	0.01	0.16**	0.11**	0.11**	0.48**
4.Sheffield	0.29**	0.00	0.19**	0.04	0.05	0.43**

*p<0.05 **p<0.01

behaviour measure across the four tasks. The Kendall's Coefficient of Concordance values for each of the hand movement categories across the four tasks are provided for each city group in Table 5-5.

The low *W* values for each individual hand movement category in Table 5-5 emphasize the variability discussed above. None the less with the exception of the Direct movements most *W* values are significant. In particular the higher concordance values obtained for the Total continuous measure across all city groups show a significant level of agreement exists between the rankings across the tasks. The suggestion from Experiments 1 and 2 that the Discrete measures might show greater levels of across task rank consistency has not been confirmed here. While the level of agreement is significant for three of the city groups its value is relatively low compared with the Total continuous measure.

Discussion

Gross comparisons of the body-focused movement means for the four groups of subjects does show that qualitatively similar movements were produced by subjects from all the cultural backgrounds examined. While this was not an unexpected result the fact that movements which have no obvious function show gross similarities in different cultures suggests either a common cultural heritage or else perhaps some biological influence. On the other hand the results obtained here should lead to a certain caution about the interpretation of earlier studies which involved the use of data taken from different cultures, with little cognizance of the possibility of systematic cultural differences in body-focused movement form or frequency.

Not only did the different cultural groups differ in the gross frequency of body-focused movements, but some differences in the frequencies of particular constituent categories were also observed. Moreover not only were significant overall cultural differences observed but also significant interactions between the tasks and the body-focused movement frequencies were obtained. While this experiment is unable to provide an indication of whether or not these frequency differences are a product of display rule (Ekman, 1971) differences or differences in affective reaction to the tasks presented it does underline the difficulty of generalizing results across cultural groups.

Despite the significant differences observed among the body-focused movement frequencies for these four groups, in general the expected task effects were observed for each. The expected higher frequencies obtained for the Monologue when contrasted with the Rest condition were observed for each city group. Similarly the frequencies for the two Stroop tasks were similar and failed to differ significantly for any of the individual city groups. As a result, if these city groups are typical of the range of cultural differences to be observed, then the differences between the results obtained here and those obtained by Barroso et al. (1978) with American subjects are unlikely to be simply the result of cultural differences. All the Stroop and Control scores obtained here were intermediate in value between those of the Monologue and Rest tasks. The frequencies obtained by Barroso et al. (1978) were similar to those reported here and are generally consistent with those reported in Figures 9 and 10.

When the total sample was examined the differences between the Stroop colour distraction task and the colour naming control task were significant. The higher frequency reported for the Stroop colour naming task by Barroso et al. (1978) was replicated with this larger sample. While the individual city groups' results agree well with the findings of Experiments 3 and 4, this significant overall subject difference suggests that, at least with a relatively large sample, the effect described by Barroso et al. (1978) can be obtained. It should be noted, however that, while the results for experiments reported for each of the city groups, and those for the subjects of Experiment 4, are all in line with the hypothesis that the Stroop colour confusion task should have the higher body-focused movement frequency, the results of Experiment 3 (involving a secondary visual distraction) were very variable and generally not in line with this hypothesis. It may be that the presence of a secondary visual distractor which actually interrupts Stroop and Control task performance directly might have influenced body-focused movement performance to the extent of making these frequencies more variable. However, the statistical analysis of the data in Experiment 3 did not show any such significant changes.

While this significant difference between the Stroop and Control tasks, when the total subject sample is examined, is intriguing it is not sufficient to support the attention model. As was observed in Experiments 3 and 4, greatly increasing the attentional demands had no significant impact upon movement frequencies. Also, the frequencies obtained for the two Stroop tasks in this experiment have consistently been close, and resemble each other to a greater extent than they resemble either of the other tasks. Considering the relatively high frequencies of body-focused movements observed for these tasks this small difference can not be seen as explaining a large percentage of the total variance.

The observation that there were significant interactions between the effects of the city groups and task effects is important evidence that suggests that the cultural background of the subjects is not just influencing the overall frequencies and form of body-focused movements, but is influencing how the subjects are affected by the task requirements. Similarly, finding that rank order correlations between the body-focused movement frequencies across tasks varied noticably from city to city suggests that cultural differences were significantly influencing the subjects reactions to the specific tasks. However, even within this generally variable picture, some findings were replicated regularly. The close correspondence between the subjects' body-focused movement frequencies for the Stroop and Control tasks was the clearest example.

With the observation that both cultural differences and task differences can influence the consistency obtained for body-focused movement performance the differences between reported levels of ordinal consistency in previous investigations become potentially explainable. The studies by Ruggieri et al. (1980) and Sainsbury and Costain (1971), who reported somewhat different degrees of across task ordinal consistency, differed both in the cultural background of the subjects (Italian versus English respectively) and in the tasks employed.

The picture that emerges from this study is a mixed one. Significant differences between subjects drawn from differing language and cultural backgrounds were observed. Further, these were not just differences in the gross frequency of body-focused movement, but showed systematic interaction with task differences. Nevertheless the predicted task differences were also consistently obtained. It would therefore appear that within this range of cultural groups some underlying consistency is present. This observation offers some support for the hypothesis that there may be similar underlying causal agents behind the occurrence of body-focused movement regardless of cultural background. On the other hand cultural differences in body-focused movement performance, or display rule differences, or differences in the subjects motivations reactions to these similar tasks, appear to be acting to make generalizations from experimental groups in one country to those in another difficult. Without further information about the subject's motivational state and social expectations these interesting differences will remain unexplained. Some clarification may be possible through examination of the scope of such differences when additional cultural groups are examined and with the examination of settings less prone to display rule constraints.

Some of the limitations of all the preceding studies need to be voiced here. All the studies so far have followed Barroso et al. (1978) in employing ten year old children as subjects. This was necessary to allow comparison between investigations. None the less it could be felt that such a limited age span restricts the generality of the findings.

As indicated in Chapter 1 studies employing subjects of virtually all ages have reported movements that appear to be very similar in form and eliciting circumstances to those observed in these investigations (e.g. Feiring & Lewis, 1979; Ingram, 1975; Koch, 1942; Olson, 1930). While some authors report age differences in the frequency of body-focused movement (Abramson, 1987 Note 1; Blatz & Ringland, 1935) others do not (Olson, 1930). This difference in these findings concerned with significance of developmental factors in body-focused movement form and frequency can perhaps best be understood as the result of probable motivational changes in the subjects. It is, for example, highly questionable whether preschool children would react to the tasks employed here with the same motivational characteristics as the ten-year-olds displayed. This difficulty in age comparison mirrors many of the difficulties previously discussed for cross-cultural studies.

A second criticism that might well be leveled at these investigations concerns the settings employed. All the studies reported so far have been concerned with subjects in somewhat formal experimental settings, and in all cases they were aware that they were being videotaped. While none of the subjects had any idea that hand movements were the focus of these investigations the restricted range of the circumstances employed might be argued to be a factor in the generality of the results obtained.

The role of display rule constraints and the restricted range of settings might raise questions concerning the relevance of this experimental work to naturally occurring body-focused movement activity. Certainly the hand movement behaviour described from field observations of adult subjects appears to follow the patterns indicated by experimental investigations (Dalby, Gibson, Grossi & Schneider, 1980; LeCompte, 1981). None the less there is a need to tie the findings of the studies reported here to those conducted with subjects of a more varied age and in more varied and natural settings.

Conducting investigations of body-focused movement in natural settings produces many difficulties. Ethical considerations preclude hidden videorecorders. The slight and often rapid nature of body-focused movements makes recording the duration of their occurrence extremely difficult. In Chapter 5 a field based series of investigations have been reported which extend the cross-cultural observations obtained with experimental procedures and which overcome many of the inherent difficulties of quantitative field observation by employing new data logging equipment.

Chapter 5

A Cross-Cultural Study of Body-Focused Movements.

A Naturalistic Observational Approach.

Experiments 6 and 7.

Introduction

In the studies reported in previous chapters all the subjects have been 10 year old children. All the studies have employed experimental approaches conducted under quite similar circumstances and all involved the subjects knowing that they were being video-recorded. To what extent do these factors limit the generalizability of the results? The experiments reported in this chapter are designed to examine this question and to extend the number of culturally different populations examined.

In few published studies of body-focused movements have the subjects been observed in natural settings (e.g. Barash, 1974; Dalby et al., 1980; LeCompte, 1981). The reason for this is probably two-fold. Firstly, it is difficult to obtain background information from anonymous people in a public setting. Thus information about the person's age, personality, current motivational state etc., are either unavailable or must be estimated using secondary cues. Secondly it is extremely difficult using standard recording procedures to log both the incidence and duration of rapidly occurring behaviour sequences. Indeed, time-sampling of behaviour was developed by Olson (1930), in the days prior to videorecorders, precisely to allow him to record body-focused movement frequencies. These difficulties have left their mark upon the published observations of naturally occurring body-focused movements.

Barash (1974) used an extremely simple classification procedure for his observations of dental patients behaviour. Dalby et al. (1980) followed Kimura (1973a,b) in measuring only the frequency of occurrence of hand movement behaviours, and ignoring their duration. These durations can vary from as little as a fraction of a second to as much as a minute. Ignoring the duration measure may miss data that might be influential in determining the attributions drawn by the average decoder observing body-focused movement performance.

LeCompte (1981) employed a somewhat different procedure in order to obtain information concerning body-focused movement occurrence in natural settings in Ankara, Turkey. He had observers record any instance of self-touching (a very broad interpretation of this term was employed) observed during a five-second observation interval. The duration of the behaviour was recorded to the nearest second. The observer had to remember the estimated duration until the end of the five-second interval after which the result could be noted.

LeCompte attempted to relate the frequency of occurrence of self-touching behaviour to motivational changes which could be determined from the setting in which the observations were conducted. Before any field observations were collected an independent group of decoders were asked to rank a series of public settings in order of the amount of anxiety with which these settings were normally associated. As such rankings were highly consistent across decoders they could be used to predict the likely motivational state of subjects in these settings.

Based on the relationship between the level of anxiety individual settings were rated as likely to provoke, and the observed frequency of self-touching in those settings, LeCompte was able to suggest that these movements were a potential indicator of stressful environments. The agreement he obtained was significant though small. He suggested that one of the possible reasons for the small size of the correlation he obtained was the extreme breadth of his self-touching score, which incorporated such behaviours as "hands-in-pockets", and other possibly confounding behaviours.

The study to be reported here has employed many of LeCompte's procedures but has attempted to overcome some of the limitations inherent in his data-recording techniques. A portable microcomputer was employed to act as a data-logger (Elias, 1984). Such a procedure allows the investigator to record both the duration and number of instances of naturally occurring behaviour in real time. The small size of the new generation of computers allows them to be readily concealed so that observations may be recorded more discretely than is possible with paper and pencil recording procedures.

The use of a computer data-logger also allows a more extended observation interval as observations do not need to be recalled by the observer.

In this experiment Adelaide subjects were asked to rate a selection of public settings (see Table 6-1 for a list of the settings) on their expected stressfulness. The subjects also rated the degree of concentration required for each setting. On the basis of these responses five of the settings were selected for behavioural observation. The frequencies of body-focused movement occurrence were then noted for each of these five settings in seven cities - Adelaide, Munich, Brussels, Antwerp, Rome, Paris and Sheffield.

On the basis of LeCompte's finding that stressful environments were associated with higher body-focused movement frequencies we might expect to find similar differences amongst the settings in each of the seven cities. If the attention model has a role to play in predicting body-focused movement occurrence then we might expect settings with very high scores on the "concentration" measure to be associated with high frequencies of body-focused movements as well.

In Experiment 5 it was observed that children in the experimental settings showed some cross-cultural consistency in task effects upon body-focused movement frequencies, but that none the less, quite significant quantitative variation between cities were obtained. In particular French- and Italian-speaking subjects were shown to produce higher frequencies of body-focused movement than English-speaking subjects in comparable settings. This finding resembles those obtained with object-focused movements by other authors (Graham, Bitti & Argyle, 1975; Sainsbury & Wood, 1977).

The larger sample of cities, from which subject were available for the field investigations in this experiment, provided an opportunity to extend these observations to speakers of related languages, in particular German- and Dutch-speakers. It was expected that subjects who spoke these Germanic languages would show greater similarity to the linguistically related English-speakers rather than the Romance-language French- and Italian-speakers.

Morris et al. (1979) demonstrated that subjects from cities which were geographically quite close could show consistent differences in gestural usage in line with historical cultural differences. In this experiment the inclusion of subjects from Antwerp (Dutch-speaking) and Brussels (largely French-speaking) allowed the examination of two groups of subjects who live geographically and politically quite close to each other but who are divided historically by cultural and language barriers.

In order to avoid the possibility that an apparent increase in body-focused movements in some settings might be confused with a general unsystematic increase in all hand or body movements, records were also kept of "object-focused movements" (Freedman et al., 1972). This general category covers all those movements which appear to replace or accompany speech and incorporates such categories as Ekman and Friesen's (1972) "Illustrators" and "Emblems" or Morris et al.'s (1979) "gestures". Such movements appear to bear little if any relationship to body-focused movements (Barroso et al., 1978; Ekman & Friesen, 1972).

In order to select a group of settings in which the subjects' motivational states might be expected to differ, rating-scale information, similar to that collected by LeCompte (1981), was obtained from a diverse group of Adelaide adults. On the basis of the rating scale results obtained in Experiment 6 five settings were selected for subsequent behavioural observation in Experiment 7.

Experiment 6

Ratings of Setting Characteristics

Method.

Following the technique employed by LeCompte (1981), 15 public settings were identified in Adelaide, Australia. Seventeen subjects, representing a diverse range of social backgrounds and ages, were independently asked to rate these settings in terms of the degree of stressfulness with which they associated each setting. As an addition to LeCompte's procedure a second question was asked of all the subjects. They were asked to rate the "amount of concentration" they thought would be required of them in each setting. This allowed some comparison between level of anxiety and attentional-demand explanations of subsequently observed between-setting differences in body-focused movement frequency.

Each setting was outlined to the subject in a few words. Many of the settings were directly comparable to those employed by LeCompte, while others were added to allow the incorporation of situations characterized by relatively high levels of "concentration". No attempt was made to explain to the subjects the terms "stressful" or "concentration". A sample of the rating forms is provided in Appendix 4.

Results

The subjects reported little difficulty in responding to either of the rating questions. The Kendall's Coefficient of Concordance (W)(Siegel, 1956) was calculated for the two questionnaires. Both the

Table 6-1

Experiment 6. Mean "stressfulness" and "degree of concentration" rankings for each of the 15 settings by Adelaide subjects.

Title	Stressfulness (Mean Rank)	Concentration (Mean Rank)
1. Waiting at the Accident and Emergency section at the Hospital.	2.7	6.7
2. Presenting a lecture or talk.	3.3	1.1
3. Maternity ward at the hospital.	4.5	7.1
4. Dentist waiting room.	4.8	9.4
5. Supermarket queue.	6.3	9.2
6. The racetrack stands during a race.	7.2	6.9
7. A cafeteria queue.	7.7	8.5
8. Airport waiting room.	7.8	7.2
9. A city bus stop.	8.1	9.9
10. Listening to a lecture or talk.	9.1	2.3
11. Strolling or sitting in a city shopping mall.	9.8	11.5
12. Racetrack stands after a race.	10.4	10.8
13. Waiting in a cinema lobby before a performance.	11.8	11.1
14. Reading in a public library.	12.2	4.2
15. Observing animals at the zoo.	14.1	14.1
Kendall's Coefficient of Concordance	0.6**	0.6**

*$p<0.05$ **$P<0.01$

"stressfulness" of the settings ($W=0.55$ $p<0.001$) and the "degree of concentration" ($W=0.61$ $p<0.001$) questions produced high degrees of agreement between raters. The mean ranks for the 15 settings for each question are provided in Table 6-1.

A number of the settings used in this study are essentially identical to those used by LeCompte (1981), and the rankings on "stressfulness" for these settings were very close to the values reported for the Ankara sample. It would appear that even culturally relatively remote populations can react similarly to functionally similar settings.

The rankings for "degree of concentration" while showing considerable overlap with those for "stressfulness", produced a few quite different results. Most notably the "lecture listening" task scored well down on the "stressfulness" rankings but was consistently high on "concentration". The Wilcoxon matched-pairs-signed-ranks test (Siegel, 1956) indicates that this difference is quite significant ($Z=3.55$ $p<0.01$). While the Bus stop and Lecture listening situations scored quite similarly in "stressfulness" rating ($Z=0.8$ $p>0.4$) they showed a marked difference on the "concentration" measure ($Z=3.7$ $p<<0.01$).

Discussion

The information provided by these simple questionnaires provides a useful basis for selecting public settings for subsequent behavioural analysis. While the sample of decoders was quite small the level of consistency in their responses suggests considerable uniformity of opinion concerning the potential motivational associations of these 15 settings.

As discussed in the previous chapter, one problem with the conduct of cross-cultural investigations is to produce or locate comparable settings in which to conduct observations. The similarity of the "stressfulness" rankings by Adelaide and Ankara (Turkey) (LeCompte, 1981) subject groups when comparing similar settings suggests that observations of behaviour in this type of public location may be a practical means of cross-cultural comparison.

Experiment 7

Naturalistic Observations of Body-Focused Movements in Seven Cities

Introduction

Based on the rankings obtained above it was possible to select a number of public settings for behavioural observation which allowed some consideration of the anxiety question posed by LeCompte (1981) and also the attentional demand suggestion of Barroso et al. (1978).

In this experiment a microcomputer was employed as a portable data-logger (Elias, 1984) to allow recording of both body and object-focused movement frequencies.

Method

Subjects. In this study all adults who were present in the setting were included in the sample. Adults were defined as subjects who on the basis of their appearance were considered by the observer to be over 16 years of age.

Each subject was individually observed for a one minute interval. In order to avoid biases in subject selection considerable care was taken to choose subjects solely on the bases that, either they were the most easily observed subject (among those already present in the setting), or in the order they arrived in the setting. The subjects' behaviour and gender had no bearing on inclusion in the study. At the conclusion of the one-minute observation interval a further subject was immediately selected, and the procedure repeated. The commencement of the observation interval was independent of any behaviour displayed by the subject.

Only two classes of subject were excluded from consideration. Subjects who were heard to speak in a language other than that spoken locally were excluded in order to maintain a local sample. Brussels is a bilingual city, and both French- and Dutch-speakers were accepted there. Due to the extremely cold weather in some locations some subjects wore gloves. As this was felt likely to inhibit Finger-to-hand behaviour such subjects were excluded from consideration.

During the observation period every effort was made by the experimenter to avoid making the subjects aware that they were under observation. The computer was concealed in a cheap nondescript blue carry bag which allowed the experimenter to manipulate the keys while the bag lay in his lap. A fairly typical view of the experimenter carrying out observations is provided in Figure 11. On no occasion amongst the many observations conducted did any of the subjects verbally or nonverbally indicate that they were aware of any unusual or inappropriate behaviour on the part of the experimenter. In all the waiting settings employed many individuals could be observed carrying bags.

A minimum of 100 subjects was observed in each of five settings. No subject was observed twice. Each observation period lasted 60 seconds. Before behavioural observations were commenced for each subject several items of information were recorded. These included:

1. Age. An estimate was made of the subjects' age based upon their appearance. These were recorded as a series of 6 categories - 16 to 20, 21 to 30, 31 to 40, 41 to 50, 51 to 60 and 60 and over.

2. Group membership. If the subject was observed to be with or to converse with another person at the location then they were classed as a member of a group.

3. Smoking. LeCompte (1981) found that the performance of smoking changed hand movement scores. Each subject was recorded as either smoking or not smoking based on their behaviour at the commencement of the observation interval.

4. Gender. The subject's gender was recorded.

Figure 11

Photograph of the observational procedure.

Procedure.

The Settings. Five settings were selected from those considered in the study of setting perception described above. The Hospital setting was characterized by the subjects as highly stressful and moderately demanding in concentration. The Bus Stop setting had a moderate ranking on both scales. The Street shopping mall setting was somewhat lower on stress and low on concentration. The Zoo setting was the lowest scoring setting on both scales. The Lecture listening setting has a high concentration ranking and a much lower stressfulness score. Thus these varied settings provide some opportunity to collect information relevant to possible associations between body-focused hand movement frequencies and settings conducive to different motivational reactions.

The specific location of each setting in Adelaide was:

1. Bus Stop. Two adjacent bus stops located in one of the central streets of Adelaide (North Terrace) were employed for this investigation. (Figure 12 shows photographs of the bus and tram stops.)
2. Zoo. The subjects were observed at the Adelaide Zoological Gardens. (See Figure 13 for photographs of the Zoo settings.)
3. Street. Rundle Mall is a large open shopping Mall in the middle of Adelaide. The subjects were observed in the Mall. (Figure 14 shows photographs of the Street settings.)

4. Hospital. The "Accident and Emergency" waiting room at the Flinder's Medical Center (a large public hospital) was the location employed. (Figure 15 shows photographs of the hospital waiting rooms.)

5. Lecture. The subjects were observed listening to lectures at the University of Adelaide and the South Australian College of Advanced Education, Magill Campus. A total of 18 lectures on widely differing topics, and with different lecturers, were observed in order to obtain a diverse sample. (Figure 16 shows some of the lecture theatres involved.)

ADELAIDE

Figure 12

Photographs of the bus setting.

MUNICH

BRUSSELS

Figure 12(cont.)

Photographs of the bus setting.

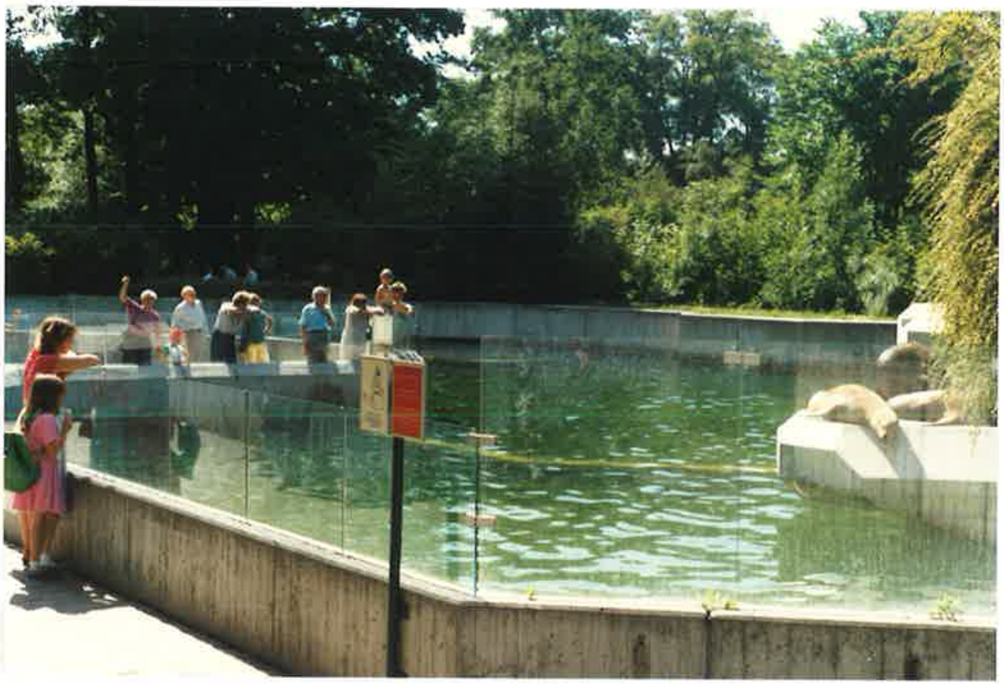
ANTWERP

ROME

Figure 12(cont.)

Photographs of the bus setting.

ADELAIDE



MUNICH

Figure 13

Photographs of the zoo settings.

BRUSSELS

ANTWERP

Figure 13(cont.)

Photographs of the zoo settings.

ROME

PARIS

Figure 13(cont.)

Photographs of the zoo settings.

ADELAIDE

MUNICH

Figure 14

Photographs of the street settings.

BRUSSELS

ANTWERP

Figure 14(cont.)

Photographs of the street settings.

ROME

Figure 14(cont.)

Photographs of the street settings.

ADELAIDE

Figure 15

Photographs of the hospital settings.

MUNICH

Figure 15(cont.)

Photographs of the hospital settings.

BRUSSELS

ANTWERP

<u>Figure 15(cont.)</u>

Photographs of the hospital settings.

ADELAIDE

MUNICH

Figure 16

Photographs of the lecture setting.

BRUSSELS

ANTWERP

Figure 16(cont.)

Photographs of the lecture setting.

ROME

Figure 16(cont.)

Photographs of the lecture setting.

Settings were sought in each European city which resembled as closely as possible those used in Adelaide both in architecture and function. In general this was successfully achieved. Unfortunately the difficulty of carrying both computer and camera equipment to some locations made it impossible to obtain photographs of all settings.

In a number of cities it was not possible to find directly equivalent settings and close approximations were employed. For the Bus Stop setting essentially identical tram stops were employed in Munich and Brussels (the term Bus Stop will be retained to avoid confusion).

Both Sheffield and Brussels lacked a central city zoo. A zoo outside the city was employed in Brussels. As there was no zoo in the vicinity of Sheffield the London zoo was substituted.

Street malls closely resembling that in Adelaide were readily found in all cities except Rome. In this case a park adjacent to a major road was employed.

Large public hospitals were readily located in all cities. The waiting rooms in most of the European public hospitals appeared to lack the feeling of urgency of the Accident and Emergency center in Adelaide.

The Lecture setting was readily matched with virtually identical lecture theatres in each city. A minimum of three lectures was examined in each city in order to assure some differences in lecture content and level of interest.

The locations and dates of each of the observation sessions in each city are provided in Appendix 6.

It was not possible to control or select the weather conditions under which the observations were conducted. While this had minimum impact on indoor locations (Hospital, Lecture) its effect upon hand movement behaviour in outdoor locations cannot be assessed. There were extreme differences between some of the locations in the weather conditions that prevailed. The temperatures ranged from about -2 degrees C. for the Bus Stops in Sheffield and Paris to over 30 degrees C. in the Zoo in Munich and the Street setting in Brussels. Rain and sleet were common occurrences during the Bus Stop observations in Paris. By contrast the weather was fine in most other locations.

Equipment. An Epson PX-8 battery operated portable microcomputer was employed to record the observations. This computer contains a built in microcassette recorder which allows the downloading of large numbers of observations on to a conveniently portable medium. The rechargeable batteries provided 8 hours of continuous operation. The computer ran a BASIC and machine code program written by the author (see Appendix 5 for the programs). The PX-8 computer's built-in clock only provides time to the nearest second. As a consequence the duration of each individual hand movement could only be measured to the nearest second.

The use of a microcomputer as a data-logger provides one limitation. Only one behaviour at a time can be logged. Thus simultaneous events will result in some omissions. Fortunately this is not a serious problem with body or object-focused movements. During the many hours of body-focused movement observation conducted by the author in experimental conditions very few instances of different categories of body-focused movement occurring simultaneously were observed.

Hand Movement Categories. Five categories of hand movement were observed. These included the familiar Finger-to-hand and Indirect body-focused movements which have been defined previously. LeCompte (1981) suggested that head-touching movements appeared to his observers to have different properties from other body-touching. For this reason the Direct body-focused movement category employed in previous experiments was subdivided into Hand-to-head and Hand-to-body. Hand-to-head movements were those in which the head or neck was manipulated by one or both hands. Hand-to-body were those movements which involved the manipulation of any other part of the body. As previously stated, active manipulation was required for a score to be recorded. Passive touching, such as resting the head on the hand was not considered to be a body-focused movement.

Object-focused movements were scored whenever a hand movement was directed away from the body and appeared to be associated with, or to replace, speech.

Results

The mean Total body-focused movement frequencies are indicated graphically for each setting and city in Figure 17. Figures 18 to 24 provide similar means for each of the movement categories, for each of the cities. Figure 25 provides frequencies for the object-focused movements. While body-focused movements were frequent in most settings object-focused movement frequencies were generally lower and more variable.

This study differed from the experimental studies reported in

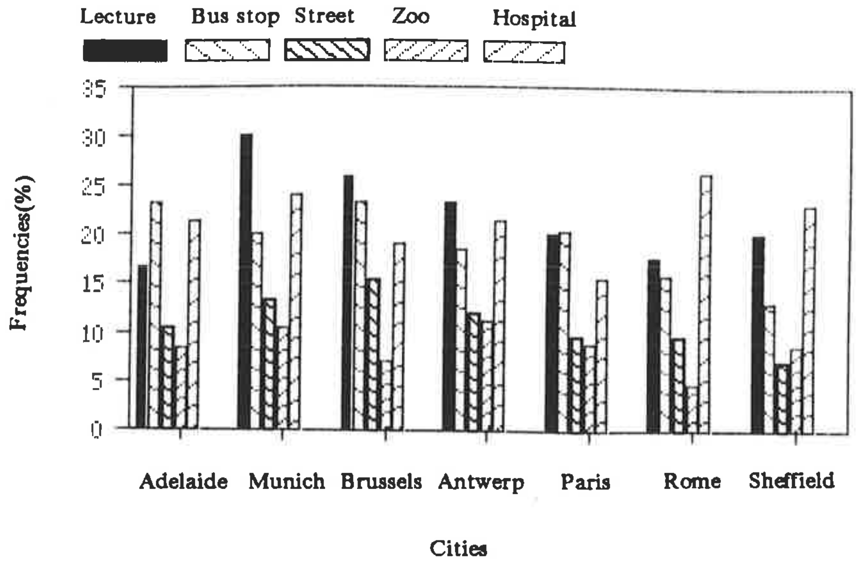


Figure 17

The Total body-focused movement frequency

for each setting in each city.

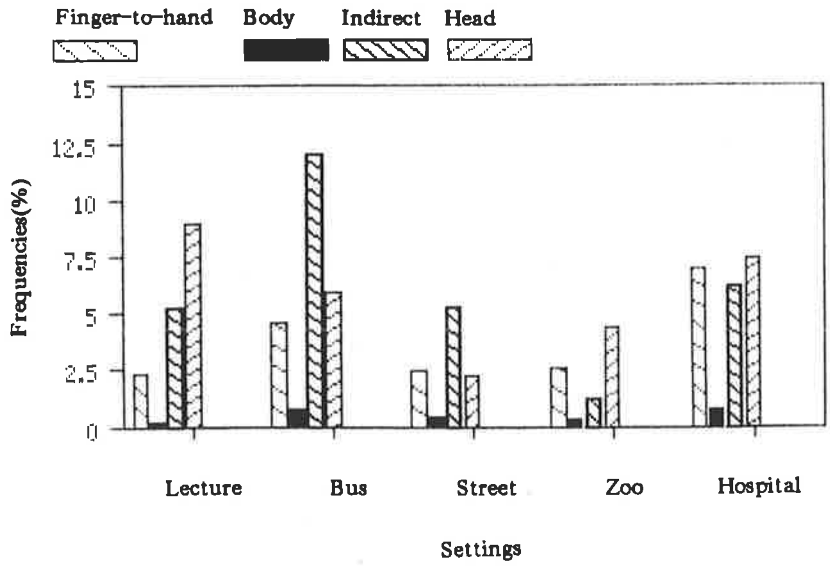


Figure 18

ADELAIDE - Body-focused movement frequencies

for each setting.

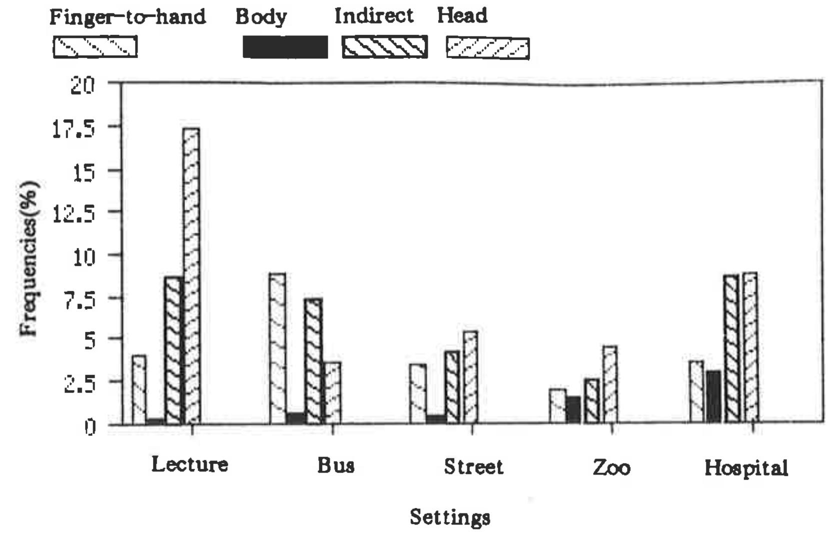


Figure 19

MUNICH - Body-focused movement frequencies for each setting.

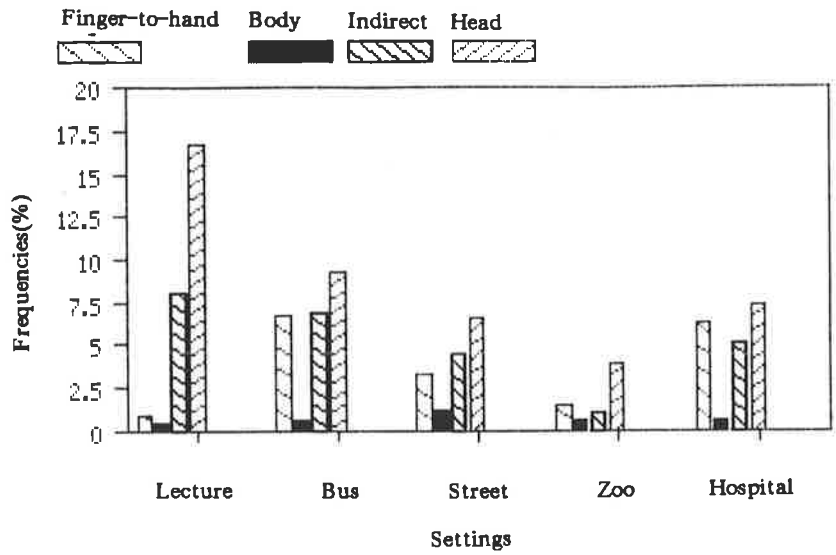


Figure 20

BRUSSELS - Body-focused movement frequencies for each setting.

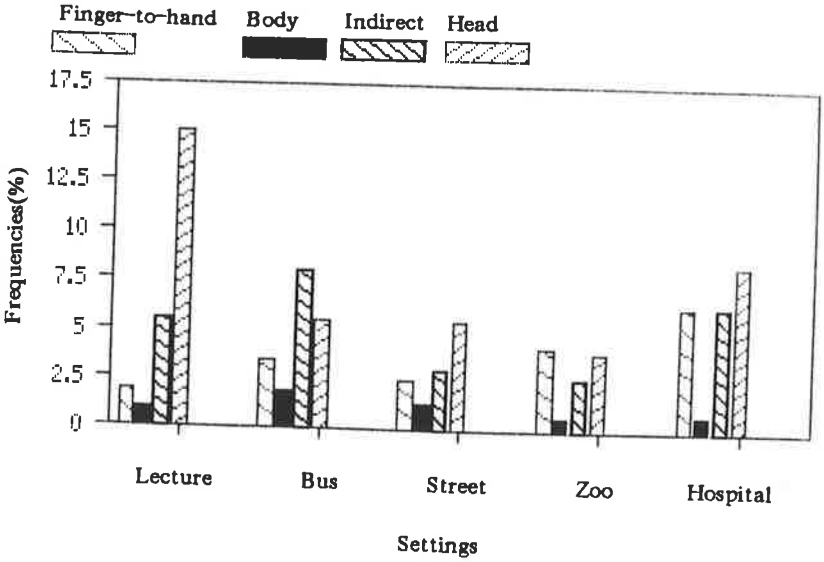


Figure 21

ANTWERP - Body-focused movement frequencies

for each setting.

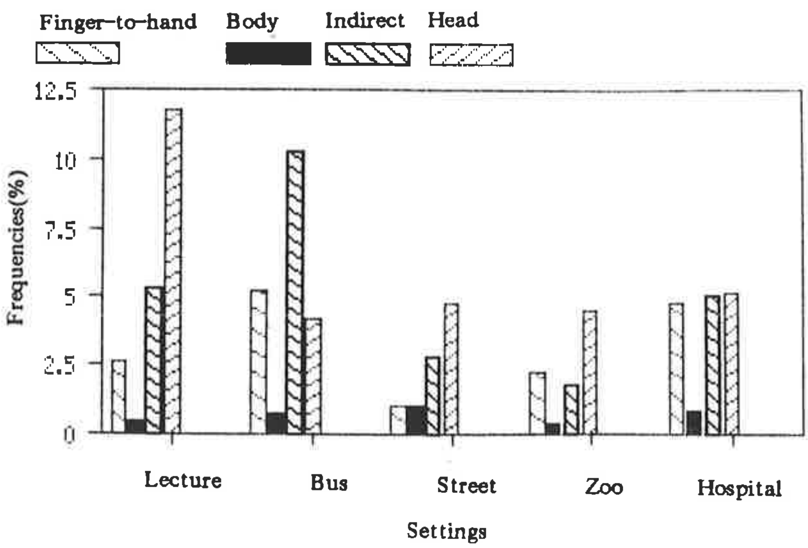


Figure 22

PARIS - Body-focused movement frequencies

for each setting.

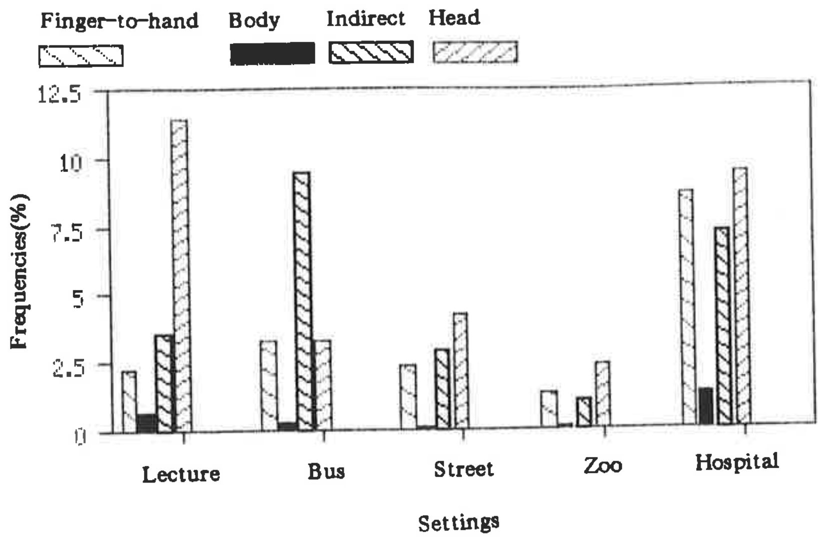


Figure 23

ROME - Body-focused movement frequencies for each setting.

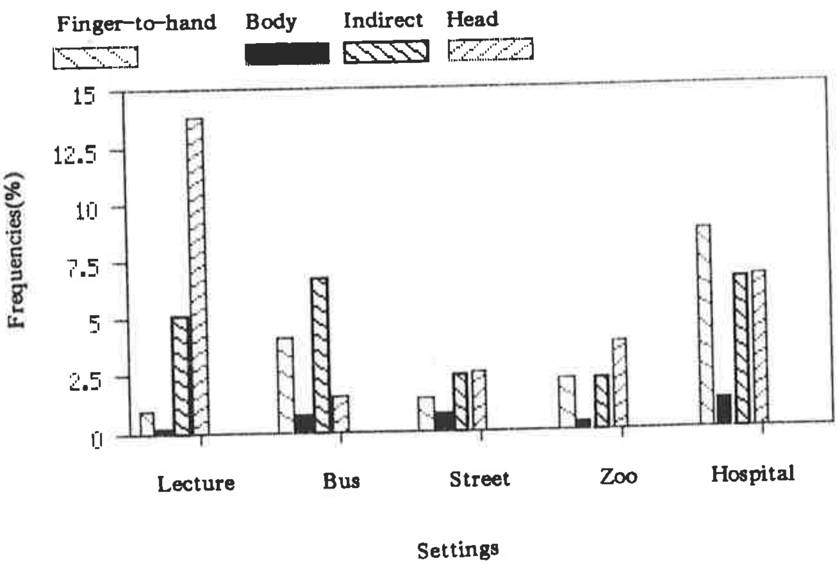


Figure 24

SHEFFIELD - Body-focused movement frequencies for each setting.

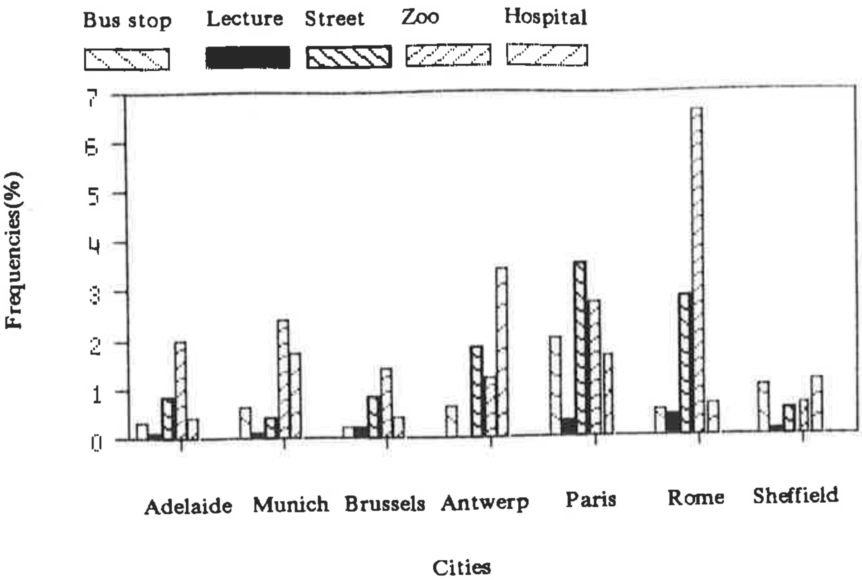


Figure 25

Mean object-focused movement frequency

for each setting in each city.

previous chapters in that it did not use repeated measures. ANOVAs were computed on the Total body-focused movement frequencies, the five Settings, and the seven Cities, and separately for each analysis Age, Sex and Smoke. No significant effects were observed for Sex ($F=0.02$ $p>0.05$), and Smoke ($F=3.7$ $p>0.05$). These will not be considered further. A significant Age ($F=7.1$ $p<0.01$) effect was observed. The Group measure was not significant ($F=2.0$ $p>0.05$) but will be considered further below due to the the significant association this measure had with object-focused movement frequencies (Table 7-2).

Object-focused movements.

An ANOVA calculated on the object-focused movement scores for the five Settings, seven Cities and the Group designation (Table 7-1) produced significant over-all cross-cultural and context differences.

Table 7-1

Experiment 7. An ANOVA calculated on the object-focused movement frequencies for the seven Cities, the five Settings and Group.

Source	df	SS	MS	F
Settings	4	2068.5	517.1	21.1**
Cities	6	1355.5	225.9	9.7**
Group	1	2872.1	2872.1	122.8**
Settings by Cities	24	2770.4	115.4	4.9**
Settings by Group	4	243.7	60.9	2.6*
Cities by Group	6	1121.6	186.9	8.0**
Settings by Cities by Group	19	1150.0	60.5	2.6**

*$p<0.05$ **$p<0.01$

For object-focused movements whether or not the subject appeared to be interacting with others (Group) was a major determining influence on the frequency of these movements, as would be expected for a type of hand movement which is, by definition, associated with speech.

Cross-cultural Comparison of Object-Focused Movements. As previously suggested, there are reasons to believe that the French- and Italian-speaking peoples produce more object-focused movements than do English-

Table 7-2

Experiment 7. Planned comparisons between the Cities calculated on the Total body-focused movement frequencies and the Object-focused movement frequencies.

	Body-Focused Movements (t values)	Object-Focused Movements (t values)
1. Germanic versus Romance	1.0	-2.1*
2. Sheffield versus Adelaide.	1.4	0.7
3. Paris versus English-speakers.	0.2	1.6
4. Rome versus English-speakers.	-0.3	2.1*
5. Two Belgian Cities. (Brussels versus Antwerp)	-1.3	-1.1
6. Brussels versus English-speakers	1.7	-0.6

*p<0.05 **P<0.01

speakers and perhaps other Germanic-language-speakers. In order to test these hypotheses planned comparisons were calculated amongst the city groups (Table 7-2).

Four of the planned comparisons employed were the same as, or similar to, those employed in Experiment 5. These were:

1. English- versus Italian-speakers. i.e. Adelaide + Sheffield contrasted with Rome.
2. English- versus French-speakers i.e. Adelaide + Sheffield contrasted with Paris.
3. Contrasting the two English-speaking populations. i.e. Adelaide contrasted with Sheffield.
4. Brussels versus English-speaking city groups (Brussels contrasted with Adelaide + Sheffield)

Despite the relatively low frequencies of object-focused movements observed in many settings several of the cross-cultural differences predicted were obtained. The contrast between the English-speaking and Italian groups was significant. The French-speaking population of Paris did not show a significant overall difference in their object-focused movement frequency from the English-speakers, though the differences in the means are in the expected direction. Little difference in object-focused movement frequency between the Brussels sample and the English-speaking groups was observed however. Similarly little difference was observed between the object-focused movement frequencies observed in the two English-speaking groups.

As little information has previously been reported for German or Dutch-speakers the following contrasts were based on the hypothesis that greater similarity might be observed between the hand movements of subjects who spoke languages coming from similar language families.

5. Germanic versus Romance language groups i.e. Adelaide + Munich + Sheffield contrasted with Rome + Paris. (Brussels was not included in this analysis as the subjects can be either French- or Dutch-speakers, though the majority were probably French.)

6. Two neighbouring Belgian cities i.e. largely French-speaking Brussels contrasted with Dutch-speaking Antwerp.

The hypothesis that the Romance-language-speakers would show higher frequencies of object-focused hand movement than would Germanic-speakers across a range of settings was supported. However, this appears to be largely the result of the major difference between Rome and the other cities.

The two neighbouring Belgian cities showed little difference in object-focused movement frequency despite the differing language background of many of the subjects in these groups.

Setting Comparisons of Object-Focused Movement. LeCompte (1981) found that anxiety provoking situations were associated with higher frequencies of body-focused movements. Could this hypothesis be generalized to object-focused movements?

The Setting planned comparisons were designed to determine whether stressfulness or concentration factors could be associated with hand movement production. In the case of object-focused movements the Lecture setting has limited relevance as the nature of the setting largely precludes conversation, and therefore associated object-focused movements.

The contrast between the two settings that ranked highest on the stressfulness scale for the Adelaide respondents (Hospital and Bus) and the two lowest ranked (Zoo and Street) showed a difference in object-focused movements frequency ($t=2.1$ $p<0.05$). However it was the lower stress settings that were characterized by the highest object-focused movement frequencies, even when differences in the number of individuals involved in interactions in each setting were considered in the analysis. By contrast the two low stress settings failed to differ in object-focused movement frequency ($t=1.6$ $p>0.1$).

Table 7-3

Experiment 7. Planned comparisons between the settings calculated on the object-focused movement frequencies for each of the cities.

	CITY (t values)						
	Adel.	Munich	Brussels	Antwerp	Paris	Rome	Sheff.
1. Bus + Hospital versus Street + Zoo.	−1.6	0.8	−0.9	0.5	−3.3**	0.8	0.9
2. Zoo versus Street	0.4	1.0	−0.5	0.7	1.5	−1.0	0.8

*p<0.05 **P<0.01

When these setting effects were examined for each city independently (Table 7-3) they were not consistently observed. It appeared to be largely the Paris group that had produced this overall setting influence on object-focused movement frequencies.

Body-focused movement.

An ANOVA calculated on the Total body-focused movement measure, the five Settings, the seven Cities and the subject's apparent Age (Table 7-4A) replicated the findings of significant overall Setting, City, and City by Setting influences found in Experiment 5. Similar analyses were conducted for each city independently (Table 7-4B). To

Table 7-4

Experiment 7.

A. An ANOVA calculated on the Total body-focused movement frequency for the seven Cities, the five Settings and Age.

Source	df	SS	MS	F
Settings	4	118049.7	29512.4	64.3**
Cities	6	12428.2	2071.4	4.5**
Age	5	16223.5	3244.7	7.1**
Settings by Cities	24	26205.6	1091.9	2.4**
Settings by Age	19	9299.5	489.5	1.1
Cities by Age	30	15499.5	516.7	1.1
Settings by Cities by Age	103	46042.6	447.2	1.0

Table 7-4 cont.

B. ANOVAs calculated on the Total body-focused movement frequency the five Settings and Age for each of the seven Cities considered separately.

Adelaide

Source	df	SS	MS	F
Settings	4	20276.4	5069.1	10.9**
Age	5	4579.2	915.8	2.0
Settings by Age	19	11053.1	581.7	1.3

Munich

Source	df	SS	MS	F
Settings	4	28242.6	7060.7	12.8**
Age	5	4953.5	990.7	1.8
Settings by Age	19	13152.7	773.7	1.4

Brussels

Source	df	SS	MS	F
Settings	4	23963.6	5990.9	12.4**
Age	5	5020.0	1004.0	2.1
Settings by Age	19	5021.0	295.4	0.6

*p<0.05 **p<0.01

Table 7-4 cont.

Antwerp

Source	df	SS	MS	F
Settings	4	12226.6	3056.6	6.2**
Age	5	2544.8	509.0	1.0
Settings by Age	19	11645.2	685.0	1.4

Paris

Source	df	SS	MS	F
Settings	4	27751.5	6937.9	15.4**
Age	5	1376.5	275.3	0.6
Settings by Age	19	2230.4	131.2	0.3

Rome

Source	df	SS	MS	F
Settings	4	12759.2	3189.8	8.8**
Age	5	8388.6	1677.7	4.6**
Settings by Age	19	6752.9	422.1	1.2

*$p<0.05$ **$p<0.01$

Sheffield

Source	df	SS	MS	F
Settings	4	19908.9	4977.2	12.5**
Age	5	3927.7	785.5	2.0
Settings by Age	19	5089.9	267.9	0.7

*p<0.05 **p<0.01

Table 7-5

Experiment 7. Planned comparisons between the settings calculated on the Total body-focused movement frequencies.

	Body-Focused Movements (t values)
1. Bus + Hospital versus Street + Zoo.	11.0**
2. Lecture versus Bus.	-0.6
3. Zoo versus Street.	-1.2

*p<0.05 **P<0.01

examine these City and Setting influences more closely planned comparisons were again employed (Table 7-5).

Setting Comparisons of Body-Focused Movement. The LeCompte (1981) hypothesis that the higher stress rated settings might be associated with higher frequencies of body-focused movement was supported by these findings. The Bus plus Hospital frequencies were much greater overall than the frequencies for the Zoo plus Street settings. When the same analyses were carried out separately for each city (Table 7-6) it is apparent that this influence is consistent across the City groups.

Table 7-6

Experiment 7. Planned comparisons between the Settings calculated on the Total body-focused movement frequencies for each of the seven Cities.

CITY (t values)

	Adel.	Munich	Brussels	Antwerp	Paris	Rome	Sheff.
1. Bus + Hospital versus Street + Zoo.	5.0**	3.2**	3.9**	2.7**	5.7**	4.3**	4.4**
2. Lecture versus Bus.	-0.8	0.9	-0.4	2.4*	0.7	1.5	-0.3
3. Zoo versus Street	-0.4	-0.2	-2.8**	-0.3	-1.3	0.4	1.4

*p<0.05 **P<0.01

The Barroso et al. (1978) hypothesis that more attentionally demanding tasks are associated with higher frequencies of body-focused movement was not supported by these findings. The Bus and Lecture settings, which were very similar in "stressfulness" ranking but differed markedly in "concentration", showed little difference in Total body-focused movement frequency when all the cities were considered together, or indeed in most of the cities when considered individually. However, the Antwerp group showed a significantly higher frequency for the Bus setting when contrasted with the Lecture setting - the opposite difference from that expected on application of the attentional demand hypothesis.

The two lowest "stressfulness" ranked settings, Zoo and Street, showed little difference in Total body-focused movement frequency when all the cities were considered or when they were considered individually. However, the Brussels groups did show a significantly greater frequency of body-focused movement for the Street setting.

These setting differences in Total body-focused movement frequencies were examined more closely by considering the same planned comparisons for each of the body-focused movement categories (Table 7-7). The significant differences for each behaviour measure reflected the Total body-focused movement finding. All categories showed the high versus low stressfulness difference. All showed no significant differences between the Lecture and Bus settings. It was only in the contrast between the two lower stress settings that any other significant differences were present - the Street setting had a higher frequency of Indirect movements when contrasted with the Zoo.

Table 7-7

Experiment 7. Planned comparisons between the settings calculated on each of the body-focused movement frequencies for the seven cities considered collectively.

	Body-Focused Movements (t values)			
	Finger-to Hand	Body	Indirect	Head
1. Bus + Hospital versus Street + Zoo.	6.9*	2.2*	7.8**	3.1**
2. Lecture versus Bus.	-0.3	-0.0	0.7	0.0
3. Zoo versus Street	0.4	-0.4	-2.4*	0.2

*p<0.05 **p<0.01

Cross-cultural Comparisons of Body-Focused Movement. As in Experiment 5 significant differences in Total body-focused movement frequencies were obtained between the City groups. Planned comparisons between the Cities in Experiment 5 showed that object-focused and body-focused movements displayed similar cross-cultural differences. Planned comparisons were employed here to examine the cross-cultural differences (Table 7-2) present within these naturalistic observations.

Table 7-8

Experiment 7. Planned comparisons between the cities calculated on the each of the body-focused movement categories.

	Body-Focused Movements (t values)			
	Finger-to Hand	Body	Indirect	Head
1. Germanic versus Romance	0.2	0.3	0.1	1.2
2. Sheffield versus Adelaide.	1.2	0.1	0.1	1.1
3. Paris versus English-speakers	0.4	0.4	-0.1	-0.0
4. Rome versus English-speakers	-0.8	0.2	-0.0	0.1
5. Two Belgian Cities. (Brussels versus Antwerp)	-0.4	-0.5	-0.6	-1.0
6. Brussels versus English-speakers.	0.0	1.4	0.1	2.2*

$*p<0.05$ $**P<0.01$

None of the planned comparisons between the Cities produced significant differences between the Total body-focused movement frequencies. When each of the constituent body-focused movement categories was examined independently, using these comparisons, (Table 7-8) they also showed little cross-cultural difference.

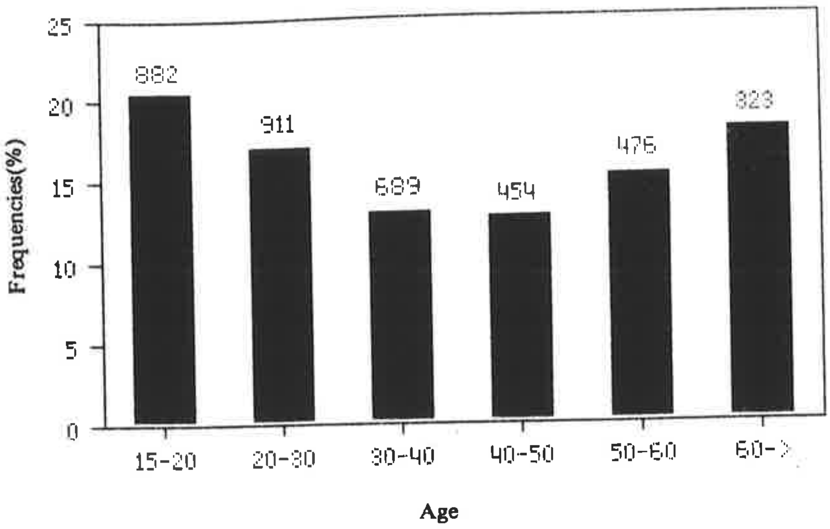


Figure 26

The relationship between age and

Total body-focused movement frequency

Age Comparisons of Body-Focused Movement Frequencies. A histogram showing the breakdown of Total body-focused movements by Age for the seven Cities considered jointly (Figure 26), showed that the significant Age effects on Total body-focused movements were not the result of a simple linear increase or decrease with Age. There was no clear reason for such a general age difference. Perhaps subjects of different ages react differently to these public settings. When the Cities were examined individually the significant Age effect was only observed for the Rome sample.

Discussion

Field studies are inevitably limited by the difficulty in finding sufficiently comparable settings and the difficulty in recording the behaviour that eventuates with sufficient accuracy. In the present experiment a range of public settings was employed, involving the subjects in differing environmental constraints and differing postures, and in coping with great differences in weather. These differences in environmental constraints and prevailing weather might plausibly have been expected to significantly influence the observed setting effects obtained in the seven cities. This was not what was observed.

The suggestion by LeCompte (1981) that public differences in body-focused movement are indicative of the stressfulness of the setting have received consistent confirmation from all cities and from all body-focused movement measures. The suggestion derived from Barroso et al. (1978) that attention focusing has a role to play in body-focused movement production has received little support. The Lecture listening setting was associated with relatively high body-focused movement frequencies but these failed to differ significantly from the Bus Stop setting with its similar stressfulness rating but much lower concentration rating.

Significant City and City by Settings effects upon body-focused movement frequencies were observed. While these city differences in body-focused movement frequency may reflect cultural differences in body-focused movement preferences, other explanations based on functional differences in the settings employed cannot be excluded.

The naturalistic methodology employed placed limitations on the similarity in contexts that could be achieved from city to city. For example it is possible that the weather conditions had an influence on the outdoor setting hand movement frequencies. Certainly the Total body-focused movement score in the very cold conditions in Sheffield were the lowest observed. However, the Paris population probably experienced even more extreme conditions and exhibited a much more typical mean.

It was not always possible to match the parallel settings in the different cities as perfectly as would have been desirable. However it appears that closeness in the form and functioning of the setting was not always important. The Street setting in Rome, perhaps the least satisfactory of the settings in terms of its similarity to the Adelaide equivalent, was associated with very similar body-focused movement frequencies.

The higher frequency of object-focused movements predicted for the Italian group, as compared to the English-speakers was confirmed for these public settings. The equivalent comparisons for the French-speakers produced means differing in the expected direction, though these did not reach statistical significance. The overall higher frequency of object-focused movements predicted for the Romance-language- speakers as compared with the Germanic-language-speakers was obtained. None of these differences were observed to correspond to similar cross-cultural differences in body-focused movement frequencies. Contrasts based on the expected cultural differences in object-focused movements appeared to have little utility in explaining body-focused movement cross-cultural differences in these public settings.

Some of the cross-cultural differences in body-focused movement frequencies were not simply a matter of differences in one or two settings. For example the body-focused movement frequencies for the Munich city group exceeded those for the Sheffield city group in each comparable setting. It is difficult to determine what could be the reason for this difference without much further information. Were these city differences perhaps the product of display rule differences between these societies? Could they be a product of different motivational reactions to the settings by the two city groups? Could they be the product of subtle but general differences in the architecture or function of Munich versus Sheffield settings? Without further information any or all of these hypotheses may hold some value. One of the consequences of anonymous field observations is the difficulty of obtaining more direct motivational information. As a result these questions concerning city differences will have to remain unanswered at present.

Despite the city by city differences in Total body-focused movement frequencies the significant setting differences obtained in each city were essentially the same. The object-focused movement frequencies did not show this across cities similarity in setting differences. Both the setting and city effects are qualitatively and quantitatively different for these two classes of hand movement. This supports the contention (Barroso et al., 1978; Ekman & Friesen, 1972; Kimura, 1973a) that object and body-focused movements, while often occurring together, are functionally dissimilar.

Experiments 1 to 5 involved children in what were probably quite stressful settings, regardless of the tasks required of them. The novelty of the experience, combined with the presence of a videocamera, would seem to ensure that most of the children would experience high levels of stress. This is quite different from the situation of the subjects in Experiment 7. There is no reason to believe that the subjects in several of these settings (Lecture, Zoo, Street and Bus Stop) were engaged in activities outside the scope of their normal daily routine. If the frequencies of body-focused movements are examined for these two types of observation it does appear that the experimental settings elicited more body-focused movements. None the less there are areas of overlap. For example the highest stress level settings in this experiment produced higher frequencies of body-focused movement than for the Rest settings in Experiment 5 for each of the comparable cities. This suggests that there is significant overlap between the laboratory and field observations in whatever underlying factors induce the subjects to perform body-focused movements. Even in the most relaxed of settings (e.g. the Zoo) quite consistent levels of body-focused movements could be observed.

Perhaps the most striking difference between the experimental findings of Experiment 5 and the more naturalistic findings of Experiment 7 is the difference in Direct body-focused movement frequency. The children in Experiment 5 produced relatively few Direct movements. Though not specifically scored for this information these Direct movements produced by the children appeared approximately evenly divided between Head and other Body manipulations. The large proportion of Head manipulation movements in all the field settings, particularly the Lecture listening setting, is in striking contrast. Again it is difficult to provide an explanation for this difference without further information. However the generally higher stressfulness inherent in the experimental studies, the differences in the task demands, and age differences are all possible relevant factors.

Abramson (1986 Note 1) has suggested that age may be a significant influence on body-focused movement form:

> "Face touching is rarely seen in pre-adolescents. Developmentally, the emergence of face touching around adolescence appears to coincide with the development of social embarrassment." (p.3).

It should be noted, however, that face and head manipulations, while of lower frequency, were consistently observed in the experimental studies of 10-year-old children reported in the earlier chapters.

The significant association of body-focused movement frequency with the estimated age of these adult subjects was not expected and remains difficult to understand. The most likely explanation would appear to be that at least in some of these cities differences in age correspond with differences in motivational reactions to the settings. In such instances it would appear that it is the young and the old who show the highest frequencies while those of middle years produce a lower frequency.

The findings of Experiment 7 support the findings of Experiment 5 that the factors which encourage subjects to produce body-focused movements are widespread, as is the gross form and frequency of the behavioural response of the peoples of Western Europe, Britain and Australia to these factors. While it is difficult to compare these results directly with those of LeCompte, because of substantial differences in methods and the definitions of the behaviour categories employed, it is most interesting to note that the results obtained are remarkably similar. If Turkish populations behave in essentially similar ways to the people of Europe, Britain and Australia then how widely can these generalizations be applied? While further evidence from remote communities would greatly help us understand the generality of body-focused movement production, the evidence from this range of populations together with observations of analogous behaviour in the very young (Beuter, 1980; Landau, 1981) does encourage the author to agree with the speculation posed by Ekman (1977) that body-focused movements may indeed be one of the universal features of human nonverbal behaviour. Such universality should not be thought of as excluding quantitative and even some qualitative differences between peoples of different cultural background. Between cultures differences in the absolute frequencies of body-focused movements are probably of relatively little theoretical importance in themselves. The factors which appear to elicit their production and the general form of the movement would seem to be of greater potential interest. These seem to be similar in the range of cultures examined to date. Despite this apparent universality we still have much to discover about these movements if we are to learn why such apparently irrelevant behaviours are so widely and consistently produced.

The consistent finding of significant cross-cultural differences in body-focused movement form and frequency must be noted. The interactions between the city differences and the settings have also been consistently significant. Thus, despite the pattern of setting influences observed across cultures, the findings of Experiments 5 and 7 add an important note of caution. Future review of body-focused movement studies should acknowledge the likelihood that subjects drawn from differing cultural backgrounds will display significant differences, as well as similarities, in their body-focused movement characteristics.

The final chapter concerns itself with drawing together the results of the six experiments, and examines the available hypotheses, in order to answer the central questions with which this series of experiments has been concerned - what consistencies are there in body-focused movement production and why do these exist?

Chapter 6

Conclusions

Conclusions.

While most investigators acknowledge that we can intuitively understand the function of much nonverbal behaviour (Patterson, 1983) body-focused movements have a number of properties which appear to inhibit the development of a general understanding. Body-focused movements have no obvious goal. They do not appear to have any productive impact on the immediate environment and they do not appear to resemble facial expressions in exhibiting a direct relationship between form and interpretation. The fact that subjects are normally unaware of their production of body-focused movement makes it difficult to associate motivational states with body-focused movement performance and one must rely on indirect measures rather than making direct inquiry. The highly variable form of body-focused movement has resulted in many different classification schemata being developed, which in turn makes generalizations across studies difficult.

Despite these difficulties investigators have been making attempts to understand body-focused movements for more than fifty years (Olson, 1930). The lack of consistency in the resulting findings has caused many authors to expressed concern at the difficulty of obtaining consistent associations between body-focused movement frequencies and external variables.

> "Regardless of the explanation, the apparent lack of close dependence of such behavior on internal processes underlines the caution one must exercise in interpreting gestural behaviors.."
> (Wild et al. 1983 pp.549-550)

> "Subjects may have been too homogeneous to allow relationships to emerge effectively, or personality questionnaires emphasising long-term, average characteristics may be insufficiently close measures of actual disturbance in the test situation. The most likely explanation is that nervous habit patterns are idiosynchratic, and this obscures any relationship with neuroticism except under special circumstances." (Williams, 1973 p.107).

> "...are not the social externalizers I wish to emphasize...In fact, all these externalizers (sometimes very difficult to interpret, if at all possible) of hidden states or past, present or anticipated motives, and of which our cointeractants are much more aware than ourselves, should be researched systematically..." (Poyatos, 1983 p.135)

> "Self-adaptor variables did not prove fruitful in this study." (Duncan & Fiske, 1977 p.90)

Nevertheless there are a few generalizations on which almost all investigators agree.

Firstly, body-focused movements are not produced randomly. Despite their apparent irrelevance, and despite their resemblance in some instances to simple comfort movements, body-focused movement frequencies for a population can be quite accurately predicted for a given task and setting (Barroso et al, 1978; LeCompte, 1981).

Secondly body-focused movements can be scored reliably (Friesen, Ekman & Wallbott, 1979) and appear functionally to be independent of hand movements that are associated with ongoing speech.

Thirdly body-focused movements are frequently associated with "negative affect". Arousal (Jones, 1943b; Rosenfeld, 1967), stress (LeCompte, 1981), embarrassment (Edelman & Hampson, 1979) and thwarting (Feiring & Lewis, 1979; Kehrer & Tente, 1969) appear to increase body-focused movement occurrence. In at least some settings decoders appear to infer some form of negative affect from observations of the occurrence of body-focused movement (Raskin, 1962; Waxer, 1977).

However, there is little agreement available on a model or models to explain these findings.

In chapter 1 a series of models were outlined which were developed by authors who sought to account for the systematic occurrence of these apparently irrelevant movements. There are implications for these models arising from the studies reported in the preceding chapters. These will be considered below. But first it is necessary to consider some of the more specific questions with which this series of investigations has been primarily concerned. These questions are outlined below and then each is subsequently considered in more detail.

Authors have defined body-focused hand movements in different ways. Some have included apparently irrelevant object manipulations (e.g. Freedman et al., 1972) while others have not (e.g. LeCompte, 1981). Some have incorporated all self-touching movements (e.g. LeCompte, 1981), while others have been more restrictive in the movements they include (e.g. Kimura, 1976). Such definitional differences have arisen largely from the different views possessed by these authors concerning the function and nature of body-focused movement. A classification schemata needs to reflect observable relationships between the items it organizes. The data obtained in this series of investigations has implications for such classification schemata related to hand movements.

While authors have conducted many studies of body-focused movements using subjects who come from varied cultural backgrounds, few examples of direct cross-cultural comparisons of body-focused movements have been conducted to date. As it appears likely that decoders make attributions about an individual's motivational state, in part on the basis of body-focused movement frequencies (Raskin, 1962; Waxer, 1977), recognition of whether such behaviour systematically varies from one culture to another has import for cross-cultural communication.

The literature which attempts to relate body-focused movement frequencies to individual differences in personality has produced a diversity of often conflicting findings. If we are to understand the significance of body-focused movement performance then we must have some understanding of the relative contributions of individual differences and more general context or motivational influences on body-focused movement performance.

Are body-focused movements best considered to be a single class of behaviour?

Whenever a scientist approaches a problem one of the first needs is to recognize clearly a categorization schema which will allow him/her adequately to describe the essential phenomena under observation (Poyatos, 1983). While most investigators recognize irrelevant self-manipulations as having the general properties outlined above, some differences between authors exist over interpretation of some other categories of hand movement. As reported in Chapter 1, some authors exclusively examine self-manipulations (Feyereisen, 1977; Kimura, 1976), while others incorporate irrelevant object-manipulations (e.g. Freedman et al, 1972; LeCompte, 1981). Yet others (e.g. Harrigan, 1985) follow Hatta and Dimond (1984) in emphasizing face-touching movements. Even those who score a range of movement types have emphasized that some body-focused movement forms appear to show differential sensitivity or differential responsiveness to a variety of personality, environmental, or information processing factors (Freedman et al., 1978). For example Freedman and his colleagues single out continuous bilateral movements as functioning as a distraction filter.

> "Continuous bilateral movements, we suspect, form a continuous white noise, filtering information input." (Freedman et al. 1978 p. 174).

In order to assess the utility of recognising subcategories of body-focused movements it is useful to examine the ways in which each of these body-focused movement categories change with associated

Table 8-1

A summary of the statistically significant and not significant experimental effects ($p<0.05$) for each of the body-focused movement categories for Experiments 1 to 5.

Task Differences	Finger-to-Hand	Direct	Indirect	Discrete
Experiment 1				
Task effect	Yes	No	Yes	Yes
Correlation with RT measure	No	No	No	No
Experiment 2				
Task effect	Yes	No	Yes	Yes
Correlation with RT measure	No	No	No	Yes (only for 1 of 4 tasks).
Experiment 3				
Task effect	No	No	No	No
Distraction group	No	No	No	No
Experiment 4				
Task effect	No	No	No	No
Distraction group	No	No	No	No
Experiment 5 (For all populations).				
All other conditions versus Rest	Yes	No	Yes	No
Stroop versus Control.	No	No	No	No

changes in external variables. A range of body-focused movement frequencies were obtained for diverse settings in the preceding chapters. If the smaller categories differ in their changes of frequency with changes in these various external variables then we have evidence that these subcategories are associated with differing underlying processes.

Table 8-1 is a brief summary of the qualitative findings for the experimental studies with children. The Finger-to-hand, Indirect and Discrete scores show a generally very similar pattern of significant differences across this range of experiments. Finger-to-hand scores, which would account largely for any measure of bilateral movements, do not show a differential response to increases in distraction. Similar findings were obtained for Indirect and Discrete movements categories. The exception to this high level of agreement amongst the body-focused movement categories is clearly the Direct measure. It has generally shown the same low frequency across all tasks, settings, populations and levels of distraction.

Some caution needs to be employed when these subcategory scores are compared. They are not independent. All categories were observed for the same subjects during the same interval. Virtually all subjects observed in these settings tended either to produce high frequencies of Indirect movements or alternatively high frequencies of Finger-to-hand and occasionally both. Given that the means for the Total body-focused movement scores were quite high for many tasks the time available for Direct movement performance may have been curtailed. The failure to find similar frequency changes for the Direct movements may therefore represent a priority difference rather than a difference in kind. Nevertheless this marked difference in the responsiveness of the Direct movement score to the variety of tasks employed during these experiments suggests that some differentiations between body-focused movement types is necessary.

To this point only the Experimental findings from Experiments 1 to 5 have been considered. The behaviour categories observed for the field observations differed in that the Direct scores were subdivided into Hand-to-head and Hand-to-body movements. In view of the preceding finding that Direct scores seem to have been both a low priority behaviour and to be insensitive to the experimental manipulations of Experiments 1 to 5 it would be most interesting to examine the subcategories of Direct movement for the field studies.

Comparisons of the various comparable categories of body-focused movement for the experimental and field studies displays some quantitative differences. The proportions contributed by each category of movement to the overall movement totals changed considerable for both sets of results when the tasks or settings were changed. The frequencies of Hand-to-head movements in the field settings are clearly proportionally much higher than one might have expected from the Direct movement totals in the experimental studies.

While there was some relative changes in the frequencies of the different subcategories of body-focused movement when the experimental and field strategies are contrasted, it must be noted that all four subcategories showed essentially the same setting contrasts in the field observations of Experiment 7. There was one exception. The Street setting was characterized by a higher frequency of Indirect movements when all four populations were considered together.

Overall several conclusions can be drawn from these results. Firstly, all the measured categories of body-focused movement display some tendency to increase in stressful settings. This is weakest for the Direct movements in general, and particularly those that do not involve Hand-to-head behaviour. Secondly, the different forms of body-focused movement show some differential frequency changes in response to differences in setting and task. Again the Direct movements seem generally the least sensitive to any change. Hand-to-head movements appear to display an increase in frequency when the subjects were in a field setting that required concentration though this difference did not reach significance. No such tendency was displayed when the children in Experiments 1 to 5 were examined.

These differences between body-focused movement subcategories provides some support for those authors who have stressed the possibility of functional differences between body-focused movement types (Freedman et al., 1978). Manipulations of the face appear to have some different properties from other forms of hand movement. However, it is difficult to associate these Hand-to-head movements with attention factors despite the possible association of higher Hand-to-head movements and the Lecture setting. Such an association should have resulted in a higher frequency of Direct movements for the more distracting circumstances of Experiments 3 to 5. None was observed. Indeed the Direct scores showed little evidence of responding at all to any of the experimental manipulations. Clearly more work on the differences between Direct and other forms of body-focused movement is needed.

The common practise of many European investigators (e.g. Feyereisen, 1977; Ruggieri et al., 1982) of not incorporating irrelevant object-manipulations within their discussions of "automanipulations" or "self-manipulations" appears to be a case of being overly cautious. Finger-to-hand and Indirect frequencies responded in a virtually identical fashion to all experimental manipulations.

Cross-cultural Differences in Body-Focused Movements.

A wide range of cultures display similar irrelevant hand movements (e.g. Feyereisen, 1977; LeCompte, 1981; Ruggieri et al., 1980; Seiss, 1965). However without quantitative data on a variety of tasks it is impossible to go beyond superficial similarities to consider broad questions of functional consistency. Do the sort of task differences observed in one culture remain essentially the same when different communities are compared? Are the cultural differences that have long been known for object-focused movements (Efron, 1941) generalizable to quantitative fluctuations in body-focused movements?

Both experimental and field observations have limitations as bases for this type of cross-cultural comparison. While the experimental approach allows the tasks and settings to be largely controlled by the experimenter, these controls themselves may introduce cross-cultural similarities which would fail to generalize to more everyday settings. The field observation approach is not only subject to methodological problems concerned with data recording but, more importantly information concerning the subjects' reactions to the setting is very limited, and largely indirect information has to be substituted. A combination of both approaches appeared to offer the prospect that each approach would supplement the weaknesses of the other. A clearer overall picture should therefore emerge.

The results of Experiments 5 and 7 were consistent in their portrayal of cross-culturally consistent task and setting effects on body-focused movement frequencies. Considering the essentially irrelevant appearance of body-focused movements, and the high variances observed for these frequencies within each city sample, the means obtained for all the body-focused movement categories are surprisingly similar.

More important than these gross similarities in body-focused movement form and frequency were the essentially identical task and setting effects observed for each of the city samples. Whether the experimental task differences or the distinction between the relatively high and low stress settings were examined essentially identical results were observed regardless of the city from which the subjects were drawn. Considering the range of secondary factors that might plausibly have been expected to have had an impact upon these frequencies (weather conditions, setting differences, culture specific display rule constraints, differences in the experimental rooms employed, etc.) these levels of agreement are notable and are consistent with a view that similar underlying motivational factors exist within each of the cultural groups examined.

Quantitative differences between cultures were also observed. It is difficult to interpret these differences. Indeed the range of uncontrolled factors in the field settings was inevitably so great that some differences from population to population could have been expected for many reasons. It is therefore extremely difficult to determine which reasons may account for the differences observed. The most obvious candidates are in the area of setting differences. However, the fact that some cities showed a general elevation of body-focused movements across all settings (e.g. Munich in comparison with the English-speaking cities) suggests that a more general explanation may be required. There are a number of possible explanations (e.g. generalized differences in stress level between cities, differences in display rules, differences in the time of year etc.) though the evidence collected here is not able to offer them differential support.

While quantitative differences between the city groups were consistently obtained, the consistencies in the setting effects observed adds support to the suggestion that city differences are unlikely to be the result of fundamental differences between populations in the factor or factors which underlie body-focused movement performance. Nevertheless the city differences observed serve as a useful cautionary note to those investigators who might make direct comparisons between studies whose findings have been obtained employing subjects from culturally different backgrounds. While the consistent setting effects suggest some consistency in the motivational underpinning of body-focused movement production, the city differences suggest that cultural influences are also significant.

How far can these cross-cultural results be generalized? The finding by LeCompte (1981) that stressful environments were associated with body-focused movements in public settings in Turkey has been consistently confirmed in the seven cities examined in Experiment 7. These similarities in result obtained from relatively diverse populations are consistent with the universality hypothesis posed by Ekman (1977). A recent brief report from Fischbach (1986 Note 2), who has been analyzing the body-focused movements ("automanipulations") of German children and children from the Yanomami Indians filmed by Eibl-Eibesfeldt's team in the Amazon basin, suggests that gross quantitative similarities are present even in culturally quite remote populations. The observation that analogous movements can also be detected in the very young (Ingram, 1975; Landau, 1981) adds support to Ekman's universality hypothesis.

Individual Differences and Body-Focused Movements

The quotation provided by Williams (1973) at the commencement of this chapter suggested that body-focused movements appeared to be largely idiosynchratic. Indeed many of us can probably associate a particular body-focused movement mannerism with a given individual of our acquaintance. Is it possible then not only to describe the circumstances that produce body-focused movements but also to define particular characteristics of these movements which will adequately cover the wide range of mannerisms individuals display? The results of the experimental studies of children provide an answer. However, that answer is not as simple as we might wish.

The data obtained in Experiment 1 was strikingly different from the results obtained by Sainsbury and Costain (1971) and by Ruggieri et al. (1980). While some weak across task consistencies were observed for some of the behaviour categories the Total continuous body-focused movement measure was singularly unsuccessful in displaying across task ordinal consistencies. In the light of the setting difference consistencies obtained in the cross-cultural studies considered above, the fact that the three city groups came from different cultural backgrounds seems an unlikely explanation for the differences in the findings obtained. The presence of a strong task effect in Experiment 1 may help to explain these differences though Ruggieri et al. (1980) obtained simultaneously significant task differences and significant ordinal ranking in body-focused movement frequencies for a group of subjects in Italy. Could the strong task effects in Experiment 1 be overriding individual preferences for body-focused movement forms?

Experiment 2 provided an opportunity to compare the behaviour of one set of subjects who experienced, after a six month gap, repetition of identical experimental circumstances. Such test-retest procedures always have the confounding effect of practice to complicate interpretation. Nevertheless it might reasonably have been expected that high body-focused movement consistencies would have been observed for the same tasks. This was not generally the case. The Discrete movement scores did display a significant rank-order consistency both across tasks and across repetitions of the same task. The continuous body-focused movement frequencies did not show this type of consistency. Indeed subjects tended to produce higher rank-order consistencies for the two dissimilar tasks within the one performance than for the same task across performances. Were these findings characteristic only of these tasks, or was there perhaps some methodological problem that was causing similarities in movement to be overlooked?

Experiments 3 and 4 examined the behaviour of the subjects during the Stroop Colour-confusion and Colour-naming tasks. These tasks were specifically chosen as they were believed to produce significant differences in body-focused movement form and frequency (Barroso et al., 1978). Not only were no significant differences in body-focused movements observed between these tasks, but rank-order correlations between these tasks were extremely high for virtually all body-focused movement measures. The striking differences in these rank-order consistency results between Chapter 2 and Chapter 3 require an explanation.

It is apparent from Experiment 1 that high frequencies of body-focused movements can be observed in subjects' behaviour across a variety of settings without the frequencies of these behaviours showing rank-order consistency across these settings. By contrast the high consistency findings of Chapter 3 show that, using similar methodology but different settings, high rank-order consistencies between subjects performances can be obtained.

The simplest explanation is that the task themselves differed significantly in Experiment 1 but did not in Experiments 3 and 4. Perhaps it is the nature of the ongoing task and its particular demands which either allows subjects to display a consistent comparative reaction or inhibits it. Perhaps the very similarity of the time constraint, the need for accuracy and so on that both Stroop tasks possess encouraged similar body-focused movement performance. Such a result would be theoretically important as it would suggest that the difference between the two Stroop tasks, i.e. the presence of distraction, is not a significant influence on body-focused movement production. The cross-cultural results of Experiment 5 generally replicate this association of tasks with level of rank-order consistency in continuous body-focused movement frequencies. However, the results of Experiment 2 complicate this picture.

That subjects can repeat the identical task after a six month interval and show such small levels of ordinal consistency suggests that it is not the specific demands of the tasks that are producing similarity in the body-focused movement frequencies observed in Chapter 3. Rather we must suggest that some change has occurred in the six month interval, either to the subjects' body-focused movement preferences, or to their motivational reaction to the setting. Observations by Sainsbury and Costain (1971) suggest that long-term stability in body-focused movement form and frequency could be obtained in adults. While it is possible that such movement preference changes might occur in such young children over a six month period it might be suggested with equal plausibility that motivational changes to the repeated task disrupted the consistency patterns that might have been expected for continuous body-focused movements. To date the nature of such underlying motivational changes remains obscure.

As discussed above, a number of authors have suggested that Discrete movements may have different properties from the more extended continuous movements. While some initial support for this contention appeared to stem from the observation that for the first two experiments the Discrete scores displayed higher rank-order consistency across tasks than did the continuous measures, this was not found in later studies. On the whole the Discrete measure frequencies showed a similar pattern of setting differences to those displayed by the Finger-to-hand and Indirect movement categories. In the light of this highly varied level of individual consistency in body-focused movement it was not surprising to find that correlations between a range of the most likely personality variables and body-focused movement frequencies produced very few consistent patterns. This was not due to a lack of significant correlations between body-focused movement scores and personality measures but rather due to the changes in these correlations with changes in setting and task. Even when the same tasks were repeated after a six month interval significant correlations between body-focused movement frequencies and personality measures showed little stability. Even the Discrete measures, which displayed the highest consistency levels, produced no personality correlations that remained stable across experiments.

The only personality body-focused movement correlation that consistently achieved significance was the correlation between Direct movements and the Field-Dependence measure (The Children's Embedded Figures Test) which was obtained for each of three replications for one of the tasks. It has already been noted above that the Direct score was the only measure which showed very little task influence. It may be that this relationship tells us something specific about the Field-dependence and Direct body-focused movement relationship. However the fact that this relationship was found for only one task and was not observed when the tasks involved high levels of distraction makes it hard to assume that this relationship is a reflection of underlying information processing strategies.

It would appear that correlating body-focused movements with personality measures is not likely to provide useful information about the nature of body-focused movements until we have a better understanding of the underlying motivational precursors to body-focused movement production. Certainly if such individual differences experiments are attempted then a range of tasks and settings are necessary if we are to know how far such results can be generalized. Certainly models which depend heavily upon personality distinctions (e.g. Freedman, Barroso, Bucci, & Grand, 1978) must be viewed with some caution.

Models of Body-Focused Movement Production.

In Chapter 1 the commonly employed models proposed to explain body-focused movement occurrence were reviewed. It was noted then that none appeared to explain all observations concerning the occurrence and form of body-focused movements. While the results of this series of experiments are not going to provide a complete answer to the larger question of the function of body-focused movements they are able to provide evidence concerning the relative merits and predictive value of each of these models. While these experiments have concentrated on one or two models in particular the range of models discussed in Chapter 1 will be considered again here in the same order to allow ready comparison.

1. Symbolic Models.

It was not the purpose of this series of experiments to examine the symbolic model. None the less certain observations do have some relevance. In particular most of the symbolic models have suggested that to understand body-focused movement occurrence one had to observe the form of these hand movements in some detail. These experiments have demonstrated that a much coarser level of analysis is not only able to demonstrate consistent task differences but is able to do so with culturally diverse populations. While these results are not completely inconsistent with a symbolic model they do suggest that the very detailed interpretation attempted by such models may add little to the more global categories employed here. None the less the differential responsiveness of several of the body-focused movement measures to changes in external variables does suggest that fine tuning of body-focused movement categories and a willingness to look at these movements in some detail may provide useful qualifications to many generalization.

2. An "Arousal" Model.

Despite the definitional difficulties which arousal concepts involve, it is this model which has proved the most useful when attempting to interpret body-focused movement occurrence. In particular many of the field observations of public behaviour are directly in line with LeCompte's predictions concerning associations between arousing or anxiety producing circumstances and body-focused movement production for virtually all body-focused movement measures.

Unfortunately the results for the experimental studies have not been so clear-cut. In Experiments 1 and 2 clear differences between tasks in body-focused movements were observed. Despite the use of a wide variety of anxiety indicators no correlations between anxiety measures and body-focused movements were observed. Trait measures (e.g. GASC and TASC), self-report state measures (e.g. Self-rating and ACL measures) as well as more indirect measures (the Non-ah ratio) were all unsuccessful.

While this result is disappointing it is not atypical as similar lack of success with such measures has been reported by previous investigators (Grand et al., 1977). The implications of this for the arousal model are unclear. The diversity of arousal measures and their poor intercorrelations (Zuckerman, 1976) may mean that the rather global "arousal" concept will need to be further refined. More likely candidates for such future research would be measures of a more physiological type; G.S.R., heart rate and pupil dilation seem useful first choices. The results from comparative research suggests that analysis of body-focused movements in relation to adrenocortical activity through the measurement of circulating hormones, either by analysis of blood samples or through urinary excretion, might produce some interesting insights about longer-term relationships between inferred motivational states and body-focused movements. Could it be, for example, that body-focused movement frequencies are being influenced by temporally remote events which can not easily be detected using simple questionnaire procedures?

3. An Affective "Communication" Model.

It has not been the purpose of these experiments to investigate body-focused movements as a communication device. These studies have largely been concerned with the production (encoding) of body-focused movements rather than how they are perceived (decoding). Certainly the subjects do not intentionally produce body-focused movements in the sense that they are unable to report their behaviour nor its intended communicative intent. In any case it is possible that the reasons for producing a movement and the inferences drawn by decoders could be quite different.

Certainly the observations that body-focused movements appear to be influenced by a wide variety of situational and task changes, and that these influences can vary to some extent with the type of hand movement considered, would suggest that accurate decoding by observers from such complex material would require an elaborate and flexible set of decoding rules. While there have been reports indicating the importance of body-focused movement performance for the evaluation of an interactants motivational state (Raskin, 1962; Waxer, 1977) these studies have not gone beyond an association of body-focused movement production and anxiety in single settings. Without further decoding studies across a variety of settings the wider ranging implications of body-focused movement as a channel of affective communication must remain speculation.

4. The Disinhibition Model.

The simplicity of the Disinhibition model together with its superficial plausibility for a range of both human and animal studies requires that this model be examined closely in the light of the preceding results. The consequence of such an analysis is not generally favorable for this model.

The disinhibition model proposes that body-focused movements are low priority behaviours which emerge when the circumstances allow. Thus scratching the chin may normally be inhibited while one is talking, but might be engaged in during a pause while other behaviour is momentarily suspended. This plausible notion does not fit well with all the evidence.

Firstly, the body-focused movement observed could not always or even usually be described as ordinary low priority behaviours. The most common behaviour for the experimental subjects was Finger-to-hand. While some of these movements (a small minority) did resemble hand cleaning or scratching movements, such as might have resulted from peripheral skin stimulation, more commonly these movements involved twisting, rotating and pulling motions which appeared to perform no such skin cleansing or scratching function. The Indirect movements display this even more clearly. Despite their association with Finger-to-hand and Discrete movements irrelevant object-manipulations were clearly not always normal low priority behaviours. Subjects were observed to manipulate bus-passes almost to the point of destruction. Lecture theatre patrons were observed to regularly twist and turn pens or other objects in ways that did not seem to have an obvious purpose. Clearly the notion that body-focused movements are merely misplaced behaviours which arise as a consequence of the blocking of more important responses will simply not explain the observations.

Secondly, the disinhibition model emphasizes the importance of response conflict. Most animal instances of displacement activities have been observed in contexts in which tendencies to perform two contradictory tasks are maximal (Zeigler, 1964). The Stroop task seems an ideal circumstance in which to observe an analogous situation for human subjects. The difficulty of the Colour Confusion Card resides in the requirement on the subjects to inhibit an overlearned response. Thus response conflicts are characteristic of the Stroop task. The frequency of body-focused movements for the Stroop task did not exceed that for a Monologue, nor generally that for its Colour Naming control. Again the predictions of the disinhibition model have not been supported.

Despite its great appeal the disinhibition model appears to fail completely to predict either the form or the eliciting circumstances which are associated with human body-focused movement production.

5. The Attention Model.

In recent years the main addition to the literature concerning body-focused movement has been the growing interest in the idea that body-focused movement may provide an insight into the performers information processes activities. It was with these concepts in mind that many of the experiments described in the preceding chapters were considered.

As discussed above, the evidence for an attention model is heavily based on indirect measures. All of us are intuitively aware that subjects in our culture scratch their chins or heads when engaged in thought. It does not seem implausible that such movements might be associated with these information processing acts. The experiments reported in the preceding chapters attempted to examine the predictions inherent in the Barroso et al. (1978) attention narrowing hypothesis. This suggests that body-focused movements play a role in filtering out distraction. If this is so then a demonstration of this relationship should be fairly straight-forward. Circumstances that are characterized by high levels of distraction should have high levels of at least some types of body-focused movements. Established measures of attention focusing should correlate with the frequencies of at least some types of body-focused movements.

In the experiments of Chapter 2 a correlational approach was used. A reaction-time probe procedure was employed to measure attention focussing. No significant correlation between any measure of body-focused movement and the reaction-time probe measure was observed.

A second attempt was made to test this hypothesis through the use a directly experimental approach. That is, the level of secondary distraction, which the subjects experienced while they engaged in the primary task, was experimentally manipulated. The distraction levels employed varied in nature and extent. Subjects performing the extremely simple Stroop Colour Naming Control task produced essentially identical body-focused movement frequencies, regardless of the measure employed, to those engaged in the highly distracting Stroop Colour Confusion task, even when this task was combined with a difficult secondary distractor. These differences in distraction level must surely approach the limits that could possibly be achieved.

The field studies, while primarily designed to investigate cross-cultural consistencies, incorporated a setting which appeared to involve the sort of listening task which has been associated by some authors with attentional demands and body-focused movement changes (Freedman, Barroso, Bucci, & Grand, 1978). Examination of the Total body-focused movement frequencies did show that relatively high frequencies were associated with the Lecture listening setting. However, the attentionally undemanding task of sitting waiting at a bus stop produced essentially the same body-focused movement frequencies. As the Lecture and Bus stop settings were essentially similar in their stressfulness rating but differed greatly on the concentration measure these results provide no support for an attention model as a useful predictor of body-focused movements in these public settings.

As has been previously noted, Hand-to-head movements were higher in frequency in the field observations of adults than they were for the experimental studies of children. More particularly the Lecture setting appeared to be associated with relatively high frequencies of this category of Direct body-focused behaviour. As neither Finger-to-hand nor Indirect movement show this tendency an explanation in terms of the physical structure of the furniture and the task requirements seems unlikely.

Attempting to explain this high frequency of Hand-to-head behaviour by reference to attention narrowing is contraindicated by the findings of Experiments 1 to 5. All of these show that no association exists between distraction and body-focused movement. In particular the Direct body-focused movement frequencies (which would include any Hand-to-head behaviours that lasted beyond 3 sec.) were the least responsive to distraction level changes. Similarly the Discrete movements (which would include all the brief Hand-to-head behaviours) behaved just like the Finger-to-hand and Indirect categories in displaying no relationship with distraction.

Perhaps the youth of the subjects in the experimental settings was the reason for the differences in Hand-to-head frequencies between the experimental tasks and the field settings. If this is so then the same applies to the Barroso et al. (1978) study, which used children of essentially identical age, and which is the most compelling evidence to date for the attention model.

It is clear that Hand-to-head behaviour, Direct and to a lesser extent Discrete movements have some properties different from those of Finger-to-hand and Indirect movements, which together made up most of the body-focused movements observed.

While the Hand-to-head, Direct and Discrete scores have been singled out here for special consideration, it should be noted that all in fact displayed the association with high arousal that the arousal model suggests for body-focused movements in general. For example Hand-to-head movements showed a significant difference in frequency between the relatively high and low stress level settings in Experiment 7. The Discrete scores showed similar setting differences to those for the Finger-to-hand and Indirect categories. Even the Hand-to-body movements, which were generally the least responsive to changes in task or setting, were significantly more frequent for the higher stress settings when all the field populations were considered together.

The suggestion of a number of authors that there are differences between body-focused movement types in their covariation with setting and task demands is supported by this data. Further, that this secondary influence (or influences) might have something to do with information processing can not be discounted at this stage. However an attention narrowing or distraction filtering model does not seem to have predictive value.

The majority of body-focused movements appear to be related to arousal processes. The form of these movements however does appear to vary with factors other than arousal.

The observation by such investigators as Wild et al. (1983) that body-focused movement differences can be produced by setting changes which appear to have nothing at all to do with either arousal or attention remains valid. These types of setting provide useful prospects for future researchers to probe further into the factors which underlie body-focused movement production. Perhaps the most immediately productive avenue to explore is to attempt to refine the vague "arousal" concept so that a more specific model can be developed which might help explain some of these anomalous observations.

Summary of Conclusions

1. While individuals display some consistency in their tendency to produce body-focused movements this varies substantially with the setting.
2. Personality correlations with body-focused movements appear to have little stability and vary substantially with the setting. In particular self-reports of anxiety and speech disfluency measures do not seem to predict body-focused movement occurrence.
3. People in Western Europe, Australia and England produce grossly similar forms and frequencies of body-focused movements in similar settings. Setting and task influences on body-focused movements were essentially the same for each city group examined. However, there were significant differences in the frequency of body-focused movements associated with differences in the subjects' cultural background.
4. An attention narrowing or distraction filtering hypothesis can not explain the circumstances in which body-focused movements generally occur, nor does it predict the form of such movements.
5. All the categories of body-focused movement examined showed some tendency to increase under stressful or anxiety producing circumstances. The sensitivity of the different types of movement to changes in the setting differed markedly.
6. Subjects in the field settings displayed some quantitative and qualitative differences in behaviour from the child subjects in the experimental settings. In particular the frequency of Hand-to-head behaviours was higher for the field observations. There

is not a clear-cut explanation for these differences.

7. There was some limited evidence that the form of body-focused movement displayed in the field settings was sensitive to factors which may have had some association with information processing requirements.

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Appendix 1

Photograph of Reaction Time Device Employed in Experiments 1,2 & 3

Appendix 2

Self-Rating Questionnaire Forms

How did you feel when you were doing the Mental Arithmetic problems?

1	2	3	4	5	6	7	8	9	10

Happy — Unhappy

1	2	3	4	5	6	7	8	9	10

Not nervous — Nervous

1	2	3	4	5	6	7	8	9	10

Confident — Not Confident

1	2	3	4	5	6	7	8	9	10

Calm — Excited

1	2	3	4	5	6	7	8	9	10

Not worried — Worried

How did you feel when you were giving your talk?

1	2	3	4	5	6	7	8	9	10

Happy — Unhappy

1	2	3	4	5	6	7	8	9	10

Not nervous — Nervous

1	2	3	4	5	6	7	8	9	10

Confident — Not Confident

1	2	3	4	5	6	7	8	9	10

Calm — Excited

1	2	3	4	5	6	7	8	9	10

Not worried — Worried

Appendix 3

Comfort and Difficulty Questionnaires

Employed in Experiment 4

How comfortable or uncomfortable were the sounds?

|____|____|____|____|____|____|____|____|____|
1 2 3 4 5 6 7 8 9 10

Uncomfortable ... Comfortable

How difficult was the task?

|____|____|____|____|____|____|____|____|____|
1 2 3 4 5 6 7 8 9 10

Very easy ... Very difficult

Appendix 4

Environmental Setting Survey Forms

Employed in Experiment 6.

Please indicate which of the following settings you believe is the MOST STRESSFULL by placing a 1 next to it. Please continue by indicating the second most stressfull setting with a 2 and so on until you reach 15.

.... A. Reading in the library.

.... B. Waiting at a bus stop in North Terrace.

.... C. The racetrack stands during a race.

.... D. The departure lounge at the Adelaide domestic airport.

.... E. Cafeteria serving line.

.... F. Strolling in Rundle Mall.

.... G. Dentists waiting room.

.... H. Listening to a lecture.

.... I. Maternity ward at the hospital.

.... J. The racetrack stands after a race.

.... K. Sitting on benches at the zoo.

.... L. Presenting a lecture or talk.

.... M. Waiting in a cinema lobby before a performance.

.... N. Waiting in the Accident and Emergency waiting room at the hospital.

.... O. Supermarket check-out queue.

THANK YOU.

Please indicate which of the following settings you believe is the <u>ONE THAT REQUIRES THE MOST CONCENTRATION</u> by placing a 1 next to it. Please continue by indicating the setting that requires the second highest level of concentration with a 2 and so on until you reach 15.

.... A. Reading in the library.

.... B. Waiting at a bus stop in North Terrace.

.... C. The racetrack stands during a race.

.... D. The departure lounge at the Adelaide domestic airport.

.... E. Cafeteria serving line.

.... F. Strolling in Rundle Mall.

.... G. Dentists waiting room.

.... H. Listening to a lecture.

.... I. Maternity ward at the hospital.

.... J. The racetrack stands after a race.

.... K. Sitting on benches at the zoo.

.... L. Presenting a lecture or talk.

.... M. Waiting in a cinema lobby before a performance.

.... N. Waiting in the Accident and Emergency waiting room at the hospital.

.... O. Supermarket check-out queue.

THANK YOU.

Appendix 5

Basic and Machine Code Programs Employed in Conjunction with the Epson PX-8 Microcomputer in Experiment 7.

Input

A program to record key presses and the associated clock time. The program requires that the Epson be configured with a 15k ram disk.

```
5 STOP KEY OFF
8 PRINT CHR$(27);CHR$(247);CHR$(4):REM LOCKS CAPS LOCK
9 PRINT CHR$(27);CHR$(240);CHR$(0):REM TURNS OFF KEY REPEAT
  10 CLS
15 ML=PEEK(6)+PEEK(7)*255:ADDR=&HA899
20 CLEAR,ADDR,256:ADDR=&HA89A
30 PRINT "INPUT OR MERGE EXISTING FILES (I) OR TRANSFER A FILE (T)?
   ";:MODE$=INPUT$(1):PRINT MODE$
31 IF MODE$="I" THEN CLS:GOTO 40
32 IF MODE$="T" THEN CLS:GOTO 2100
33 IF MODE$="" THEN 50
34 GOTO 30
40 PRINT "SIMPLE INPUT (I) OR MERGE FILES (M) ";:M8$=INPUT$(1):PRINT
   M8$:IF M8$="" THEN 50
41 IF M8$="I" THEN PRINT "LOADING PLEASE WAIT":GOTO 50
42 IF M8$="M" THEN GOSUB 5000
50 DEF
   FNT=VAL(RIGHT$(TIME$,2))+VAL(MID$(TIME$,4,2))*60
   +VAL(LEFT$(TIME$,2))*3600
60 DURATION=60
70 IF MER$="M" THEN NO=VAL(NO.$):GOTO 100
80 NO=1:NO.$=STR$(NO)
100 FOR J=0 TO 107
110 READ A
```

```
120 POKE &HA89A+J,A

130 NEXT J

200 DATA &HCD,&H09,&HAF,&H32,&H99,&HA8,&HED,&H5B,&H4C,&HA9,&H12

201 DATA
    &h4f,&hcd,&hc,&haf,&h3a,&h4C,&ha9,&hfe,&hff,&h38,&h4,&h21,&h4D,&ha9,
    &h34,&h21,&h4C,&ha9,&h34,&H0E,&H0,&H11,&H0F,&HA9,&HCD,&H4E,&HAF

202 DATA
    &HED,&H5B,&H4C,&HA9,&H3A,&H12,&HA9,&H12,&h3a,&h4C,&ha9,&hfe,&hff,
    &h38,&h04,&h21,&h4D,&ha9,&h34,&H21,&H4C,&HA9,&H34

203 DATA
    &HED,&H5B,&H4C,&HA9,&H3A,&H13,&HA9,&H12,&h3a,&h4C,&ha9,&hfe,&hff,
    &h38,&h04,&h21,&h4D,&ha9,&h34,&H21,&H4C,&HA9,&H34

204 DATA
    &HED,&H5B,&H4C,&HA9,&H3A,&H14,&HA9,&H12,&h3a,&h4C,&ha9,&hfe,&hff,
    &h38,&h04,&h21,&h4D,&ha9,&h34,&H21,&H4C,&HA9,&H34,&HC9

230 HXASC=&HA91A

235 FOR Q=0 TO 39

238 READ Q2

240 POKE &HA91A+Q,Q2

245 NEXT Q

250 SCREEN 1,0,0

252 IF MER$="M" THEN 260

255 CLS:INPUT "FILE NAME: ";FILE$

256 LENGTH=LEN(FILE$):IF LENGTH>7 THEN PRINT "FILE NAME TOO LONG-7
    LETTERS MAX.":GOTO 255

257 PRINT "RAMDISK (D) OR TAPE (T) OUTPUT ";:OUTFILE$=INPUT$(1):PRINT
```

```
    OUTFILE$:IF OUTFILE$<>"D" THEN IF OUTFILE$<>"T" THEN 257
258 IF OUTFILE$="T" THEN FILE$="H:"+FILE$
260 INPUT "LOCATION: ";LOCATION$
270 INPUT "SITE: ";SITE$
275 IF MER$<>"M" THEN 280
276 IF RAMTAPE$="D" THEN FILE$="H:TEMP":GOTO 282
277 IF RAMTAPE$="T" THEN FILE$="TEMP":GOTO 282
280 OPEN "O",#1,FILE$+".OBS"
282 CLS:IF MER$<>"M" THEN 284
283 PRINT "FILE: EXTENDING "FILE4$;" SUB.NO.:"NO.$:GOTO 285
284 PRINT "FILE: ";FILE$;" SUB.NO.:";NO.$
285 PRINT "LOCATION: ";LOCATION$:PRINT "SITE: ";SITE$
290 PRINT "(RETURN ON GENDER TO QUIT)"
295 INPUT "GENDER (M=1): ";SEX$
296 IF SEX$="ABORT" THEN 6000
300 IF SEX$="" THEN INPUT "DO YOU WISH TO END SESSION?";Q$:IF Q$="Y"
    THEN 2000
301 IF SEX$="" THEN IF Q$<>"N" THEN BEEP:GOTO 295
302 IF SEX$="" THEN IF Q$="N" THEN 310
305 IF SEX$="1" THEN 310
306 IF SEX$="2" THEN 310
307 BEEP:GOTO 295
310 INPUT "AGE: ";AGE$
312 IF VAL(AGE$)>9 THEN BEEP:GOTO 310
313 IF VAL(AGE$)<1 THEN BEEP:GOTO 310
320 INPUT "SMOKING/NON (S=1): ";SMOKE$
321 IF SMOKE$="1" THEN 330
```

```
322 IF SMOKE$="2" THEN 330
323 IF SMOKE$="" THEN 330
324 BEEP:GOTO 320
330 INPUT "ALONE/GROUP (A=1): ";GROUP$
331 IF GROUP$="1" THEN 500
332 IF GROUP$="2" THEN 500
333 IF GROUP$="" THEN 500
334 BEEP:GOTO 330
500 PRINT "PRESS THE <\> KEY TO START
510 I$=INKEY$:IF I$="\" THEN 590
520 IF I$="" THEN 510
525 IF I$<>"D" THEN BEEP:GOTO 500
530 INPUT "DURATION: ";DURATION
570 GOTO 500
590 POKE &HA94B,DURATION
600 START$=DATE$+","+TIME$
601 START=FNT
604 POKE &HA94C,&H4E
605 POKE &HA94D,&HA9
610 CALL ADDR
615 IF (DURATION+START)<=FNT THEN 640
620 IF PEEK(&HA899)=47 THEN 282
630 GOTO 610
640 BEEP 15:Z=&HA94E
750 DATA &H3A,&H44,&HA9,&H47,&HE6,&HOF,&HC6,&H30,&HFE,&H3A,&HFA,&H29,
    &HA9,&HC6,&H7,&H32,&H42,&HA9,&H78,&HCB,&H3F,&HCB,&H3F,&HCB,&H3F,
```

```
    &HCB,&H3F,&HC6,&H30,&HFE,&H3A,&HFA,&H3E,&HA9,&HC6,&H7,&H32,&H43,
    &HA9,&HC9
810 E1$=HEX$(PEEK(&HA94D)):E2$=HEX$(PEEK(&HA94C)):E3$=E1$+E2$:
    E=VAL("&H"+E3$)
815 N=E-Z-1
890 DURATION$=STR$(DURATION)
900 PRINT#1,LOCATION$;",";SITE$;",";NO.$;",";DURATION$;",";START$;",";
    SEX$;",";AGE$;",";SMOKE$;",";GROUP$;",";
910 WHEN$=RIGHT$(START$,8):
    W=VAL(RIGHT$(WHEN$,2))+VAL(MID$(WHEN$,4,2))*60
    +VAL(LEFT$(WHEN$,2))*3600
1000 FOR I=0 TO N-4 STEP 4
1010 FOR J=0 TO 3
1020 A(J)=PEEK(&HA94E+I+J)
1030 NEXT J
1040 A$(0)=CHR$(A(0))
1050 FOR J=1 TO 3
1060 POKE &HA944,A(J)
1070 CALL HXASC
1080 B$=CHR$(PEEK(&HA943)):C$=CHR$(PEEK(&HA942))
1090 A$(J)=B$+C$
1100 NEXT J
1120 W1=VAL(A$(1))*3600+VAL(A$(2))*60+VAL(A$(3))-W:W1$=STR$(W1)
1130 PRINT #1,A$(0);",";W1$;",";
1320 NEXT I
1325 PRINT#1,CHR$(38);",";CHR$(38);",";
1330 NO=NO+1:NO.$=STR$(NO)
```

```
1340 BEEP:GOTO 282
2000 PRINT #1,CHR$(42);",";CHR$(42):CLOSE
2002 IF MER$<>"M" THEN 2009
2004 IF RAMTAPE$="D" THEN NAME "H:TEMP" AS
     "H:"+FILE4$+".OBS":FILE$=FILE4$
2005 IF RAMTAPE$="T" THEN FILE4$=FILE5$:NAME "TEMP" AS
     FILE4$+".OBS":FILE$=FILE4$
2006 SCREEN 0,0,1
2007 IF RAMTAPE$="D" THEN PRINT FILE$;" WRITTEN TO TAPE":GOTO 6000
2009 SCREEN 0,0,1
2010 CLS:IF OUTFILE$="D" THEN PRINT FILE$;" WRITTEN TO RAM DISK"
2015 IF OUTFILE$="T" THEN PRINT FILE$;" WRITTEN TO TAPE":GOTO 6000
2020 PRINT "DO YOU WISH TO WRITE THIS FILE TO TAPE?
     (Y/N)";:YES$=INPUT$(1):PRINT YES$:IF YES$="Y" THEN
     TRANS=1:FILE$=FILE$+".OBS":OPEN "I",#1,FILE$:GOTO 2310
2030 IF YES$="N" THEN 6000
2040 GOTO 2020
2100 PRINT "RAM DISK TO TAPE (1) OR TAPE TO RAM DISK (2) ":INPUT
     TRANS:IF TRANS>2 THEN 2100
2120 IF TRANS<1 THEN 2100
2130 IF TRANS=2 THEN 2270
2200 INPUT "FILE (WITH EXTENSION) TO BE LOADED TO TAPE FROM RAM DISK:
     ";FILE$:OPEN "I",#1,FILE$:GOTO 2310
2270 INPUT "FILE (WITH EXTENSION) TO BE LOADED FROM THE TAPE TO RAM
     DISK: ";FILE$:OPEN "I",#1,"H:"+FILE$
2310 IF TRANS=1 THEN OPEN "O",#2,"H:"+FILE$
```

```
2312 IF TRANS=2 THEN OPEN "O",#2,FILE$

2315 IF EOF(1) THEN 2600

2320 INPUT #1,A$

2340 PRINT #2,A$;",";

2350 GOTO 2315

2600 CLOSE

2610 REMOVE

2660 IF TRANS=1 THEN PRINT "FILE ";FILE$;" WRITTEN TO TAPE"

2670 IF TRANS=2 THEN PRINT "FILE ";FILE$;" WRITTEN TO RAM DISK"

3999 GOTO 6000

5000 REM MERGE SUBROUTINE

5005 PRINT "YOU CAN: 1.MERGE TWO EXISTING FILES (BOTH IN RAM DISK)"

5010 PRINT "         2.BEGIN APPENDING DATA AT THE END OF AN EXISTING
     FILE "

5020 INPUT B:ON B GOTO 5040,5500

5040 INPUT "NAME OF FILE 1 (NO EXTENSION) ";FILE1$

5050 INPUT "NAME OF FILE 2 (NO EXTENSION) ";FILE2$

5060 INPUT "NAME OF JOINT FILE (NO EXTENSION BUT MUST BE DIFFERENT
FROM EITHER OF THE ABOVE) ";FILE3$

5070 OPEN "I",#2,FILE1$+".OBS"

5080 OPEN "I",#3,FILE2$+".OBS"

5090 OPEN "O",#1,FILE3$+".OBS"

5100 IF EOF(2) THEN 5140

5110 INPUT #2,A$

5120 IF A$=CHR$(42) THEN 5140

5130 PRINT #1,A$;",";

5135 GOTO 5100
```

```
5140 CLOSE #2
5150 IF EOF(3) THEN 5180
5160 INPUT #3,A$
5170 PRINT #1,A$;",";
5175 GOTO 5150
5180 CLOSE
5190 PRINT "MERGED FILE ";FILE3$;" HAS BEEN CREATED FROM ";FILE1$;"
     AND ";FILE2$
5200 RETURN
5500 PRINT:INPUT "TO WHICH FILE TO YOU WISH TO APPEND YOUR INPUT (NO
     EXTENSION) ";FILE4$
5502 PRINT "IS THIS A RAM DISK (D) OR TAPE FILE (T)?
     ";:RAMTAPE$=INPUT$(1):PRINT RAMTAPE$:IF RAMTAPE$<>"D" THEN IF
     RAMTAPE$<>"T" THEN 5502
5503 IF RAMTAPE$="D" THEN 5510
5504 IF RAMTAPE$="T" THEN FILE5$=FILE4$:FILE4$="H:"+FILE4$
5510 OPEN "I",#2,FILE4$+".OBS"
5520 IF RAMTAPE$="D" THEN OPEN "O",#1,"H:TEMP"
5525 IF RAMTAPE$="T" THEN OPEN "O",#1,"TEMP"
5530 INPUT #2,A$
5535 IF A$=CHR$(38) THEN COUNT=COUNT+1
5540 IF A$=CHR$(42) THEN 5600
5550 PRINT #1,A$
5560 GOTO 5530
5600 CLOSE #2
5610 NO.$=STR$(COUNT/2+1)
```

```
5700 IF RAMTAPE$="D" THEN KILL "A:"+FILE4$+".OBS"

5710 MER$="M"

5720 GOTO 50

6000 STOP KEY ON:PRINT CHR$(27);CHR$(240);CHR$(1):END
```

Analysis

A program to take the output of the preceding program and compute the percentage of the total time occupied by each of the behaviour categories for each subject.

```
60 DIM A$(200,2):DIM CODE$(24,2)
70 CLS:PRINT:PRINT TAB(10);"1.LIST FILE CONTENTS":PRINT
   TAB(10);"2.ANALYZE DATA AND SAVE TO FILE":PRINT TAB(10);"3.EXIT"
75 MODE$=INPUT$(1):MODE=VAL(MODE$):IF MODE>5 GOTO 70
76 IF MODE<=0 THEN 70
77 FILEN=FILEN+1
78 IF FILEN>1 THEN RETURN
80 ON MODE GOTO 100,300,3740
90 RETURN
100 REM PRINT DATA CONTROL SECTION
110 GOSUB 1000
117 IF LOCATION$=CHR$(42) THEN LOCATION$="":SITE$="":GOTO 3600
120 GOSUB 1400
130 GOSUB 1090
140 IF LOCATION$=CHR$(42) THEN 3600
150 GOTO 120
300 REM ANALYSIS WITH FILE OUTPUT
305 CLS:PRINT:PRINT:PRINT TAB(10);"DO YOU WISH TO WRITE THE OUTPUT TO
    AN OUTPUT FILE ";:ANS$=INPUT$(1):PRINT ANS$:IF ANS$<>"Y" THEN IF
    ANS$<>"N" THEN 305
306 IF ANS$="N" THEN 315
307 PRINT:PRINT TAB(10);"WHAT DO YOU WISH TO CALL THE OUTPUT FILE
    ";:INPUT FOUT$:PRINT:PRINT TAB(10);"WRITE TO RAMDISK (D)
```

```
    OR TAPE (T) ";
308 D5$=INPUT$(1):PRINT D5$:IF D5$="D" THEN FOUT$="A:"+FOUT$+".OUT"
309 IF D5$="T" THEN FOUT$="H:"+FOUT$+".OUT"
310 OPEN "O",#2,FOUT$
315 GOSUB 1000
320 IF LOCATION$=CHR$(48) THEN GOTO 3600
330 GOSUB 1400
340 GOSUB 1990
350 GOSUB 3000
390 GOSUB 1090
400 IF LOCATION$=CHR$(42) THEN GOTO 3600
410 GOSUB 1400
420 GOSUB 1990
430 GOSUB 3000
440 GOTO 390
999 REM FILE INPUT SUB
1000 CLS:PRINT:PRINT TAB(10);:INPUT "NAME OF INPUT FILE (NO
     EXTENSION): ";FILE$:FILE$=FILE$+".OBS"
1010 PRINT TAB(10) "SOURCE OF FILE-DISK(D) OR TAPE(T)
     ";:D$=INPUT$(1):PRINT D$
1020 IF D$="D" THEN FILE$="A:"+FILE$:GOTO 1050
1030 IF D$="T" THEN FILE$="H:"+FILE$:GOTO 1050
1040 GOTO 1010
1050 PRINT:PRINT:PRINT "IS THIS FILE'S DURATION RECORD IN SECONDS (S)
     OR MINUTES (M)?";:SECMIN$=INPUT$(1):PRINT SECMIN$:IF SECMIN$ <>"S"
     THEN IF SECMIN$ <>"M" THEN 1050
```

```
1080 OPEN "I",#1,FILE$

1090 INPUT #1,LOCATION$,SITE$:IF LOCATION$=CHR$(42) THEN RETURN

1100 INPUT#1,NO.$,DURATION$,SDATE$,STIME$,SEX$,AGE$,SMOKE$,GROUP$

1110 N=0

1120 I=1

1130 INPUT#1,A$(I,1),A$(I,2)

1140 IF A$(I,1)=CHR$(38) THEN RETURN

1150 N=N+1

1160 I=I+1 :GOTO 1130

1196 PRINT "N="N

1400 REM RAW DATA OUTPUT SUB:CLS

1401 CLS

1500 PRINT "RAW DATA FOR SUBJ. NO. ";NO.$

1510 PRINT "LOCATION:";LOCATION$;TAB(20);"SITE:";SITE$

1520 PRINT "DURATION:"DURATION$

1530 PRINT
    "AGE:";AGE$;TAB(15);"GENDER:";TAB(30);SEX$;TAB(45);"SMOKE:";
     SMOKE$;TAB(60);"GROUP?:";GROUP$

1540 FOR P=1 TO 400:REM PAUSE

1541 NEXT P

1545 PRINT:PRINT TAB(5);"CHARACTER";TAB(18);"TIME OF ONSET FROM START"

1550 FOR I=1 TO N

1560 IF A$(I,1)=CHR$(28) THEN PRINT TAB(10);CHR$(45);CHR$(62);:GOTO
     1590

1570 IF A$(I,1)=CHR$(29) THEN PRINT TAB(10);CHR$(60);CHR$(45);:GOTO
     1590

1580 IF A$(I,1)=CHR$(31) THEN PRINT TAB(10);CHR$(156);:GOTO 1590
```

```
1581 IF A$(I,1)=CHR$(30) THEN PRINT TAB(10);CHR$(155);:GOTO 1590
1582 IF A$(I,1)=CHR$(26) THEN PRINT TAB(10);CHR$(94);CHR$(90);:GOTO
     1590
1585 PRINT TAB(10);A$(I,1);
1590 PRINT TAB(20);A$(I,2):PRINT
1600 NEXT I
1610 RETURN
1990 REM DURATION SUB
1992 J=0
1995 IF SECMIN$="M" THEN DURATION$=STR$(VAL(DURATION$)*60)
2000 FOR I= 1 TO N
2010 IF J=N GOTO 2050
2020 J=I+1
2030 T=VAL(A$(J,2))-VAL(A$(I,2))
2040 GOTO 2060
2050 T=VAL(DURATION$)-VAL(A$(I,2))
2060 IF T=0 THEN T=1
2070 A$(I,2)=STR$(T)
2080 NEXT I
2110 PRINT TAB(6);"CHARACTER";TAB(22);"DURATION(SEC)"
2120 FOR I=1 TO N
2130 IF A$(I,1)=CHR$(28) THEN PRINT TAB(10);CHR$(45);CHR$(62);:GOTO
     2170
2140 IF A$(I,1)=CHR$(29) THEN PRINT TAB(10);CHR$(60);CHR$(45);:GOTO
     2170
2150 IF A$(I,1)=CHR$(31) THEN PRINT TAB(10);CHR$(156);:GOTO 2170
```

```
2151 IF A$(I,1)=CHR$(30) THEN PRINT TAB(10);CHR$(155);:GOTO 2170
2152 IF A$(I,1)=CHR$(26) THEN PRINT TAB(10);CHR$(94);CHR$(90);:GOTO
     2170
2160 PRINT TAB(10);A$(I,1);
2170 PRINT TAB(25);A$(I,2):PRINT
2180 NEXT I
2190 J=1
2200 RETURN
3000 REM ANALTSIS SUBROUTINE FOR TWO BODY FOCUSED MOVEMENT DATA
3005 PRINT:PRINT:PRINT TAB(29);"TOTAL";TAB(53);"DISCRETE"
3010 PRINT
     TAB(24);"FREQ";TAB(31);"DUR(PERCENT)";TAB(49);"FREQ";TAB(58);
     "DUR(PERCENT)"
3040 DATA 15
3050 READ NC
3060 GOSUB 3350
3065 IF ANS$="Y" THEN
     PRINT#2,CHR$(13);NO.$;",";LOCATION$;",";SITE$;",";DURATION$;
     ",";AGE$;",";SEX$;",";SMOKE$;",";GROUP$;",";SDATE$;",";STIME$;
     ",";:PRINT CHR$(13)
3070 FOR I=1 TO NC
3080 FOR J=1 TO N-1
3100 IF A$(J,1)+A$(J+1,1)=CODE$(I,1) THEN 3110 ELSE 3200
3110 IF VAL(A$(J,2))=1 THEN A$(J,2)=STR$(0)
3115 DIS=VAL(A$(J,2))+VAL(A$(J+1,2)):IF DIS<3 THEN
     STTD=STTD+DIS:SFREQD=SFREQD+1
3120 STT=STT+DIS
```

```
3130 SFREQ=SFREQ+1
3200 NEXT J
3210 STTPER#=(STT/VAL(DURATION$))*100:STTPER#=STTPER#*100:
     STTPER#=CINT(STTPER#):STTPER=STTPER#/100
3215 STTDPER#=(STTD/VAL(DURATION$))*100:STTDPER#=STTDPER#*100:
     STTDPER#=CINT(STTDPER#):STTDPER=STTDPER#/100
3230 IF ANS$="N" THEN 3270
3245 PRINT #2,STR$(SFREQ);",";STR$(STTPER);",";STR$(SFREQD);",";
     STR$(STTDPER);",";
3247 PRINT #2,CHR$(13);
3260 PRINT
3270 REM
3272 PRINT TAB(2);"CHARACTER PAIR ";CODE$(I,2);
3273 PRINT TAB(25);STR$(SFREQ);TAB(35);STR$(STTPER);TAB(50);
     STR$(SFREQD);TAB(60);STR$(STTDPER)
3300 SFREQT=SFREQT+SFREQ:SFREQDT=SFREQDT+SFREQD:
     STTPERT=STTPERT+STTPER:STTDPERT=STTDPERT+STTDPER:SFREQ=0:
     SFREQD=0:STT=0:STTD=0
3310 NEXT I
3315 RESTORE
3320 RETURN
3350 CODE$(1,1)="A"+CHR$(28):CODE$(1,2)="AR"
3360 CODE$(2,1)="A"+CHR$(29):CODE$(2,2)="AL"
3370 CODE$(3,1)="A"+CHR$(31):CODE$(3,2)="AB"
3380 CODE$(4,1)="E"+CHR$(28):CODE$(4,2)="ER"
3390 CODE$(5,1)="E"+CHR$(29):CODE$(5,2)="EL"
```

```
3400 CODE$(6,1)="E"+CHR$(31):CODE$(6,2)="EB"
3410 CODE$(7,1)="T"+CHR$(28):CODE$(7,2)="TR"
3420 CODE$(8,1)="T"+CHR$(29):CODE$(8,2)="TL"
3430 CODE$(9,1)="T"+CHR$(31):CODE$(9,2)="TB"
3440 CODE$(10,1)="H"+CHR$(28):CODE$(10,2)="HR"
3450 CODE$(11,1)="H"+CHR$(29):CODE$(11,2)="HL"
3460 CODE$(12,1)="H"+CHR$(31):CODE$(12,2)="HB"
3530 CODE$(13,1)="@"+CHR$(28):CODE$(13,2)="@R"
3540 CODE$(14,1)="@"+CHR$(29):CODE$(14,2)="@L"
3550 CODE$(15,1)="@"+CHR$(31):CODE$(15,2)="@B"
3590 RETURN
3600 REM MORE THAN ONE INPUT FILE ROUTINE FROM OUTPUT FILE ROUTINE
3610 CLOSE #1
3620 PRINT "ANOTHER INPUT FILE?":YES$=INPUT$(1):IF YES$="N" THEN 3710
3630 IF YES$<>"Y" GOTO 3620
3640 INPUT "NAME ";FILE$
3650 INPUT "DISK (D) OR TAPE (T) ";D9$:IF D9$="D" THEN
     FILE$="A:"+FILE$+".OBS":GOTO 3680
3660 IF D9$="T" THEN FILE$="H:"+FILE$+".OBS":GOTO 3680
3670 GOTO 3650
3680 OPEN "I",#1,FILE$
3690 GOSUB 70
3700 ON MODE GOTO 120,390,3710
3710 IF ANS$="Y" THEN PRINT #2,CHR$(42);",";CHR$(42)
3720 CLOSE:IF ANS$="YES" THEN IF D5$="T" THEN REMOVE
3730 FILEN=0:GOTO 70
3740 CLS:END
```

Appendix 6

The Locations and Dates for Each of the Field Observations of Experiment 7.

Adelaide

Hospital

Date	Location	No. of Subjects
11/7/85	Flinders Medical Centre	2
12/7/85	" " "	17
13/7/85	" " "	20
14/7/85	" " "	11
14/7/85	Royal Adelaide Hospital Casualty	5
14/7/85	Flinders Medical Centre	15
15/7/85	" " "	14
16/7/85	" " "	18
20/7/85	" " "	12

Bus Stop

Date	Location	No.
10/7/85	North Terrace Bus Stop	12
11/7/85	" " " "	15
12/7/85	" " " "	33
13/7/85	" " " "	46
14/7/85	" " " "	3

Zoo

Date	Location	No.
14/7/85	Adelaide Zoological Gardens	54
17/7/85	" " "	23
18/7/85	" " "	9
21/7/85	" " "	36

Street

Date	Location	No.
12/7/85	Rundle Mall	17
13/7/85	" "	37
15/7/85	" "	11
16/5/85	" "	16
17/5/85	" "	32

Lecture

Date	Location	No.
10/5/85	South Australian College	13
10/5/85	University of Adelaide	14
11/5/85	South Australian College	9
11/5/85	University of Adelaide	10
12/5/85	South Australian College	10
15/5/85	" " "	11
16/5/85	" " "	25
17/5/85	University of Adelaide	6
19/5/85	" " "	11

Munich

Hospital

Date	Location	No.
12/8/85	Klinikum Grosshadern - Munich	69
13/8/85	" " "	37

Bus Stop

Date	Location	No.
8/8/85	Bus Stop at Westpark train station	2
9/8/85	Strassenbahn Halt Wla Outside Hauptbahnhof	101

Zoo

Date	Location	No.
5/8/85	Munich Tiergarten Hellabrun.	105

Street

Date	Location	No.
8/8/85	Neuhauser Strasse	106

Lecture

Date	Location	No.
16/10/85	Ludwig-Maximilians Universitaet	34
17/10/85	" " "	20
25/11/85	" " "	84

Brussels

Hospital

Date	Location	No.
10/9/85	Clinique St.-Luc	21
18/9/85	" "	45
23/9/85	" "	33
27/9/85	" "	24

Bus Stop

Date	Location	No.
13/9/85	Tram stop at Place Louise.	107

Zoo

Date	Location	No.
12/9/85	Planckendael Zoo near Brussels	111

Street

Date	Location	No.
11/9/85	Place Monnaie-outside Theatre Royal.	110

Lecture

Date	Location	No.
23/9/85	Universitat Catholique de Louvain au Woluwe	69
27/9/85	" " " " " "	9
2/10/85	" " " " " "	28

Antwerp

Hospital

Date	Location	No.
4/10/85	Academisch Ziekenhuis Antwerpen	18
9/10/85	Algemeen Ziekenhuis Middlheim	92

Bus Stop

Date	Location	No.
30/9/85	Bus terminus in Rooseveldtplatt	102

Zoo

Date	Location	No.
22/9/85	Antwerpen Zoo	105

Street

Date	Location	No.
30/9/85	Wapper square off Meir	105

Lecture

Date	Location	No.
4/10/85	Univ. of Antwerpen	114

Rome

Hospital

Date	Location	No.
18/11/85	Ospediali San Camillo	106

Bus Stop

Date	Location	No.
29/10/85	Tram Stop in Via Tiburtina	34
4/11/85	" " " " "	24
14/11/85	" " " " "	65

Zoo

Date	Location	No.
27/10/85	Rome Zoo	107

Street

Date	Location	No.
4/11/85	Park in Via Tiburtina	24
12/11/85	" " " "	79

Lecture

Date	Location	No.
4/11/85	University of Rome	24
14/11/85	" " "	43
15/11/85	" " "	35

Paris

Hospital

Date	Location	No.
5/12/85	Centre Hopital de Gonesse	49
6/12/85	" " " "	54

Bus Stop

Date	Location	No.
29/11/85	Bus Stop in Rue du St. Denis	103

Zoo

Date	Location	No.
1/12/85	Paris Zoo	104

Street

Date	Location	No.
2/12/85	Place George Berry	103

Lecture

Date	Location	No.
28/11/85	University of Paris	103

Sheffield (and London Zoo)

Hospital

Date	Location	No.
31/12/85	Royal Hallamshire Hospital	88
31/12/85	Children's Hospital	15

Bus Stop

Date	Location	No.
27/12/85	Bus stop in Charter Row	18
27/12/85	Bus stop in Waingate	34
27/12/85	Central Bus Station	40
8/1/86	Bus stop at The Moor shopping mall	11

Zoo

Date	Location	No.
4/1/86	London Zoo	105

Street

Date	Location	No.
23/12/85	The Moors shopping mall	105

Lecture

Date	Location	No.
13/12/85	University of Sheffield	50
9/1/86	" " "	3
10/1/86	Sheffield Polytechnic	48