Family Environmental Influences on Girls’ Physical Activity

by

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Submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

Deakin University

July 2014
I am the author of the thesis entitled

‘Family Environmental Influences on Girls' Physical Activity’

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Firstly I would like to thank all the teachers, adolescent girls and parents who so kindly donated their time to be part of the various research projects in this PhD. None of this would have been possible without your generous assistance, insights and wisdom.

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Finally, my love and thanks go to my family, in particular Scott, Liam, Campbell and my Mum – I do look forward to spending more time with you once this is finished.
LIST OF PUBLICATIONS & PRESENTATIONS

Publications


Presentations

Saunders, J., Timperio, A., Hume, C., Ball, K., Crawford, D. & Salmon, J. 2006. *Associations between family function and parenting style and adolescents’ organised sport participation*. Late breaking poster presented at the Australasian Society for Behavioural Health and Medicine Annual Scientific Meeting, Auckland. (See Appendix 1)

Saunders, J., Timperio, A., Hume, C. & Salmon, J. 2012. *Cross-sectional and longitudinal associations between parenting style and adolescent girls’ walking and cycling trips*. Oral presentation delivered at the International Society for Behavioral Nutrition and Physical Activity Annual Scientific Meeting, Austin. (See Appendix 2)


Saunders, J., Hume, C., Timperio, A. & Salmon, J. 2011. *How can parents best encourage their daughters to be physically active?* Oral presentation delivered at the International Society for Behavioral Nutrition and Physical Activity Annual Scientific Meeting, Melbourne. (See Appendix 5)
Saunders, J., Hume, C., Timperio, A. & Salmon, J. 2011. Parental attitudes towards their daughter’s physical activity. Oral presentation delivered at the Australian Conference of Science and Medicine in Sport, Fremantle. (See Appendix 6)


A lack of physical activity is a significant public health problem, particularly among adolescent girls. The successful promotion of physical activity necessitates a thorough understanding of the vast array of potential influences on physical activity. Numerous individual and physical environmental correlates of physical activity have been identified among adolescent girls, yet correlates within the social environment, and the family environment in particular, are poorly understood.

Parenting styles and practices are aspects of the family environment which have been positively associated with various psychological and cognitive outcomes and are considered to be protective against negative health behaviours such as drug use and consumption of unhealthy diets among children and adolescents. There is, however, little evidence regarding the influence of parenting styles and practices on physical activity.

This thesis examined the relationship between parenting styles, parenting practices and physical activity among adolescent girls. Three studies were conducted to explore the complex relationships between these variables and provide deeper understanding of the influence of physical activity parenting among adolescent girls. The first study was a secondary analysis of cross-sectional and longitudinal data to determine the relationship between global measures of parenting style and physical activity, and the extent to which socio-demographic characteristics moderate these relationships. The second study involved a series of in-depth interviews with adolescent girls and their parents to identify the range of strategies parents implement to support their daughter’s physical activity, which led to the development of items to assess physical activity-specific parenting practices. The third and final study was a cross-sectional study of adolescent girls and their parents to assess the reliability of the newly developed items and determine their association with physical activity.
Results from these studies suggest that parenting styles and practices are cross-sectionally associated with physical activity, and that these relationships differ by socio-demographic characteristics. This thesis also supports the notion that both the broad construct of parenting style, and more specific parenting practices, are important determinants of physical activity among adolescent girls and should be considered in future studies. It is also clear that parents implement a wide variety of strategies, additional to those previously reported in the literature, such as developing an active family culture and encouraging the uptake of physically active part-time employment, in order to encourage physical activity among their daughters, and that these strategies vary by parenting style. Finally, the items developed to assess physical activity parenting in this thesis were found to be reliable, with many of these items consistently moderately to strongly associated with physical activity among adolescent girls.

This thesis clearly demonstrates that physical activity parenting, though complex, makes an important contribution to physical activity among adolescent girls. Further, it provides evidence for the inclusion of specific parenting strategies, tailored to socio-demographic circumstances, in interventions to increase physical activity that target adolescent girls and their families. In addition, this research has led to the development of comprehensive and reliable measures of physical activity parenting which can be used in future research.
A number of terms will be referred to frequently throughout this thesis. Definitions for these terms are listed below:

**Physical activity**: “Bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure” (USDHHS 1996 p. 21).

**Moderate-intensity physical activity (MPA)**: Physical activity requiring approximately 3 to 6 times as much energy as rest (Sallis & Owen 1999), that is 3.0 – 6.0 metabolic equivalents (METs) (Crouter et al. 2006).

**Vigorous-intensity physical activity (VPA)**: Physical activity requiring greater than 6.0 METs (Crouter et al. 2006), often defined as activity that makes you short of breath.

**Physical activity domains**: The setting or context in which physical activity takes place. This includes leisure-time physical activity (LTPA), occupational/school-based physical activity, transport-related physical activity and household physical activity.

**Parenting styles**: The overall emotional climate of the child-parent relationship that sets the tone for parent-child interactions (Steinberg & Silk 2002), generally characterised as one of four types - authoritarian, authoritative, neglectful and indulgent.

**Parenting practices**: Specific attempts or strategies implemented by the parent to socialise the child toward a particular goal– a particular parenting practice may have a very different outcome when implemented within two different parenting styles (Steinberg & Silk 2002).

**Family function**: A global term to describe the interrelationships between family members and the family environment. Components of family functioning include
home environment, parent behaviour and spousal relationships (Poresky & Whitsitt 1985).
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CHAPTER 1: LITERATURE REVIEW

1.1 Introduction

Traditional epidemiology seeks to understand the distribution and determinants of disease frequency in human populations (Hennekens & Buring 1987). Through epidemiological research, physical inactivity has been established as a contributing factor in a number of serious chronic health conditions (Sallis & Owen 1999). In recent decades, the epidemiological evidence supporting the importance of physical activity in the prevention of disease has contributed to an increase in research in this area (USDHHS 1996), much of which uses a behavioural epidemiological approach. A behavioural epidemiological perspective differs from traditional epidemiology in that it seeks to determine the distribution and aetiology of the behaviours which are associated with disease, rather than the disease itself. More specifically, in a physical activity context, behavioural epidemiology seeks to understand who is active, what influences their activity, and how this information can be used to increase activity levels of others (Sallis & Owen 1999).

Using a behavioural epidemiological approach, this chapter aims to build a rationale for the current thesis by reviewing evidence of the benefits of physical activity, the prevalence of activity and inactivity, theoretical approaches used to explain and predict physical activity and correlates of physical activity, with a particular emphasis on those within the family environment.

1.2 Benefits of Physical Activity

1.2.1 Health benefits among adults

Among adults, the health benefits of physical activity are well documented, with numerous studies and reviews showing positive associations between physical

In relation to psychological health, while some studies have demonstrated a cross-sectional association between physical activity and various aspects of mental health (Galper et al. 2006, Goodwin 2003) there is limited evidence of a causal nature (Bauman 2004). Observational studies have demonstrated an inverse association between physical activity and depression (Galper et al. 2006, Iverson & Thordarson 2005), and a positive association between physical activity and general well-being (Galper et al. 2006), while reviews (Teychenne et al. 2008, Mammen & Faulkner 2013) suggests that even low doses of physical activity may offer some protection against depression. Further, physical activity has been used with some success within treatment programs for various mental health conditions, including mild-moderate depression and anxiety (Dunn et al. 2005), and moderate-intensity physical activity has been shown to improve sleep in sedentary older adults (King et al. 1997).

The public health cost of physical inactivity is significant, with the direct health care costs associated with physical inactivity in Australia estimated at $719 million per annum (Medibank Private 2008). These estimates do not include indirect costs such as lost productivity potential or the value of human life, or intangible costs such as costs to individuals and their families due to decreases in quality of life (Medibank Private 2008). In Australia, physical inactivity has been identified as the second leading modifiable cause of ill-health after smoking and the leading modifiable cause of ill-health among women (Mathers et al. 1999). Given the substantial cost to society of physical inactivity, it poses one of the
most significant public health issues associated with modern lifestyles, and is comparable to tobacco use or poor diet in its contribution to ill-health.

### 1.2.2 Health benefits among children

Whilst the body of research into the benefits of physical activity among children is not as extensive as that among adults, there is growing support for the role of physical activity in improving bone health (Biddle et al. 2004, Wang et al. 2005, Janssen & LeBlanc 2010, Okely et al. 2012) and improving CHD risk factors (Saakslahti et al. 2004, Strong et al. 2005, Janssen & LeBlanc 2010, Boreham et al. 2002, Okely et al. 2012). This is particularly important as diseases such as osteoporosis (Bass 2000) and coronary heart disease (McGill et al. 2000) have their origins in childhood. Further, studies have demonstrated a long term protective effect of adolescent physical activity on bone health and breast cancer (Hallal et al. 2006a) and an association between youth physical activity and reduced risk of developing metabolic syndrome in adulthood (Yang et al. 2009).

There is also evidence to suggest that physical activity reduces adiposity among youth (Riddell & Iscoe 2006), although this evidence is somewhat inconsistent. A review of controlled trials among obese youth found that while exercise training did not consistently decrease bodyweight or body mass index (BMI), it led to positive changes in lean body mass and fat (Watts et al. 2005). Similarly, a recent Australian school-based obesity prevention program among adolescent girls demonstrated improvements in body fatness, but not BMI (Dewar et al. 2013), while a cohort study of adolescent girls showed self-reported exercise frequency did not predict obesity onset (Stice et al. 2005). However, the authors suggested that this finding may be attenuated by difficulties in obtaining reliable reports of exercise behaviour prospectively.

In relation to psychological health benefits among children and adolescents, research has shown an association between physical activity and emotional well-being (Biddle et al. 2004, Parfitt & Eston 2005, Okely et al. 2012), enhanced social and moral development (Cavill et al. 2001), body image (Sothern et al. 1999), self-esteem (Parfitt & Eston 2005, Sothern et al. 1999, Cavill et al. 2001,
Kristjansson et al. 2010, Biddle & Asare 2011) and improvements in depression (Janssen & LeBlanc 2010).

Several recent studies have also shown a positive relationship between academic outcomes and physical activity (Kwak et al. 2009, Fox et al. 2010, Reed et al. 2010, Okely et al. 2012). Kwak and colleagues (2009) observed a cross-sectional association between academic achievement and vigorous physical activity in girls, and academic achievement and fitness in boys. Similarly, a cross-sectional study by Fox et al. (2010) found a positive association between physical activity and academic achievement among high school students. This is consistent with a review by Strong and colleagues (2005), which suggests positive associations between physical activity and various components of academic performance such as concentration and memory. In contrast, Coe et al. (2006) found no significant relationship between physical education enrolment and academic achievement, although vigorous activity was positively associated with higher grades. More recently, Rasberry and colleagues’ (2011) review of school-based physical activity and academic performance found positive associations between physical activity and academic performance in approximately half the studies they reviewed, and no demonstrated relationship in the remainder. Further, in their review of prospective studies, Singh and colleagues (2012) noted a positive association between physical activity and academic performance among children, while Tomporowski and colleagues (2008) suggest exercise training programs enhance children’s mental functioning.

Further, Ahamed and colleagues (2007), in their evaluation of a school-based physical activity intervention, found the inclusion of additional physical activity in the school curriculum did not compromise academic performance, while Reed et al. (2010) found the integration of physical activity within elementary school curricula improved components of academic achievement. This is consistent with longitudinal evidence suggesting that increasing students’ physical education or physical activity at school does not result in lower levels of academic achievement, despite a potential reduction in time available for the study of academic material (Shephard 1997).
In conclusion, there is consistent evidence to suggest that health benefits, such as improved bone health, reduced adiposity, improved CVD risk factors and increased emotional well-being, are associated with physical activity in childhood and adolescence. Further, emerging evidence supports the notion that physical activity in childhood and adolescence may provide ongoing health benefits in adulthood.

1.3 Tracking of Physical Activity

Physical activity promotion across the lifespan is based on the assumption that physical activity is an habitual behaviour which tracks over time (Telama 2009). Tracking refers to the tendency of individuals to, over time, maintain their position or rank relative to others within a group (Malina 1996). It is hypothesised that the degree to which physical activity tracks varies according to different transition periods and phases of life (Telama 2009).


During childhood, relatively short studies using maternal report (Hallal et al. 2006b) and objectively measured (Kelly et al. 2007, Nyberg et al. 2009, Raudsepp & Pall 1998) physical activity have shown low to moderate levels of tracking, with those studies using objective measures typically reporting higher levels of tracking in this period (Telama 2009). Similarly, during adolescence, physical activity has been observed to track at low to moderate levels over short periods using both self-report (Baggett et al. 2008, Telama et al. 1996, Aarnio et al. 2002)
and objective (Baggett et al. 2008) measures. During adulthood, physical activity appears to track at a moderate level, particularly among younger males, with levels of tracking decreasing with increasing duration of follow-up (Telama et al. 2005, Kirjonen et al. 2006, Anderssen et al. 1996).

Studies investigating tracking of physical activity in the transition period from childhood to adolescence have found low to moderate levels of tracking with self-report and objective measures (Pate et al. 1999, McMurray et al. 2003, Janz et al. 2000, Kristensen et al. 2008). In a cohort of rural youth in the U.S., self-report measures of physical activity were found to track moderately during late childhood through to early adolescence (Pate et al. 1999). McMurray and colleagues (2003) observed low tracking of physical activity during this period and Janz and colleagues (2000) found that self-reported vigorous activity tracks from childhood to adolescence among both boys and girls. Further, Kristensen and colleagues (2008) found that objectively assessed physical activity tracked moderately from childhood to adolescence, suggesting there is at least some degree of tracking over this transition period.

Tracking studies from childhood and adolescence to adulthood have been less consistent (Matton et al. 2006, Tammelin et al. 2003, Telama et al. 2005, Anderssen et al. 2005). In particular, studies using self-reported sports participation as a measure of physical activity have found mixed results. Matton and colleagues (2006) assessed the stability of physical activity, as measured by sports participation, from adolescence to middle adulthood in a cohort of Flemish females, finding physical activity was not a stable characteristic. Conversely, Tammelin and colleagues (2003) found that frequent participation in sport after school hours (at least once a week among females and twice a week among males) during adolescence was associated with a high level of activity later in life. It is important to note however, that these studies are based on self-reported measures of sports participation, which is not necessarily reflective of total physical activity.

Using more comprehensive measures of physical activity, Telama and colleagues (2005) examined whether persistent physical activity between the ages of 9 and 18...
predicted adult physical activity over a 21-year tracking period. Findings indicated that the probability of being active in adulthood was increased by persistent physical activity at a young age (Telama et al. 2005). Similarly, Anderssen and colleagues (2005) found a weak though significant level of tracking from adolescence to young adulthood. Both studies observed higher levels of tracking among males than females.

Overall, physical activity appears to track at a low to moderate level across the lifespan, particularly in men (Telama 2009) and is higher in studies of shorter duration. From a public health perspective, this has important implications for physical education and encouraging physical activity from an early age. Further, it appears that physical activity promotion among girls may warrant additional focus given physical activity does not track as strongly among this group.

1.4 Physical Activity Recommendations and Guidelines

To assist in providing a consistent public health message, physical activity guidelines specifically for children and adolescents have been developed and adopted by many countries. In Australia, guidelines suggest children and adolescents should accumulate “at least 60 minutes of moderate- to vigorous-intensity physical activity every day” (Australian Government Department of Health 2013). Further, it is recommended that children and adolescents should engage in activities that strengthen muscle and bone on at least three days per week, and should engage in more activity, up to several hours per day, to achieve additional health benefits (Australian Government Department of Health 2013). In addition, it is recommended that children and adolescents “should limit use of electronic media for entertainment (e.g. television, seated electronic games and computer use) to no more than two hours a day” and “break up long periods of sitting as often as possible” (Australian Government Department of Health 2013). Internationally, similar guidelines exist for children and adolescents, with at least one hour a day of physical activity for school-age children and adolescents currently being recommended in the United Kingdom (UK) (Cavill et al. 2001),
the United States (US) (Centres for Disease Control and Prevention 2005) and Canada (Canadian Society for Exercise Physiology 2012).

More recently, Tudor-Locke and colleagues (2011) have translated these time- and intensity-based guidelines into step thresholds, suggesting that among children, these guidelines equate to 13000 to 15000 steps per day for boys and 11000 to 12000 steps per day for girls. Among adolescents, these guidelines equate to approximately 10000 to 11700 steps per day among boys and girls. The authors note, however, that further research is needed to confirm these preliminary recommendations (Tudor-Locke et al. 2011).

There is evidence which suggests, however, that for the prevention of clustering of cardiovascular risk factors, physical activity levels among children and adolescents should be even higher than the recommended levels of at least one hour per day (Andersen et al. 2006). While there is emerging evidence on the extent to which some of these guidelines for children and adolescents are being met (Australian Bureau of Statistics 2013), the assessment of compliance with physical activity guidelines at a population level presents a number of challenges.

1.5 Assessment of Physical Activity

Assessment of physical activity is challenging among children and adolescents (Kohl et al. 2000). The nature of children’s physical activity differs from that of adults, with children’s activity characterised by short bursts of moderate- to vigorous-intensity activity interspersed with longer periods of light activity or inactivity (Bailey et al. 1995), which has implications for physical activity assessment. There are a number of methods for assessing physical activity, each with various advantages and limitations. These include self-report, activity monitors, pedometers, heart rate monitors, direct observation, doubly labelled water and indirect calorimetry (Welk et al. 2000). While some methods such as doubly labelled water and indirect calorimetry provide a measure of energy expenditure, methods such as self-report questionnaires or activity monitors are required to provide information on physical activity behaviour. The choice of
assessment method ultimately depends on the research question (i.e. whether physical activity behaviour or energy expenditure is the focus) and study design. As physical activity rather than energy expenditure is the focus of this thesis, only those measures which directly assess physical activity will be reviewed here.

### 1.5.1 Objective measures

Objective measures include activity monitors, pedometers, heart rate monitors and direct observation. Direct observation is a method often used for assessing physical activity among children. This technique involves an observer recording all physical activity a child or group of children engages in during a particular time period (Kohl et al. 2000), thereby providing quantitative and qualitative or contextual information about physical activity (Welk & Wood 2000). Further, direct observation overcomes a major limitation of self-report measures in that it does not rely on recall (Kohl et al. 2000). However, it is not appropriate for population level physical activity assessment and can be difficult to implement in a wide geographic area and in particular settings (Kohl et al. 2000).

Assessment methods such as heart rate monitors, pedometers and accelerometers have been used with some success among adults (Welk 2002) and children (Trost et al. 1998). Heart rate monitors are lightweight devices with extended data storage capacities which continuously record heart rate (Welk 2002). They are versatile and unobtrusive, providing data on intensity, duration and frequency of physical activity (Welk 2002), and have been used to increase physical activity in children via the provision of feedback (McManus 2008). However, heart rate monitors can be cumbersome for the subject, due to the necessity to have the heart rate monitor secured to the chest (Welk 2002), and their cost may prohibit their use in large-scale epidemiological studies.

Pedometers are cheap, easy to use devices which are worn on the hip and provide data on the number of steps taken by the wearer (McNamara et al. 2010). Some models can also provide a number of additional outputs, such as distance travelled (McNamara et al. 2010). Pedometers are considered a simple and inexpensive option for assessing physical activity among adults (Tudor-Locke et al. 2002b).
and children (McNamara et al. 2010), however are not as appropriate if data on the type of physical activity is sought. Further, Scott and colleagues (2013) note that reactivity and pedometer tampering can be problematic among adolescents.

Accelerometers have increasingly been used to assess physical activity among youth. Accelerometers are small, easy to use devices worn on the hip, which operate by recording movement as counts of activity in real time, which are then extracted for analysis (Kohl et al. 2000). The accelerometer has a low subject burden (Staudenmayer et al. 2012) and is a useful tool for objectively measuring frequency, intensity and duration of activity in a field setting (Treuth et al. 2004, Butte et al. 2012), providing data on patterns of activity and an estimate of energy expenditure (Welk et al. 2000, Butte et al. 2012). As accelerometers capture activity in real time, they are able to detect short bursts of activity which is particularly relevant when assessing physical activity among children. The Actigraph ® has been shown to be a valid tool for measuring energy expenditure and activity levels in children and adolescents, with high correlations (r=0.87) reported between Actigraph counts and energy expenditure when walking and running on treadmills (Trost et al. 1998), and lower correlations (r=0.45-0.81) reported between Actigraph counts and heart rate monitoring or direct observation in free-living conditions (McMurray et al. 2004). Further, the Actigraph ® is the most frequently used accelerometer for physical activity research (McMurray et al. 2004, Yang & Hsu 2010). More recently, wrist worn models are emerging in the literature (Schaefer et al. 2014). While these models show promise in terms of acceptability and compliance, they do provide real-time visual feedback, hence may lead to reactivity (Schaefer et al. 2014).

There are a number of limitations associated with the use of accelerometers, including the cost, the requirement for a specific software interface to download and manage the data, and many models are not waterproof. Accelerometers do not provide data on the type of activity undertaken (Butte et al. 2012), the domain in which it occurred, nor do they adequately capture physical activity in graded or resistance exercise, and are inappropriate measures of cycling (trunk remains stable) (Riddoch et al. 2004). Further, compliance with accelerometers can be problematic among adolescents (Van Coevering et al. 2005). Recently, however,
pattern recognition approaches such as artificial neural networks (ANNs) have been used to predict type of activity from accelerometers (Trost et al. 2012), although this technique is in its infancy. Further, given their utility in measuring physical activity among children and adolescents, accelerometers provide a valid and reliable option for gathering data on frequency, intensity and duration of physical activity. In spite of advances in accelerometer data mining, techniques such as ANNs are still in development; therefore a combination of accelerometers and subjective measures remain the most appropriate techniques for comprehensive physical activity assessment.

1.5.2 Subjective measures

There is concern about the accuracy of self-report data from children, and more information about the cognitive skills required to accurately complete self-reports is needed (Welk et al. 2000). Similarly, proxy-report questionnaires, which rely on the assumption that the parent or teacher providing the proxy report is fully aware of all activity a child has engaged in, have shown mixed results in relation to validity and reliability, hence the need for further research into these measures (Sirard & Pate 2001).

Among older children and adolescents, self-completion of physical activity questionnaires can be less problematic due to their increased cognitive abilities, with a number of reasonably reliable and valid instruments existing, including the 3 Day Physical Activity Recall (Pate et al. 2003), the 7 Day Physical Activity Recall (Sallis et al. 1993), the Leisure Time Exercise Questionnaire (Godin & Shephard 1985) and the International Physical Activity Questionnaire for Adolescents (IPAQ-A) (De Cocker et al. 2011). The IPAQ-A, which has been specifically adapted for adolescents, contains items about housework- and gardening-related physical activity, transport-related physical activity, leisure-time physical activity and physical activity at school, including physical education, walking, moderate and vigorous physical activity (De Cocker et al. 2011). The IPAQ-A was found to be a reasonably valid measure of physical activity when assessed against accelerometers, with significant correlations
between the IPAQ-A and the Actigraph observed ($r=0.08$ to 0.26) (De Cocker et al. 2011). The reliability of this instrument is yet to be reported.

In Australia, the Adolescent Physical Activity Recall Questionnaire (APARQ) (Booth et al. 2002b) has been used with some success to determine the level of physical activity among adolescents. The APARQ assesses participation in both organised and non-organised games, during a normal week in summer school terms and winter school terms (reported separately), excluding holiday periods. This instrument has been shown to have acceptable reliability (weighted kappa ranged from 0.33-0.71 and 0.39-0.71 for summer and winter terms respectively) and acceptable validity (Spearman correlation coefficients: 0.147 ($P<0.001$) and 0.208 ($P<0.001$) for grade 8 boys and girls, respectively, 0.139 ($P<0.01$) and 0.391 ($P<0.001$) for grade 10 boys and girls, respectively) when compared with performance on the Multistage Fitness Test (Booth et al. 2002b), however a more appropriate validation method is required. Further, it has been suggested that seasonal format questionnaires, such as the APARQ, may improve accuracy of self-report of physical activity among adolescents (Rifas-Shiman et al. 2001).

The Children’s Leisure Activities Study Survey (CLASS) is another Australian example which has proved a valid and reliable measure of self-reported physical activity among older children and adolescents (Telford et al. 2004). This survey includes items on the frequency and duration of activities undertaken in a typical week (during school term, excluding school holidays), active transport to school, school physical education and school sport (Telford et al. 2004).

While some of these questionnaires show promise, a review by Chinapaw and colleagues (2010) notes that further research is required to confirm the validity and reliability of physical activity questionnaires among youth. In light of the numerous challenges associated with assessing physical activity among children and adolescents, further investigation of measures which can adequately capture the nature of physical activity among youth is required to enable an accurate determination of the prevalence of physical activity among this important population group. In the interim, however, a combination of objective and subjective methods provides useful information. Accelerometers appear to be one
of the best options currently available for objectively assessing physical activity among children and adolescents, while subjective measures such as the APARQ and IPAQ-A show promise as a means of obtaining self-report physical activity data from adolescents, particularly in large scale epidemiological studies where data on physical activity prevalence are sought.

1.6 Prevalence of Physical Activity

In light of the well-established benefits of physical activity and public health guidelines, it is of concern that physical activity levels among youth are poor across many facets of participation, including overall physical activity, that is, meeting physical activity guidelines (Pearson et al. 2009), organised sport (NHS Information Centre 2012) and active transport (Sirard & Slater 2008). Further, little is known about the prevalence and influences on participation patterns within certain domains (Klinker et al. 2014), for example the home environment.

1.6.1 Meeting physical activity guidelines

Research internationally has attempted to determine the proportion of young people meeting physical activity guidelines, though comparison across studies is often hampered by the inconsistent use of intensity thresholds (Ekelund et al. 2011) and operationalisation of compliance with guidelines (Olds et al. 2007). In the US, accelerometry data from the Youth Risk Behavior Survey suggests that 59% of 11-15 year old boys and 34% of 11-15 year old girls meet the recommended 60 minutes of MVPA per day (Sanchez et al. 2007). Accelerometry data from the 2003-2004 National Health and Nutritional Examination Survey (NHANES) in the US were more sobering (Troiano et al. 2008), with only 12% of 12-15 year old boys and 3% of 12-15 year old girls meeting the physical activity guidelines. Some of the observed differences in results of these two studies may be due to the different definitions used for moderate-intensity physical activity (a lower range of 3 METs in Sanchez (2007) and 4 METs in Troiano (2008)); however, it is clear that the majority of adolescents in the US do not meet the current physical activity guidelines.
Similarly low levels of objectively assessed compliance with physical activity guidelines have been observed in the UK. Using 3-5.9 METs as the definition for moderate-intensity activity, Pearson and colleagues (2009) found 28% and 17% of 12-16 year old boys and girls respectively engaged in 60 minutes or more of MVPA daily.

Two large European studies, the European Youth Heart Study (EYHS) (Riddoch et al. 2004) and the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study (Ruiz et al. 2011), reported somewhat higher levels of compliance with physical activity guidelines. The EYHS involved children and adolescents aged 9 and 15 years from countries including Denmark, Portugal, Estonia and Norway. Physical activity was assessed via accelerometer. The vast majority of boys and girls (97% and 98% respectively) achieved the recommended guidelines at age 9, while at age 15, 82% of boys and 62% of girls achieved the guidelines (Riddoch et al. 2004). These relatively high levels of compliance may be explained in part by the use of 3 METs as the cutpoint for moderate-intensity physical activity. The HELENA study, a cross-sectional study of European adolescents from 10 European cities, measured a range of health behaviours, including physical activity measured via accelerometer (Ruiz et al. 2011). Using similar definitions of moderate-intensity activity and the same physical activity guidelines as the EYHS, the HELENA study found that 57% of boys and 28% of girls met the recommended activity level (Ruiz et al. 2011). These lower levels of compliance, in comparison to the EYHS study, may in part reflect the higher accelerometer counts/minute cutpoints used in the HELENA study.

In Australia, the National Secondary Students’ Diet and Activity (NaSSDA) (Scully et al. 2012) survey 2009-10 provided self-reported data on 12,188 secondary school students’ physical activity, with results indicating 22% and 8% of males and females respectively met the physical activity guideline of 60 minutes or more of daily MVPA. While this study gathered data from a large sample, assessment of compliance with guidelines was limited by the use of a single measure of physical activity. This measure has previously been shown to be
reliable, valid and correlated with objective measures of physical activity (Prochaska et al. 2001, Ridgers et al. 2012); however, it does not provide the same level of detail as the objective measures in the studies described previously. Similar levels of compliance with guidelines were observed in the Australian Health Survey 2011-12 (Australian Bureau of Statistics 2013), which found 19% of children and adolescents met the physical activity guideline of 60 minutes or more of MVPA on every day in the week prior to the survey.

The 2007 Australian National Children’s Nutrition and Physical Activity Survey (Children’s Survey) utilised self-report and objective measures of physical activity in a sample of children and adolescents (CSIRO Preventative Health National Research Flagship 2007). Physical activity was measured among 9-19 years olds via a time use survey, the validated Multimedia Activity Recall for Children and Adolescents (MARCA) (Ridley et al. 2006), from which total energy expenditure and a physical activity level (PAL) was calculated, and via pedometers which were worn for up to seven consecutive days by 5-16 year olds. Although no national guidelines exist for recommended steps per day in Australia, Tudor-Locke et al’s (2004) criteria of 15000 steps per day for boys and 12000 steps per day for girls were used to calculate achievement of guidelines. Thirty-two percent of boys aged 5-8 years, 24% of boys aged 9-13 years and 13% of boys aged 14-16 years met this criteria (15000 steps per day). Fifty percent of girls aged 5-8 years, 33% of girls aged 9-13 years and 16% of girls aged 14-16 years met the criteria of 12000 steps per day. Nearly half (46%) of boys aged 9-13 and one quarter (25%) of boys aged 14-16 met the physical activity guideline of at least 60 minutes of daily MVPA based on self-report data. In comparison, one third (33%) of girls aged 9-13 years and 13% of girls aged 14-16 years met this guideline (CSIRO Preventative Health National Research Flagship 2007).

Levels of compliance with step thresholds were also determined in the Australian Health Survey 2011-12 (Australian Bureau of Statistics 2013). This research used a minimal daily target of 12000 steps for boys and girls to calculate achievement of guidelines. Results indicated 33% of boys aged 5-8 years, 42% of boys aged 9-11 years, 14% of boys aged 12-14 years and 9% of boys aged 15-17 years met the criteria of 12000 steps per day. Among girls, 10% of those aged 5-8 years, 7% of
those aged 9-11 years, 11% of those aged 12-14 years and 5% of those aged 15-17 years met the threshold of 12000 steps per day (Australian Bureau of Statistics 2013).

Using the APARQ as the measure of physical activity, the 2010 NSW Schools Physical Activity and Nutrition Survey (SPANS) found that 61% of boys in year 6, 68% of boys in years 8 and 10, 56% of girls in year 6, 60% of girls in year 8, and 57% of girls in year 10 participated in at least one hour of MVPA per day during summer school terms (Hardy et al. 2011). Compliance during winter school terms was lower, with 50% of boys in year 6, 57% of boys in year 8, 61% of boys in year 10, 39% of girls in year 6, 43% of girls in year 8 and 48% of girls in year 10 participating in at least one hour of MVPA per day (Hardy et al. 2011).

These figures are considerably higher than those reported by the 2008 Child and Adolescent Physical Activity and Nutrition Survey (CAPANS) in Western Australia (Martin et al. 2008), where 38% and 10% of secondary school boys and girls respectively reported doing 60 minutes or more MVPA daily. This difference between Australian studies may in part be attributable to the different survey instruments used.

There is now emerging evidence on secular changes in compliance with physical activity guidelines. Okely and colleagues (2008) found that self-reported compliance had increased among NSW adolescents from 1985 to 2004. This increase is consistent with data from the United Kingdom, Europe and Canada (Okely et al. 2008). More recently, data from the NSW SPANS study suggest that while compliance with physical activity guidelines increased among NSW adolescents between 1997 and 2004, it subsequently decreased significantly between 2004 and 2010, except among year 10 girls (Hardy 2011). In light of conflicting evidence, a recent review (Ekelund et al. 2011) observed that changes in physical activity levels among youth are not well understood and there is insufficient evidence to state that compliance with physical activity guidelines has increased or decreased in recent decades. Until internationally standardised surveillance systems using objective measures are implemented (Ekelund et al.
it is difficult to determine with any certainty how physical activity levels among youth may be changing.

While the level of compliance with physical activity recommendations differs between studies, and varies according to the type of measure used, overall the literature suggests that a lack of compliance with physical activity guidelines among children and adolescents is not limited to one country, indeed it is a challenge of international significance. Examining prevalence within specific domains of physical activity may provide focus for intervention efforts.

1.6.2 Organised sport

Few recent studies report on prevalence on organised sport participation among youth. In the US, a telephone survey of parents of 9-13 year old children found that 38% of boys and 39% of girls in this age group had participated in organised physical activity during the preceding 7 days (Centers for Disease Control and Prevention 2003). Similar levels of sport participation were observed in the UK, where data from the Health Survey for England (HSE) 2008 found that 49% of boys and 38% of girls had participated in formal sports in the previous week (NHS Information Centre 2012).

In Australia, in the 12 months to April 2009, it was estimated that 63% of children aged 5 to 14 years were involved in organised sport, with more boys involved (70%) than girls (56%) (Australian Bureau of Statistics 2009), while the 2011 Young People’s Survey showed that, in New Zealand, 93% of boys aged 11-14 years and 91% of girls aged 11-14 years had participated in at least one sport or recreational activity once or more a week for the previous year (Sport New Zealand 2012).

In relation to changes in organised sport participation over time, there is little consistent evidence (Dollman et al. 2005, Salmon & Timperio 2007). Australian data (Australian Bureau of Statistics 2009) show that prevalence of organised sport participation did not increase significantly between 2003 and 2009 (62% and 63% respectively) among 5-14 year old children, while Westerstahl and
colleagues (2003) observed participation by adolescents in leisure-time sports activities increased from 1974 to 1995.

While there is some variation in the levels of youth sport participation worldwide, comparisons between countries are difficult due to methodological differences. However, it is clear that organised sport plays an important part in youth physical activity; indeed Norton and colleagues (2003) identified that playing sport is the most preferred activity among 12-15 year old Australian boys and girls, making it an important focus for future research and intervention.

1.6.3 Active transport

There is a growing body of literature on the prevalence of, and secular changes in, active transport among children and adolescents, particularly in relation to active commuting to and from school. Data from the 2010 National Travel Survey in the UK suggest that for 41% of children aged 5 to 16, walking was the main method of getting to school, while 2% used a bike to get to and from school (NHS Information Centre 2012). Sirard and Slater’s (2008) review suggests that overall frequency of active transport to school is much lower in the US, particularly in the south-eastern states, with some studies reporting rates of 13-14%, while prevalence in European studies has ranged from 40-70%.

In Australia, the 2010 NSW SPANS found that one-fifth of primary school-aged children and 15% of secondary school students reported using only active travel to school, while between 18% and 27% of primary school children and 17% of secondary school students reported using only active travel from school (Hardy et al. 2011). However, many students reported using mixed modes of travel, many of which contained a component of active travel, hence the figures above are likely to be an underrepresentation of the prevalence of active commuting.

Data from the 2008 CAPANS survey in Western Australia showed that 32% of primary school aged boys and 26% of primary school aged girls had actively commuted to school on the day of the survey, while 42% and 35% of primary school aged boys and girls respectively had commuted home from school on the
day prior to the survey (Martin et al. 2008). Almost 58% of secondary school boys
and 46% of secondary school girls had actively commuted to school on the day of
the survey, with 63% and 57% of secondary school boys and girls actively
commuting home from school the day prior to the survey (Martin et al. 2008).

In relation to trends in active transport, recent reviews have noted declines over
time in active transport among children and adolescents in both US (Sirard &
Slater 2008, Davison et al. 2008) and European studies (Sirard & Slater 2008).
Similarly, Salmon and colleagues (2005a) observed declines in the frequency of
walking and cycling to or from school from 1985 to 2001 among children aged 9-
13 years in Melbourne, Australia. Conversely, the 2008 Western Australian
CAPANS study found no significant declines between 2003 and 2008 in active
commuting to and from school among primary and secondary school students. In
fact, they observed a significant increase from 2003 to 2008 in the proportion of
secondary school aged boys and girls actively commuting home from school the
day prior to the survey (Martin et al. 2008).

Despite the difficulties in making direct comparisons between studies due to
different definitions and methodologies employed, active transport appears to be
higher among youth in Europe and Australia compared to the US, and higher
among boys compared with girls. Further, there appear to be declines in active
transport internationally, hence an understanding of the influences on this domain
of physical activity is crucial.

1.6.4 Sex differences in physical activity participation

Among children and adolescents, sex differences in participation in overall
physical activity and types of activity are well established, with boys undertaking
more vigorous (Bradley et al. 2000, Booth et al. 2002a, Ortega et al. 2007,
Troiano et al. 2008) and moderate- to vigorous-intensity physical activity (Trost et
2011) than girls. Girls also more frequently report sedentary pursuits than boys
(Bradley et al. 2000, Ruiz et al. 2011). Recent Australian data support these
international findings, with data from the Australian Health Survey 2011-12
(Australian Bureau of Statistics 2013) and the 2007 Children’s Survey (CSIRO Preventative Health National Research Flagship 2007) showing that boys were more likely to engage in at least 60 minutes MVPA per day than girls. Similarly, the NSW SPANS 2010 showed a significantly greater proportion of boys than girls in years 8 and 10 participated in at least one hour of MVPA per day in summer terms, and a significantly greater proportion of boys than girls in years 6, 8 and 10 participated in at least one hour of MVPA per day in winter terms (Hardy et al. 2011).

Sex differences are also present in organised sport, with Australian data showing boys were more likely than girls to participate across childhood and adolescence (Australian Bureau of Statistics 2009). Similarly, in a Western Australian sample of adolescents, boys were more likely to report participation in at least one session of sport/exercise/dance in the previous seven days than girls (95% of boys and 89% of girls) (Martin et al. 2008).

While there are some inconsistencies in the evidence, sex differences have been observed in active transport, with reviews indicating girls are less likely than boys to actively commute to school (Davison et al. 2008, Sirard & Slater 2008). Conversely, Hume and colleagues (2009) found no significant differences between boys and girls in relation to active commuting to school in their sample of 121 children and 188 adolescents in Melbourne, Australia. However, given the consistency of findings in relation to sex differences in overall physical activity, it is clear that in most domains, girls are typically less active than boys, thus making them an important target group for intervention.

1.6.5 Participation across transition periods

While studies discussed previously (Pate et al. 1999, Janz et al. 2000, McMurray et al. 2003, Telama et al. 2005, Matton et al. 2006, Kirjonen et al. 2006) have examined whether physical activity tracks from childhood to adolescence or adulthood, others have observed how physical activity differs with age. The decline in levels of participation throughout the lifespan has been well documented (Riddoch et al. 2004, Trost et al. 2002, Dovey et al. 1998, Ortega et
al. 2007, Troiano et al. 2008, De Cocker et al. 2011), and the transition from childhood to adolescence has been identified by several authors as a period of marked decline in physical activity participation (Armstrong et al. 2000, Trost et al. 2002, Gavarry et al. 2003, Riddoch et al. 2004, Ortega et al. 2007, Troiano et al. 2008). In the 2003-2004 NHANES, a cross-sectional study of a representative sample of the US population, Troiano and colleagues (2008) observed adherence to physical activity guidelines, as measured by accelerometer, declined dramatically from childhood to adolescence. Among 6-11 year olds, 49% and 35% of males and females respectively complied with the recommendation of at least 60 minutes MVPA daily, compared with 12% and 3% of 12-15 year old males and females respectively. These findings demonstrate the importance of the transition from childhood to adolescence, particularly among girls, as a period for physical activity intervention.

Others (Bélanger et al. 2009a, Duncan et al. 2007, Dovey et al. 1998, Gavarry et al. 2003) have highlighted the continued decline in participation throughout adolescence and noted that this decline is more significant among girls than boys (Cavill et al. 2001, Armstrong et al. 2000). For example, in a longitudinal sample of New Zealand adolescents, total participation time at age 18 was 63% of that reported at age 15 (Dovey et al. 1998). The mean participation time decreased from 11.7 hours a week to 7.8 hours a week among boys, and from 7.5 to 4.3 hours a week among girls, further supporting the need to encourage physical activity during youth, particularly among girls. Similarly, results from pooled analyses suggest that physical activity decreases by 7% per year during adolescence (Dumith et al. 2011), making this period a critical time for intervention.

Further, the nature of participation changes from childhood through adolescence (Dovey et al. 1998, Gavarry et al. 2003, Bradley et al. 2000, Harrell et al. 2003). Cross-sectional research has shown that total physical activity, vigorous physical activity and moderate physical activity decreases from childhood to adolescence, while low intensity physical activity increases (Gavarry et al. 2003) and sedentary pursuits increase (Harrell et al. 2003, Matthews et al. 2008). Data from the 2003-2004 NHANES in the US found that objectively assessed sedentary time
increased from childhood to adolescence among both boys and girls, with girls aged 6-11 years spending on average 6.14 hours daily sedentary time, and girls aged 12-15 and 16-19 spending 7.70 and 8.13 hours respectively in sedentary behaviours daily. Longitudinal research among Canadian youth showed a decline in vigorous physical activity and higher levels of sustained light intensity physical activity during adolescence (Bélanger et al. 2009a), while a reduction in total time spent in physical activity and the number of physical activities from mid to late adolescence was observed in a cohort of New Zealand adolescents (Dovey et al. 1998).

Similar declines from childhood to adolescence are evident in organised sport participation, with 68% of Australian children aged 9-11 and 65% of Australian children aged 12-14 participating in organised sport outside of school hours in the 12 months prior to April 2009 (Australian Bureau of Statistics 2009). Data from the Western Australian 2008 CAPANS study indicate that 2% of primary school males and 4% of primary school females reported no vigorous sport, physical activity or dance in the previous week, compared with 5% of secondary school males and 11% of secondary school females (Martin et al. 2008). Similar declines were seen for other forms of physical activity, including active play and school sport or physical education (PE), while the proportion of children reporting at least one session of active transport in the previous 7 days was higher among adolescents than children (Martin et al. 2008). More recently, the Australian Health Survey 2011-12 data show that 5-8 year olds spent, on average, 120 minutes per day in physically active pursuits (including active transport and MVPA), compared with 62 minutes per day among 15-17 year olds (Australian Bureau of Statistics 2013).

In summary, it is evident that while a proportion of children meet current physical activity recommendations, this proportion declines markedly with age. Typically, girls are less active than boys at all ages and declines in activity levels with age are more marked among girls. Further, the nature of physical activity appears to change with age, with organised sport, active play, MVPA and VPA decreasing, and light intensity and sedentary pursuits increasing. Given elements of physical activity appear to track, albeit moderately, from childhood to adolescence and
from adolescence to adulthood, it is evident that physical activity levels need to be increased and/or maintained throughout childhood and adolescence. As girls are less active than boys, and show a substantial drop off in participation from childhood to adolescence, the remainder of this thesis will have a particular focus on adolescent girls. In order to maintain or increase physical activity among this group, it is important to understand the influences on participation. Exploring the relevant theoretical underpinnings for physical activity provides a framework for examination of potential correlates.

1.7 Theoretical Approaches to Explaining and Predicting Physical Activity

A number of intrapersonal models have been used to explain and predict physical activity behaviour, including the Transtheoretical Model (TTM) (Prochaska & DiClemente 1983), the Theories of Reasoned Action (TRA) and Planned Behaviour (TPB) (Nutbeam & Harris 2004) and the Health Belief Model (Becker & Maiman 1975). In particular, TTM and TPB have been used extensively in physical activity research with some success (Rhodes & Nigg 2011). Although intrapersonal theories are important predictors of youth physical activity (Plotnikoff et al. 2013), they are limited by their focus on individual correlates.

Participation in physical activity has also been explained using several interpersonal models including Social Cognitive Theory (Bandura 1986), the Family Influence Model (Kimiecik et al. 1996) and Ecological Models (Stokols 1996), all of which consider some component of the environment and its influence on behaviour. However, the importance of the environment in influencing physical activity is emerging (Davison & Lawson 2006, Duncan et al. 2005a, McCormack et al. 2004), and, among youth in particular, the literature confirms the importance of targeting factors beyond the individual level (Perry et al. 2012), therefore only those models containing constructs related to the social and physical environment will be reviewed here.
1.7.1 Ecological Models

Ecological models have developed from the work of Bronfenbrenner (1979) and have since been adapted in studies of child obesity (Davison & Birch 2001), health promotion (Stokols 1996) and physical activity (Perry et al. 2012). The underlying premise of ecological models is that multiple interrelated systems affect human development. These systems include the individual microsystem (the most proximal setting), the mesosystem, the exosystem and the macrosystem (the most distal setting) (Grzywacz & Marks 2001). The microsystem is the immediate system within which individuals interact (Spence & Lee 2003), and includes, for example, family and friendship networks (Huebner & Mancini 2003). The mesosystem refers to the relationships between two or more microsystems (Spence & Lee 2003), and includes, for example, the school or work setting (Maccoby & Martin 1983), while the exosystem is those settings in which microsystems and mesosystems are embedded (Meyers et al. 2002), for example settings which influence family life but are not directly participated in by family members (Maccoby & Martin 1983). The macrosystem is the broader socio-cultural context including economic and political forces which influence individuals (Meyers et al. 2002), for example the notion that childhood socio-economic status is related to adult physical activity is a macrosystem dimension (Spence & Lee 2003). These systems or levels of influence, which include individual, social and environmental features, are interdependent and can impact directly or indirectly upon each other, providing multiple points for intervention (Spence & Lee 2003, Perry et al. 2012).

The social ecological approach provides a theoretical framework for understanding the dynamic interplay between personal and environmental factors and the impact they have on health (Stokols 1996). For example, application of the ecological model to childhood overweight suggests that a child’s weight status is influenced by the interactions which occur between child characteristics and child risk factors, parenting styles and family characteristics, and community, demographic and societal characteristics (Davison & Birch 2001). In a physical activity context, ecological models have been used with some success to examine various associations and interactions between contextual factors from multiple
domains in predicting exercise among adults (Grzywacz & Marks 2001), and to explore time use among adolescents with regard to self, family and friend systems (Huebner & Mancini 2003).

Social ecological models are being used increasingly in the physical activity literature to describe the interaction between the individual and the social and physical environment and how this influences physical activity participation (Giles-Corti & Donovan 2002). These models have provided a framework in which to examine the relative influence of social environmental, physical environmental and individual factors on physical activity participation.

However, reviews of physical activity research based on ecological models identify the need for the development of more comprehensive ecological models (Duncan et al. 2005a). While these models have provided a framework in which to examine the relative influence of social environmental, physical environmental and individual factors on physical activity participation, they do not fully account for the importance of the family and family relationships in relation to physical activity. Further, increasing the specificity of social ecological models by developing behaviour-specific and environment-specific ecological models may be warranted (Giles-Corti & Donovan 2002).

### 1.7.2 Social Cognitive Theory

Social Cognitive Theory (SCT) (also known as social learning theory) is based on the notion of reciprocal determinism, which describes the interaction between personal factors, the perception of the environment (situation), and behaviour (Bandura 1986, Nutbeam & Harris 1999). It suggests that these interactions are bidirectional, and therefore environmental and personal factors can have a direct or a mediating influence on behaviour (Motl et al. 2005). Unlike ecological models, the constructs in SCT have been more fully described and tested (Glanz et al. 2002).

SCT is comprised of a number of constructs including self-efficacy, observational learning, outcome expectations and self-regulation (personal factors) and situation
and social support (environmental factors) (Petosa et al. 2003). Self-efficacy refers to one’s confidence that they can consistently overcome barriers in order to perform the desired behaviour (Petosa et al. 2005). Observational learning refers to the acquisition of behaviours through the observation of others’ behaviour and the consequences of that behaviour (Maccoby & Martin 1983). Outcome expectations refer to an individual’s beliefs about whether the desired behaviour will result in positive or negative outcomes, and the value placed on that outcome (Petosa et al. 2005, Petosa et al. 2003). Self-regulation consists of the use of cues to act and reinforce desired behaviours, and while the importance of this construct has been documented for adults, it has not been studied as a determinant among adolescents (Petosa et al. 2005). In relation to environmental factors, situation refers to an individual’s perception of their environment, while social support includes support provided by friends, family and the community (Rhodes & Plotnikoff 2005).

Recent research in the physical activity context has used SCT to predict and explain physical activity behaviour (Tavares et al. 2009, Dishman et al. 2009, Motl et al. 2005, Wallace et al. 2000, Petosa et al. 2005, Petosa et al. 2003, Netz & Raviv 2004, Taymoori et al. 2010). For example, Motl et al. (2005), in their study of adolescent girls, found the effect of perceived equipment accessibility (environmental factor) on physical activity (behaviour) was mediated by self-efficacy for overcoming barriers (personal factor). Further, Duncan and colleagues (2007) observed that efficacy to overcome barriers was associated with a reduced physical activity decline in a longitudinal sample of adolescents, while Dishman et al. (2009) suggest that adolescent girls’ efficacy beliefs about physical activity barriers may moderate the relationship between changes in perceived social support and physical activity.

Although not specifically in relation to physical activity, SCT has been particularly influential in explaining socialisation within the family unit, child rearing and the parent-child interaction (Maccoby & Martin 1983). Whilst originally used to describe socialisation within the family, more recently cognitive components have been incorporated to a greater degree to broaden its applicability (Maccoby & Martin 1983). The comprehensiveness of SCT suggests it may
provide a means of examining the mechanisms of family influence on behaviour (Taylor et al. 1994), although to date it has not been used to fully describe the complex family interactions that may influence physical activity participation, particularly among adolescent girls. It does provide, however, a useful framework for exploring the individual, social and environmental determinants of physical activity among children and adolescents, although more comprehensive theories are required to explain the dynamic and complex interaction within the family environment. Further, a growing body of research has recognised the family environment in particular as an important influence (Anderssen & Wold 1992, DiLorenzo et al. 1998, Sallis et al. 1999), thus those theories which consider the family environment and some of these more complex family variables are described below.

1.7.3 Family Influence Model

The Family Influence Model (FIM) (Kimiecik & Horn 1998, Dempsey et al. 1993, Kimiecik et al. 1996) is based on Bandura’s SCT and Eccles’ and Harold’s (1991) expectancy-value model for understanding children’s achievement in academic settings. It purports that the home environment, which consists of parent/sibling beliefs, parent/sibling behaviour, and family functioning and interaction, influences a child’s perception of the home environment. This perception then leads to the development of specific beliefs which in turn are a primary influence on behaviour (Kimiecik et al. 1996). In a physical activity context, the FIM has been used to explain the influence of the family environment on children’s (Dempsey et al. 1993, Cleland et al. 2011) and adolescents’ (Cleland et al. 2011) MVPA and purports that parents’ beliefs about their children’s MVPA is the basis for understanding family influence on children’s MVPA. It is the individual’s belief system, interacting with their environment, that guides behaviour, and parents’ beliefs are a core component of this system. These relationships are illustrated in Figure 1.1.
While this model demonstrates the importance of assessing parental beliefs when examining the influence of parents on children’s MVPA (Kimiecik & Horn 1998), it could perhaps be applied more broadly to encompass those aspects of the FIM not previously examined comprehensively in the context of physical activity, such as child perception of parent/sibling beliefs, environmental influences outside the home including significant adult others, peers and community, and demographic and family characteristics including socio-economic status (SES), ethnicity and family size and type. In addition, family characteristics such as parenting style and family function could be examined within this framework.

1.7.4 Theories of parenting and family functioning

A number of theories have been used to explain and predict the nature of family interaction. In general, these theories view the family as a system of individuals
which form a bio-psycho-social unit which is constantly changing and evolving (Compan et al. 2002). Whilst these theories have not previously been applied in a physical activity context, they may be useful to help explain the influence of the family environment on children’s and adolescents’ physical activity.

Family Systems Theory

Family Systems Theory (FST) purports that the family is greater than the sum of its parts (Schoppe et al. 2001) and that within each family there is a series of dyadic relationships (relationships between two family members) and other sub-system relationships which are related to the qualities of the family as a whole (Wise 2003). It suggests that these dyadic relationships, including the marital relationship and parenting behaviour, have a high degree of relatedness with child development (Poresky & Whitsitt 1985). More specifically, according to FST the well-being of the child is dependent upon the functioning of the entire family system, and all its separate elements or dyadic relationships (Wise 2003).

In the clinical setting, FST has been used as a framework for psychological intervention with individuals (Bott 1994) and to examine adolescent addiction and delinquency (Cook 2001). Among 4 to 6 year old girls, it has provided a framework for the examination of intelligence and motivation, although few significant correlations were found between spousal relationships or reports of parent behaviour and intelligence and motivation (Poresky & Whitsitt 1985). Family Systems Theory has also provided a theoretical framework for qualitative work examining how parents experience the transition of their child to adolescence (Spring et al. 2002).

Further, FST has been used in the context of organisational consultation, with particular application in the business, human services and sport sectors (Matheny & Zimmerman 2001). In a physical activity context, Family Systems Theory has been used to guide the development of the Healthy Dads, Healthy Kids intervention (Morgan et al. 2014).
Attachment Theory

Attachment, that is the affective bond between parents and children, is considered seminal to the study of parenting as numerous studies have demonstrated an association between attachment and children’s and adult’s functioning (Cummings & Cummings 2002). Attachment theory posits that the relationships between parents and their children are crucial to an individual’s development and functioning throughout the lifespan. Whilst attachment itself is not a parenting style or practice, the strength of the bond or the security of the attachment between a parent and child will be influenced by parenting style and the child’s experiences of parenting, thus attachment theory is often used to describe the complex development of the affective bond between parents and children (Cummings & Cummings 2002).

In summary, as evidenced above, there a number of potentially relevant theories, both within a physical activity behaviour context and more broadly within the family context, which may be useful for examining in detail the influence of the family environment on children’s and adolescents’ physical activity participation. In general, the choice of theory will ultimately depend on the context in which it is being applied, the behaviour in question, and the associations or correlations to be studied. In this instance, the Family Influence Model appears to have potential for examining those family characteristics, such as family functioning, parenting styles and practices, and parent/sibling beliefs, that have not previously been extensively investigated in a physical activity context, and may provide a useful framework for considering the determinants of physical activity. Further, examining these variables within the Family Influence Model may provide valuable information on the interaction of these variables with each other and various components of the family environment such as parent/sibling beliefs and behaviour.
1.8 Correlates of Physical Activity among Children and Adolescents

Correlates are those factors which are statistically associated with physical activity participation, that is, they may make an individual more or less likely to participate (Sallis & Owen 1999). Further, some correlates have been shown to mediate the relationship between interventions and physical activity (Bauman et al. 2002). Consistent with the interpersonal models described above, the following provides an overview of the individual, physical environmental and social environmental influences on physical activity. While a brief review of the individual and physical environmental correlates is provided, a more in-depth discussion of the social environmental correlates is warranted due to their relevance to this thesis.

1.8.1 Individual correlates

A number of biological, demographic, psychological and behavioural correlates have been consistently shown to be associated with physical activity participation among children and adolescents. Among children, individual-level variables consistently associated with physical activity include sex (male) and self-efficacy (Van der Horst et al. 2007), while in an earlier review (Sallis et al. 2000) parental overweight status, perceived barriers (negative association), physical activity preferences, intention to be active, previous physical activity and healthy diet were additionally consistently associated with physical activity. More recently, in their review of prospective studies, Uijtdewilligen and colleagues (2011) found intention was the only determinant of physical activity among children.

Among adolescents, sex (male), self-efficacy, attitude, goal orientation/motivation and PE/school sports are positively associated with physical activity (Van der Horst et al. 2007), while previously Sallis and colleagues (2000) found that age (negative association), ethnicity (white), achievement orientation, perceived activity competence, intention to be active, depression (negative association), sensation seeking, previous physical activity, participation in community sports...
and being sedentary after school and on weekends (negative association) were additional individual-level variables found to have a consistent association with physical activity participation. Further, a recent review found a positive association between fundamental movement skill competence and physical activity among adolescents (Lubans et al. 2010). In contrast to Sallis et al. (2000), Uijtdewilligen and colleagues (2011) observed a positive association between age and physical activity among adolescents.

In their review of determinants of change in physical activity among children and adolescents, Craggs and colleagues (2011) found that sex (female) was associated with larger declines in physical activity, while higher levels of self-efficacy and previous physical activity were associated with smaller declines in physical activity among children. Among adolescents, correlates of smaller declines in physical activity included higher self-efficacy, perceived behavioural control and support for physical activity (Craggs et al. 2011). Further, self-efficacy has been shown in several reviews to mediate the relationship between interventions and physical activity (Lubans et al. 2008, van Stralen et al. 2011).

Biddle et al. (2005) reviewed those studies conducted subsequent to the Sallis, Prochaska and Taylor review, focussing only on correlates of physical activity among adolescent girls. This review found that demographic correlates such as non-white ethnicity and age were negatively associated with physical activity among adolescent girls, while socio-economic status was positively associated with physical activity. In addition, enjoyment, perceived competence, self-efficacy, physical self-perceptions and organised sport participation were positively correlated with physical activity, while smoking was negatively correlated. However, the effects found in this review were classified as small to moderate (Biddle et al. 2005).

1.8.2 Physical environmental correlates

In relation to the physical environment, de Vet and colleagues (2011), in their systematic review of reviews, found that school and neighbourhood facilities for physical activity and traffic safety were positively associated with physical activity and being sedentary after school and on weekends (negative association) were additional individual-level variables found to have a consistent association with physical activity participation. Further, a recent review found a positive association between fundamental movement skill competence and physical activity among adolescents (Lubans et al. 2010). In contrast to Sallis et al. (2000), Uijtdewilligen and colleagues (2011) observed a positive association between age and physical activity among adolescents.

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activity among youth. Similarly, Ding et al. (2011) found that among children, proximity to recreation facilities, traffic safety, walkability, land-use mix and residential density were associated with physical activity, while among adolescents, residential density and land-use mix were associated with physical activity. Further, this review observed that objectively measured environmental variables were more consistently associated with physical activity than perceived environmental attributes (Ding et al. 2011).

These reviews build on earlier work by Sallis and colleagues (2000) who observed that, among children, program/facility access and time spent outdoors were positively associated with physical activity, while opportunities for exercise had a consistent association with physical activity participation among adolescents. More recently, Ferreira et al.’s (2007) review of environmental correlates of physical activity among youth identified time spent outdoors and school-related physical activity policies as consistent positive correlates of physical activity among children, and low crime incidence in the neighbourhood environment as a correlate of physical activity among adolescents. Similarly, Davison and Lawson’s (2006) review found positive associations between children’s physical activity and publicly provided recreational infrastructure (such as access to recreational facilities) and transport infrastructure (such as presence of sidewalks), and negative associations between children’s physical activity and traffic density/speed, crime and area deprivation. Further, Giles-Corti and colleagues (2009) suggest that the built environment is an important influence on young people’s physical activity, but that the impact varies by age and sex, highlighting the need for more age and sex specific research in the area.

1.8.3 Social environmental correlates

Interpersonal frameworks such as Ecological Models, Social Cognitive Theory and the Family Influence Model identify the need to consider the broader social and physical environmental contexts in which individuals operate to fully understand the potential influences on behaviour. In particular, each of these frameworks suggest that the family environment may be an important influence on children’s and adolescents’ physical activity. Further, the varying influence
that parents have on their children as they progress from childhood to adolescence suggests a need to consider these correlates within a developmental or constantly evolving framework (Kimiecik et al. 1996).

Whilst the impact of the broader social environment on physical activity participation has been the subject of much research, relatively few variables in this domain have shown consistent associations with physical activity. In their review of parental influences on physical activity in youth, Edwardson and Gorely (2010b) concluded that parents’ physical activity levels, attitudes towards physical activity, transport and encouragement were important for youth physical activity. However, the authors acknowledged the need for more longitudinal research employing a combination of objective and self-report measures in the future.

Van der Horst and colleagues (2007) found that parental support was positively associated with physical activity among children, while parent education, family influences and friend support were positively associated with physical activity among adolescents. In their earlier review, Sallis, Prochaska and Taylor (2000) identified parental support, direct help from parents, support from significant others, and sibling physical activity as being consistently associated with adolescents’ physical activity, although most social variables had either indeterminate or no associations with children’s physical activity. More recently however, Heitzler et al. (2006) observed a cross-sectional positive association between children’s perceptions of parental support and parents’ reports of direct support and organised physical activity. Similarly, Gustafson and Rhodes’ (2006) review of parental correlates of physical activity in children identified significant correlations between parental support and child physical activity level. Further, Louicades et al (2007) identified friends’ and siblings’ frequency of participation in physical activity as a correlate of Canadian adolescents’ physical activity, while connectedness to family was associated with higher levels of physical activity among a sample of New Zealand adolescents (Carter et al. 2007).

Among female adolescents, exercise knowledge, girls’ and mothers’ friends modelling/support (DiLorenzo et al. 1998) and friends’ physical activity participation (Voorhees et al. 2005, Price et al. 2008) have been identified as
correlates of physical activity participation. In a cohort study of adolescent girls who were inactive at baseline, Neumark-Sztainer et al. (2003) found that support for physical activity from peers, parents and teachers was a strong and consistent correlate of change in physical activity participation over time. Similarly, other cohort studies (Dowda et al. 2007, Davison & Jago 2009) have shown that maintenance of family support (Dowda et al. 2007, Davison & Jago 2009) and higher levels of parental physical activity modelling (Davison & Jago 2009) are associated with reduced declines in adolescent girls’ physical activity, and cross-sectionally, family support has been associated with adolescent girls’ physical activity (Kuo et al. 2007, Springer et al. 2006). These findings are supported by those of Crawford and colleagues (2010), who observed that in a longitudinal study of girls aged 10-12 years at baseline, paternal MVPA role modelling and parental physical activity co-participation were associated with MVPA among girls.

Interestingly, in their sample of adolescent girls, Saunders et al. (2004) found that social variables such as social provisions and family support played a greater role in explaining team sport involvement than in explaining MVPA, while Van der Horst and colleagues (2010) observed a positive association between parental sports behaviour and adolescent participation in leisure-time sports.

Among a sample of 9 year-old girls, Davison and colleagues (2003) examined the influence of parents’ provision of logistic support and explicit modelling on girls’ physical activity. The measures of logistic support (e.g. enrolling girls in sports and driving them to activities), and explicit modelling (e.g. using parents’ own behaviour to encourage physical activity in their daughter), were defined by the authors as ‘parenting practices’, though were not discussed within a parenting style framework. Results indicated that mothers provided more logistic support and fathers provided more explicit modelling, and both constructs were associated with higher physical activity among girls (Davison et al. 2003). Similarly, Edwardson and Gorely (2010a), in their sample of 117 UK children and using measures based on those developed by Davison and colleagues, found that mothers provided more logistic support for their daughters than did fathers.
There have been inconsistent findings in the literature around physical activity rule setting and monitoring. Ornelas et al. (2007) found that MVPA among adolescent girls over a one year period was predicted by family cohesion, parent-child communication and parental engagement, but not parental monitoring. In contrast, Arredondo and colleagues (2006) found parental monitoring of activity was positively associated with children’s activity among Latino families, while parental control was not associated with children’s physical activity. Van der Horst et al. (2010) found a positive association between parental rule setting and adolescent leisure-time sports participation, while Crawford and colleagues found that physical activity rules were positively associated with MVPA among girls (Crawford et al. 2010).

In summary, various family environmental variables have been examined for their influence on adolescents’ physical activity participation, though few studies have taken a comprehensive approach to identifying and measuring associations among the vast array of family environmental variables which may influence physical activity participation. While basic parenting practices are emerging as a focal point in the physical activity literature, these are often not discussed within the context of parenting style, hence potentially overlooking an important relationship. This notion is supported by Hennessy and colleagues’ (2010) recent work which demonstrates that parenting style has a moderating role between parenting practices and youth physical activity. Parenting style and practices, as they relate to adolescent health behaviours, and in particular physical activity, are discussed below.

Parenting style and child and adolescent health behaviours

Parenting style is recognised as a stable parental characteristic which provides the environmental and emotional context for child development and a framework for the interpretation of parenting behaviours (Rhee et al. 2006). As indicated previously, definitions of parenting styles have evolved such that current literature identifies four main parenting styles, that is, authoritative, authoritarian, neglectful and indulgent, which are reflective of various degrees of demandingness and responsiveness (Baumrind 1991, Steinberg et al. 1994, Lamborn et al. 1991,
Maccoby & Martin (1983) (see Table 1.1). On occasion, neglectful and indulgent parenting styles are grouped together to form ‘permissive’, but the “use of a single category for all parents low in control mixes together two types of families who have very different reasons for their laxity” (Lamborn et al. 1991, p. 1050).

**Table 1.1: Parenting style definitions**

<table>
<thead>
<tr>
<th>Parenting style</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Authoritative</strong></td>
<td>Parents are responsive and nurturing, set clear expectations and explain the reasoning behind their expectations (Okagaki 2001), they are “both firm and supportive” (Lamborn et al. 1991 p. 1050).</td>
</tr>
<tr>
<td><strong>Authoritarian</strong></td>
<td>Parents are “firm and directive but relatively less supportive” (Lamborn et al. 1991 p. 1050), they value obedience and respect for authority, they are neither warm nor nurturing and do not include the child in decision making (Okagaki 2001).</td>
</tr>
<tr>
<td><strong>Indulgent</strong></td>
<td>Parents are child-oriented, responsive and nurturing, placing few demands on the child (Okagaki 2001). Parents are supportive but not directive and the “low level of control derives from an ideological orientation that has its foundations in trust, democracy and indulgence” (Lamborn et al. 1991 p. 1050).</td>
</tr>
<tr>
<td><strong>Neglectful</strong></td>
<td>Parents are relatively low in both support (responsiveness) and control (demandingness). This “low level of control reflects disengagement from the responsibilities of child rearing” (Lamborn et al. 1991 p. 1050).</td>
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</tbody>
</table>

While there is emerging evidence regarding parenting style as a predictor of physical activity, Baumrind’s (1991) view of parenting style and adolescent outcomes emphasises the importance of the family context throughout childhood and adolescence and suggests that, at any stage, attachment to family and community facilitates individual development. Her research provided evidence that children from authoritative homes are more instrumentally competent (that is, able to balance societal and individual needs and responsibilities (Darling & Steinberg 1993)) than other children, while children from permissive homes are less self-assertive, and preschool children from permissive homes are less cognitively competent compared with those from authoritative homes. More generally, authoritative parenting has been consistently associated with a range of
positive psychosocial and cognitive outcomes for children (Grigorenko & Sternberg 2001, Patrick et al. 2013). Similarly, among adolescents, cross-sectional (Lamborn et al. 1991) and longitudinal (Steinberg et al. 1994) research has shown that an authoritative parenting style is positively associated with adolescent adjustment, and that over time, the benefits of authoritative parenting in relation to adjustment are maintained, while the negative effects of neglectful parenting accumulate further.

While research on parenting style has, to date, encompassed a broad range of health outcomes, the bulk of the literature centres on the outcomes of antisocial behaviour, overweight and obesity, nutrition and feeding practices and, emerging more recently, physical activity. The evidence surrounding these key outcomes is reviewed below.

**Antisocial behaviour**

Research on the family environment in the context of adolescent antisocial behaviour found that poor parent-child relationships were correlated with participation in activities with low structure, which in turn was associated with antisocial behaviour (Mahoney & Stattin 2000). An observational study, which examined the possible associations between parenting style and adolescent’s reaction to conflict found that adolescents who reported their mothers as having a more permissive parenting style exhibited more intense negative reactions when presented with hypothetical situations than did adolescents who reported their mothers as authoritarian or authoritative (Miller et al. 2002). Similarly, an authoritative parenting style has been shown to be protective against adolescent drug use (Baumrind 1991) and mothers have been shown to be more influential than fathers in affecting adolescents’ (especially daughters’) behaviour. Further, Newman et al’s (2008) review found consistent evidence that authoritative parenting was associated with reduced risk of drug or alcohol use among adolescents, while O’Byrne and colleagues (2002) found that parenting style was an independent risk factor for smoking initiation among adolescents, although it was not significantly associated with smoking experimentation. Similarly, Huver et al. (2007) found authoritative parenting to have favourable effects on
adolescent smoking. Indeed, Steinberg’s (2001) discussion of research on parent-adolescent relationships concludes there is sufficient evidence to suggest that adolescents benefit from having parents who are authoritative, and the challenge lies in educating adults on how to adopt or develop an authoritative style.

*Overweight and obesity*

Research by Rhee and colleagues (2006) examined parenting styles and overweight status in first grade children. Results indicated that authoritarian parenting was associated with the highest risk of overweight among young children, while children of permissive and neglectful mothers were twice as likely as children of authoritative mothers to be overweight. The authors highlighted the need for research into how parenting styles and specific parenting behaviours affect activity levels and eating patterns (Rhee et al. 2006). These findings are supported by Berge et al. (2010), who examined longitudinal associations between parenting style and adolescent weight and related behaviours, concluding that an authoritative parenting style played a protective role against adolescent overweight. Ventura and Birch’s (2008) review, however, noted a lack of causal evidence in the area.

*Nutrition and feeding practices*

Research has examined parenting styles and practices in a child-feeding context, with findings indicating that authoritative feeding practices are positively associated and authoritarian feeding practices negatively associated with the availability of fruit and vegetables (Patrick et al. 2005). Authoritative feeding was also associated with reported child consumption of dairy and vegetables, suggesting that increasing caregivers’ authoritative feeding practices may lead to the consumption of healthier diets among children. Further, a review of the determinants of children’s eating patterns identified associations between feeding styles and dietary intake and weight status, and described a number of feeding practices reflective of the various parenting styles (Patrick & Nicklas 2005).
Among adolescents, a maternal authoritative parenting style was shown to predict fruit and vegetable consumption; however, paternal non-authoritative (authoritarian) parenting was associated with increased fruit and vegetable consumption (Lytle et al. 2003). Similarly, in a sample of Dutch adolescents, Kremers et al. (2003) observed that adolescents raised in an authoritative home ate more fruit and had positive attitudes towards fruit consumption compared with adolescents raised with other parenting styles, while Pearson et al. (2010) found positive associations between authoritative parenting and aspects of adolescent dietary behaviour, including increased fruit consumption, increased frequency of breakfast consumption and decreased consumption of healthy snacks.

Interestingly, Hoerr and colleagues (2009) observed a positive relationship between authoritarian feeding practices and healthier eating behaviours among low income children. In contrast, Arredondo et al. (2006) found parental control (a characteristic of authoritarian parenting) was positively associated with unhealthy eating among Latino children.

**Physical activity**

Newman et al. (2008), in their review of relationships between parenting style and risk behaviours in adolescents, found a lack of evidence relating to parenting style and physical activity, suggesting that an examination of parenting style patterns as they relate to physical activity is imperative. Berge’s review (2009) of familial correlates of child and adolescent obesity, while concluding that a range of familial factors are associated with child and adolescent physical activity, identified very few studies which specifically investigated parenting style and physical activity.

In their cross-sectional study, Garton and colleagues (2004) examined associations between adolescents’ perceptions of parenting style and their leisure participation. Assessment of leisure participation included self-reported participation in social activities, screen activities, miscellaneous activities and sport activities. No relationships between adolescents’ perceived parenting styles and preferences for type of leisure activity were observed; however, adolescents
who perceived their parents as authoritarian spent more time in leisure activities by themselves than with others, and more time in solitary leisure activities than adolescents from other family types. Adolescents who perceived their family as neglectful spent more time with friends or in a group, than alone or with family. Adolescents who perceived their family as indulgent shared the most amount of leisure-time with their families (Garton et al. 2004). While this research provides unique data about parenting style and adolescent leisure-time activities, the use of only four categories provides a somewhat superficial view of this relationship. Future research should explore these relationships in greater detail and examine more comprehensive categories of leisure-time activities.

Schmitz and colleagues (2002) examined parenting style correlates of physical activity and sedentary leisure behaviour among adolescents. In that study, parenting style was categorised as authoritative or non-authoritative, with adolescents rating their parents on a number of scales. The authors found that girls whose mothers adopted an authoritative parenting style reported higher levels of physical activity and lower levels of sedentary behaviour (Schmitz et al. 2002).

Davison and colleagues (2003), in their study of physical activity-related parenting, which was limited to provision of logistic support and explicit modelling, observed that both of these constructs were related to physical activity among 9 year old girls. However, while this study demonstrated that parents can have a substantial influence on their daughters’ physical activity, the measures of physical activity-related parenting were not comprehensive, nor were parenting practices discussed within a parenting style framework.

Viewing the parent/child interaction, parenting styles and parenting practices in this context provides a potential but as yet untested framework for examining parental influences on physical activity participation, or ‘physical activity parenting’. One of the key challenges associated with investigating physical activity parenting, however, is a lack of valid and reliable tools with which to comprehensively assess this construct.
Measurement of physical activity parenting

Sleddens and colleagues (2012) conducted a systematic review of questionnaires assessing physical activity parenting. While several physical activity parenting questionnaires were identified, there was considerable variation in the constructs assessed and few provided data on the psychometric properties of the instrument.

Davison and colleagues’ (2003) early measure of physical activity parenting was a parent-report instrument containing 7 items which were grouped according to two different concepts – logistic support and explicit modelling. This was further developed to include a 27 item child version (the ‘activity support scale’) (Davison 2004) and a parent-report version for African-American parents (Davison et al. 2011), all of which have acceptable reliability and validity (Davison et al. 2012). Further, several items or constructs from each of these scales have been positively associated with physical activity among children and adolescents (Sleddens et al. 2012). Similarly, Jago and colleagues (2009b) developed a ‘parental influence on physical activity scale’, which consisted of four sub-scales: general parenting support, active parents, past parental activity and guiding support. These sub-scales had acceptable internal consistency; however few sub-scales showed any association with child physical activity (Jago et al. 2009b). While these measures show promise in capturing some of the basic physical activity-related parenting practices such as provision of support, modelling and co-participation, and encouragement, they do not provide a comprehensive picture of the myriad of ways in which physical activity parenting may manifest.

King and colleagues (2011) adapted Vereecken et al’s (2009) parental feeding styles questionnaire for physical activity, including items on authoritarian, authoritative and permissive physical activity parenting. Each of the physical activity parenting practices identified were classified as authoritarian, authoritative or permissive, although many of these practices did not fall exclusively into one parenting style. Further, the psychometric properties of the instrument were not reported, nor were there any observed associations between these measures and child physical activity (King et al. 2011).
While there are existing instruments which assess one or more components of physical activity parenting, there is no instrument which effectively captures the wide range of practices that parents employ to support their child’s physical activity. Further, few instruments examine the potential influence of broader parenting styles on physical activity. Given these limitations, the development of comprehensive theory-based physical activity parenting measures is considered a priority (Sleddens et al. 2012, Davison et al. 2013).

In summary, while authoritative parenting appears to be positively associated with a broad range of desirable health outcomes among adolescents, research in the context of physical activity parenting is in its infancy and the relationship between parenting and physical activity is poorly understood. As described above, one of the key challenges associated with research in this domain is the absence of comprehensive measures of physical activity parenting.

1.9 Rationale for Current Research

The numerous benefits of physical activity, the decline in participation throughout adolescence, and the lower likelihood of girls participating compared to boys, support the need to encourage physical activity during youth, particularly among girls. To successfully promote physical activity among this group, a thorough understanding of the influences on participation is required. Whilst the impact of the broader social environment on physical activity participation has been the subject of much research, relatively few constructs in this domain have shown consistent associations with physical activity, highlighting the need for further research in this area. Further, there exists little research on whether variables relating to parenting style and practices impact upon children’s and adolescents’ physical activity participation, despite a wealth of research into associations between family environmental variables and generic health outcomes.

An additional challenge in examining this area is the measurement of parenting style and practices in relation to physical activity. Research in the field of child
nutrition has led to the development of comprehensive measures to assess parenting styles and practices in relation to child feeding behaviour (Hughes et al. 2005), but few such measures exist for the assessment of these concepts in a physical activity context (Sleddens et al. 2012). Further, few existing measures of physical activity parenting provide data on their psychometric properties.

Although a number of the theories of parenting and family functioning provide useful frameworks for considering child development and generic health outcomes, they do not necessarily incorporate the vast array of personal and physical environmental determinants known to influence physical activity participation. Therefore, the Family Influence Model will be used as a framework for examining those family characteristics, such as parenting style and parental beliefs, that have not previously been extensively investigated in a physical activity context.

1.9.1 Aims

This thesis will make a unique contribution to the literature by determining the association between parenting and girls’ physical activity, particularly during the transition from childhood to adolescence, and identifying those parenting practices which may maintain or increase physical activity participation among adolescent girls. Further, this thesis aims to develop measures to assess parenting styles and practices in relation to physical activity, and test these measures within a cross-sectional study of adolescent girls and their parents. As described previously, while authoritative parenting appears to be important for healthy adolescent development, research in relation to physical activity parenting is insufficiently robust to support the development of hypotheses at this juncture.

1.9.2 Research questions

This thesis will address the following research questions:

1. How are the four parenting styles developed by Baumrind (authoritative, authoritarian, indulgent, neglectful) associated with physical activity among girls?
2. What types of parenting practices do parents employ in relation to their daughter’s physical activity?

3. What are the psychometric properties of the physical activity parenting measures developed as a result of research question 2?

4. Are the physical activity parenting measures developed as a result of research question 2 associated with physical activity among adolescent girls?
CHAPTER 2: ASSOCIATIONS BETWEEN PARENTING STYLE
AND GIRLS’ PHYSICAL ACTIVITY¹

2.1 Introduction

As identified in the previous chapter, the numerous benefits of physical activity
(Janssen & LeBlanc 2010, Parfitt & Eston 2005, Fox et al. 2010), the decline in
participation throughout adolescence (Riddoch et al. 2004, Bélanger et al. 2009b),
and the lower likelihood of girls participating compared with boys (Hardy 2011,
Martin et al. 2008), make promotion of physical activity during youth, particularly
among girls, an important priority. While numerous social environmental
influences on physical activity participation have been investigated (Gustafson &
2000), few variables have been consistently associated with physical activity
among adolescent girls, hence further research in this area is imperative.

While there exists little research on whether variables relating to parenting style
impact upon children and adolescents’ physical activity participation, associations
between parenting styles and various health outcomes have been identified
(Newman et al. 2008). An authoritative parenting style has been shown to be
protective against adolescent drug use (Baumrind 1991) and authoritative
parenting has been consistently associated with positive psychological and
cognitive outcomes for children (Grigorenko & Sternberg 2001). Research
suggests that authoritative feeding practices are associated with child consumption
of fruit and vegetables (Patrick & Nicklas 2005) and authoritarian parenting is

¹ Preliminary results from this study have been:
   a) Presented at the Australasian Society of Behavioural Health and Medicine (ASBHM)
      Scientific Conference in Auckland, February 2006 (see Appendix 1), and awarded the
      ASBHM Public Health Poster Award;
   b) Presented at the International Society for Behavioral Nutrition and Physical Activity
      (ISBNPA) Annual Scientific Meeting in Texas, May 2012 (see Appendix 2); and,
   c) Published in the International Journal of Behavioral Nutrition and Physical Activity,
      2012, 9:141 (see Appendix 3) and awarded the Deakin University Neil Archbold
      Memorial Travel Award and Medal for its contribution to the field.
associated with risk of overweight among young children (Rhee et al. 2006). It may be that parenting style is more strongly associated with certain domains or types of adolescent physical activity (for example, organised sport); however, no studies have specifically examined how parenting style influences physical activity (in particular among girls), nor have many physical activity-specific parenting practices been identified. Further, it is possible that physical activity is more strongly associated with parenting style during periods when adolescents are more likely to be with their parents, for example on weekends and in the after-school period; however this concept has not been examined in the literature to date.

Given the considerable impact of parenting style on child and adolescent health, and the known associations between other aspects of the family environment (such as provision of support and direct help from parents) and physical activity, it is reasonable to expect there may be an association between parenting style and adolescents’ physical activity.

2.2 Aims

Study 1 involved secondary analyses of an existing dataset and aimed to:

1. Examine cross-sectional and longitudinal associations between parenting style and frequency and duration of participation in organised sport, number of walking/cycling trips undertaken per week and MVPA participation among adolescent girls; and,

2. Examine interactions between socio-demographic factors, parenting style, and organised sport, walking/cycling trips and MVPA.

2.3 Method

These analyses were based on a sub-sample from the Children Living in Active Neighbourhoods (CLAN) cohort study (Timperio et al. 2010, Timperio et al. 2008). The study used a combination of self-report questionnaires completed by parents and adolescents, and accelerometry data collected from children and
adolescents to examine contextual influences on physical activity. This study had three waves of data collection from two cohorts of children and their parents. The first (baseline) occurred in 2001, the second in 2004 and the third in 2006. The younger cohort was aged 5-6 (Prep) at baseline, and the older cohort was aged 10-12 (grades 5-6) at baseline. This present study utilised data from girls in the older cohort in the 2004 and 2006 data collection periods.

2.3.1 Ethics

Ethics approval for the Children Living in Active Neighbourhoods Study was received from Deakin University Human Research Ethics Committee (2001: EC 114-2000; 2004 and 2006: EC 40-2003) and the then Department of Education and Training and the Catholic Education Office. As the current study (Study One: Associations between parenting style and girls’ physical activity) was a secondary analysis of the data collected in CLAN, no further ethical approval was required.

2.3.2 Sample selection and recruitment

In 2001, 919 10-12 year old children and their parents were recruited through 19 state primary schools in high (n=10) and low (n=9) socioeconomic areas in Melbourne, Victoria. Stratified random sampling, proportionate to school size, was used to select schools. Schools who did not agree to participate were replaced by the next school on the randomly generated list (Timperio et al. 2004a). Children in Grade Prep and Grades 5 and 6 in each school were provided with information and consent forms to take home to their parents. Only those families who returned consent forms for the responding parent and on behalf of their child were included in the study (Timperio et al. 2004a). Data were collected between July and December 2001.

Participants were asked to provide their contact details (and, in the event that they moved, contact details of a close friend/relative) if they agreed to be re-contacted to participate in follow up data collections. In 2004, 222 adolescent girls and their parents participated in a 3-year follow up. Data were collected between July and December 2004. In 2006, 169 adolescent girls and/or their parents participated in
a second follow up, with data collection occurring between July and December 2006.

While data on physical activity were collected in 2001, 2004 and 2006, parenting style measures were collected in 2004 only, so the 2004 data served as a baseline for the current analyses with the 2006 data serving as the follow up.

### 2.3.3 Measures

#### Survey measures

Participating families were sent an adult and an adolescent survey, which was to be completed then returned to the research team when they visited either the school or the home to fit accelerometers to participating adolescents. The parents or carers completed the adult survey, which included socio-demographic items and items relating to parenting style, while adolescents completed a survey including items relating to organised sport participation and walking and cycling to school. Each participant was sent two movie vouchers as compensation for their time participating in the study. These vouchers were sent with participants’ personal summaries of their accelerometer results once data collection was complete. Those participants who forgot to return their surveys when the researchers visited were given a further opportunity to return completed surveys a week later when the researchers visited again to collect the accelerometer.

#### Parent survey

**Socio-demographic items**

Parents or carers reported demographic characteristics including their relationship to the child in the study, age, educational attainment (collapsed into some secondary school or less; completed secondary school, technical college or apprenticeship; university/tertiary qualification), employment status (collapsed into employed full-time; employed part-time; home duties full-time/other) and
family status (single or dual carer family). Family status was recorded as dual
carer if the responding parent/carer answered questions about their co-carer who
lives with them, and those parents who did not record responses to these questions
were identified as single carer.

Parenting style

Parents responded to twenty-two items about their parenting style (Table 2.1).
Response options on a five-point scale were: never (1); rarely (2); sometimes (3);
often (4) to always (5). These items were adapted from those developed by
Baumrind (Baumrind 1971). Test-retest reliability was determined in a sub-
sample of students (n=66) and their parents (n=66) from two Melbourne
secondary schools for each of the parenting style items, with most having fair to
substantial ICCs as shown in Table 2.1 (Brown et al. 2004).
### Table 2.1: Reliability of parent-reported parenting style items

<table>
<thead>
<tr>
<th>Items</th>
<th>ICCs*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I let my child express feelings about being punished or restricted</td>
<td>.326</td>
</tr>
<tr>
<td>I listen to reasons why my child might not want to do something that I ask him/her to do</td>
<td>.514</td>
</tr>
<tr>
<td>I encourage my child to tell me what he/she is thinking</td>
<td>.545</td>
</tr>
<tr>
<td>I make decisions in consultation with my child</td>
<td>.456</td>
</tr>
<tr>
<td>I tell my child how happy he/she makes me</td>
<td>.737</td>
</tr>
<tr>
<td>I am consistent with my discipline techniques</td>
<td>.347</td>
</tr>
<tr>
<td>I make clear rules for my child to follow</td>
<td>.449</td>
</tr>
<tr>
<td>I give my child reasons for my directions</td>
<td>.583</td>
</tr>
<tr>
<td>I am clear about my parental role</td>
<td>.353</td>
</tr>
<tr>
<td>I use a gentle manner with my child</td>
<td>.570</td>
</tr>
<tr>
<td>I confront my child when he/she does not do as I say</td>
<td>.444</td>
</tr>
<tr>
<td>I punish my child for disobedience</td>
<td>.722</td>
</tr>
<tr>
<td>I am firm with my child</td>
<td>.492</td>
</tr>
<tr>
<td>I have the final say with my child</td>
<td>.391</td>
</tr>
<tr>
<td>I see to it that my child does what he/she is told</td>
<td>.258</td>
</tr>
<tr>
<td>I let myself be talked out of things by my child</td>
<td>.179</td>
</tr>
<tr>
<td>I ignore my child’s misbehaviour</td>
<td>.480</td>
</tr>
<tr>
<td>My child nags me into changing my mind</td>
<td>.328</td>
</tr>
<tr>
<td>My child wins arguments with me</td>
<td>.422</td>
</tr>
<tr>
<td>I become annoyed/impatient when my child disobeys me</td>
<td>.598</td>
</tr>
<tr>
<td>I become irritated/annoyed when my child dawdles or is annoying</td>
<td>.647</td>
</tr>
<tr>
<td>I avoid open confrontation with my child</td>
<td>.563</td>
</tr>
</tbody>
</table>

*ICC values for test-retest reliability for parent-reported parenting style items

**Adolescent survey**

**Organised sport participation**

Organised sport was assessed via self-report survey items adapted from the Adolescent Physical Activity Recall Questionnaire (APARQ) (Booth et al. 2002b), which asked the adolescent to list each organised physical activity they were involved in during summer and winter respectively, the average number of times per week they participated, and the average duration each time they participated. The reliability and validity of the APARQ has previously been
assessed (Booth et al. 2002b) with the authors concluding it has acceptable validity when compared with performance on the multistage fitness test and acceptable reliability. More specifically, among grade 8 girls, test-retest reliability assessment showed a 90% and 83% agreement between test 1 and test 2 for summer and winter sports respectively. In relation to validity, among grade 8 girls the Spearman correlation coefficient for the association between total energy expenditure (as estimated from questionnaire responses) and laps completed on the multi-stage fitness test was 0.208 (p<0.001).

Walking and cycling trips

The number of walking/cycling trips undertaken in a usual week was assessed via a self-report item listing sixteen common destinations (e.g. friends’ houses, sport venues, skate ramps, school and parks) and asking adolescents to report how frequently they walked or cycled to each of these destinations. These items have previously been found to have acceptable reliability, with percent agreement reported as >= 73% for each item (Timperio et al. 2006). Response options (with scores assigned to each response in parentheses) were: it’s not within walking/riding distance (0); never/rarely (0); less than once/week (0); 1-2 times/week (1); 3-4 times/week (3); 5-6 times/week (5); and daily (7).

Accelerometry

Moderate- to vigorous-intensity physical activity

Moderate- to vigorous-intensity physical activity (MVPA) was assessed using Manufacturing Technology Inc. (MTI) accelerometers (Actigraph Model 7164-2.2), a device that provides an objective measure of duration and intensity of physical activity with real time data storage capabilities (Welk et al. 2004). Previous research indicates that accelerometry is a valid and reliable method of measuring children’s physical activity (Janz et al. 1995) and that four or more days of monitoring are required to approximate an average week (Janz et al. 1995, Cain et al. 2013). Participants in this study were requested to wear their
accelerometer on a belt at their right hip for 8 days, only removing it for aquatic activities, bathing and sleeping.

**Weight status**

Anthropometric measurements were taken by researchers when they visited the child’s school or home to fit accelerometers to participants using a portable stadiometer and digital scale. Height and weight were measured to the nearest 0.1cm and 0.1kg respectively using standardised procedures (Timperio et al. 2010). Participants who had moved away from Melbourne at follow up (7%) were weighed and measured by their parents, with instructions provided by the researchers (Timperio et al. 2008).

### 2.3.4 Data management

Data were managed and analysed using IBM SPSS Statistics Version 19 (2010).

**Parenting style**

Categories of parenting style were created using factor analysis (principal component analysis with varimax rotation). With the exception of three items, all items loaded onto one of four factors (categories) with Eigenvalues >1 (Table 2.2). The items which did not load onto any factors were ‘I become annoyed/impatient when my child disobeys me’, ‘I become irritated/annoyed when my child dawdles or is annoying’ and ‘I avoid open confrontation with my child’. As these items represented actions rather than parenting styles as such, and did not load onto any single factor, they were excluded from analyses.

The four factors identified reflected the parenting styles indulgent, authoritarian, authoritative and neglectful as previously described in the literature (Baumrind 1991, Steinberg et al. 1994, Lamborn et al. 1991, Maccoby & Martin 1983). In order to develop standardised scales which could be compared across all four parenting styles, average scores for each participant for each of the four parenting
styles were created. The indulgent, authoritative and authoritarian scales each contained five items, so scores for the items in each scale were summed and divided by five. Cases which were missing more than two items from any one of these scales were excluded from analysis. The neglectful parenting scale contained four items. Scores for these items were summed and divided by four. Cases with more than one item missing from the neglectful parenting scale were excluded.

The internal reliability of each parenting style was assessed, with Cronbach’s alpha scores ranging from 0.63 for a neglectful parenting style to 0.77 for an indulgent parenting style, which is considered acceptable (Sim & Wright 2000). Analyses indicated that none of the Cronbach’s alphas would have increased with removal of any of the items from the scales. While several individual items had ICCs below 0.4, these items were retained in the analysis due to their contribution to the overall parenting style scales.
<table>
<thead>
<tr>
<th>Items</th>
<th>Indulgent</th>
<th>Authoritative</th>
<th>Authoritarian</th>
<th>Neglectful</th>
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</thead>
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<tr>
<td>I let my child express feelings about being punished or restricted</td>
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<td>.731</td>
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<tr>
<td>I encourage my child to tell me what he/she is thinking</td>
<td>.692</td>
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<td>I make decisions in consultation with my child</td>
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<td>I am consistent with my discipline techniques</td>
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<td>I make clear rules for my child to follow</td>
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<td>I give my child reasons for my directions</td>
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<td>I am clear about my parental role</td>
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<td>I punish my child for disobedience</td>
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<td>I am firm with my child</td>
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<td>I have the final say with my child</td>
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<td>I see to it that my child does what he/she is told</td>
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<td>I let myself be talked out of things by my child</td>
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<td>My child wins arguments with me</td>
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**Eigenvalue**

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<th>1.84</th>
<th>1.22</th>
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<td>% variance</td>
<td>21.2</td>
<td>13.9</td>
<td>8.4</td>
<td>5.5</td>
</tr>
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</table>

**Mean score for each parenting style (SD)**

<table>
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<th></th>
<th>3.98 (0.55)</th>
<th>4.08 (0.46)</th>
<th>3.58 (0.57)</th>
<th>2.39 (0.53)</th>
</tr>
</thead>
</table>

**Cronbach’s alpha for each parenting style**

|            | 0.77 | 0.73 | 0.70 | 0.63 |

*Range is 1-5, with higher values indicating higher presentation of these characteristics
For General Linear Modelling (GLM) analyses, scores were dichotomised at the mean for each parenting style. Those scores falling below the mean were classified as “low” and those above the mean as “high” for each parenting style.

**Organised sport participation**

Organised sport data were cleaned and truncated consistent with procedures used by Booth and colleagues (2002b). Where it was clear that the participant had reported total time spent at a venue as opposed to actual time competing, competition time was divided by two for tennis and by six for swimming, gymnastics and martial arts. For example, if a participant indicated that they participated in tennis for four hours once per week, the total time of 240 minutes was divided by two to give 120 minutes. Further, where it was clear that the participant had reported total time spent in an activity, rather than the average time spent in an activity each time they do it, the total duration was divided by the frequency to give the average duration. For example, if a student reported participating in dancing five times a week for 300 minutes each time, this was corrected to five times a week, 60 minutes each time. Where participants had not reported any organised sport, but had completed other items, responses were coded as zero rather than missing.

Total frequency and duration of organised sport participation in summer and winter terms were computed for each participant, by summing all reported frequencies and durations of activities in summer and winter respectively. The average frequency and duration of organised sport across the whole year was calculated by summing the totals for summer and winter then dividing by two. Missing data were excluded from analysis.

**Walking and cycling trips**

The frequency of walking/cycling trips in a usual week was calculated by summing the number of trips per week to each destination. Missing data were excluded from analysis.
Moderate- to vigorous-intensity physical activity (MVPA)

Due to fitting of the accelerometer, data from day one were removed as it represented incomplete data. Wear-time was calculated as 24 hours minus all periods with >20 minutes of consecutive zeroes. Days where wear-time was >= 8 hours and <300 minutes of vigorous activity was recorded were included as valid days. Participants with four or more valid days (including one or more weekend day) were included in weekly MVPA analyses (Cain et al. 2013), while those with three or more valid weekdays were included in weekday analyses and those with one or more valid weekend days were included in weekend analyses. Participants with three or more valid days were included in critical window analyses. Total counts per minute were converted into duration of movement at various intensities according to the age-specific cutpoints utilised by Freedson and colleagues (2005), using a custom-designed data reduction program. Moderate-intensity activity was defined as 4.0-5.9 METs and vigorous-intensity as 6.0 METs and above (Trost et al. 2011). Minutes per day in MVPA were calculated by summing the minutes spent in moderate activity and the minutes spent in vigorous activity. Average duration of MVPA on weekdays, weekend days, and across the week was calculated. MVPA recorded during the ‘critical window’ or after-school period, from 3pm to 6pm, was also calculated.

Weight status

Body mass index (BMI) was computed (kg/m²) and participants were classified as ‘not overweight’, or ‘overweight/obese’ using sex and age-specific BMI cutpoints, as proposed by Cole and colleagues (2000).

Data transformation

Organised sport, walking/cycling trips and MVPA data from 2004 and 2006 were all positively skewed and were therefore transformed, with the square root transformation best approximating a normal distribution for all physical activity variables. Transformed data were used for all statistical analyses and generation of
p-values. Unless specified otherwise, transformed data have been reported in tables, with corresponding raw values described in text for ease of interpretation.

2.3.5 Statistical analyses

Descriptive statistics were used to determine the demographic characteristics of the sample. Separate bivariate linear regression models were generated to assess cross-sectional associations between independent (parenting style) and dependent (organised sport, MVPA and walking/cycling trips respectively) variables. GLM was employed to examine interactions between 1) specific socio-demographic variables and parenting style and organised sport; 2) specific socio-demographic variables and parenting style and walking/cycling trips and 3) specific socio-demographic variables and parenting style and MVPA. Where a significant interaction was identified, the estimated marginal means were plotted to illustrate the interaction.

For the longitudinal analyses, paired t-tests were used to describe changes in physical activity from 2004 to 2006 and bivariate linear regression models were performed to examine associations between parenting style in 2004 and physical activity in 2006. Where specific socio-demographic variables were associated with the outcome, they were controlled for in analyses. Baseline physical activity was controlled for in longitudinal analyses, and all analyses for MVPA were adjusted for accelerometer wear time.

To maximise the baseline sample size, cross-sectional analyses were performed using all available data rather than restricting the sample only to those who also participated in 2006. There were no significant differences in any of the variables examined between the 166 girls and/or their parents who were retained in the sample from 2004 to 2006 and those who were lost to follow up (n=56). For all analyses, a p-value of <0.05 was used to denote statistical significance.
2.4 Results

2.4.1 Demographic characteristics

In 2004, the mean age of the girls in the sample (n=222) was 14.5 years. Most were not overweight or obese, with 74% of girls having a BMI within the normal weight range. The mean age of the responding parent (n=222) was 43.9 years, the majority were mothers (87%), employed either full-time or part-time (77%) and were part of a dual carer family (80%). Almost half (44%) had completed a university or tertiary qualification (Table 2.3).

Table 2.3: Demographic characteristics of the cross-sectional and longitudinal samples in 2004

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Cross-sectional*</th>
<th>Longitudinal*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N=222)</td>
<td>Followed up</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(N=166)</td>
</tr>
<tr>
<td>Mean age of daughter (years)a</td>
<td>14.5</td>
<td>14.4</td>
</tr>
<tr>
<td>Daughter’s BMI (%)b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal weight</td>
<td>74.1</td>
<td>74.0</td>
</tr>
<tr>
<td>Overweight/obese</td>
<td>25.9</td>
<td>26.0</td>
</tr>
<tr>
<td>Mean age of parent (years)a</td>
<td>43.9</td>
<td>44.1</td>
</tr>
<tr>
<td>Relationship to child (%)b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>86.5</td>
<td>85.5</td>
</tr>
<tr>
<td>Parental employment status (%)b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>37.3</td>
<td>39.0</td>
</tr>
<tr>
<td>Part-time</td>
<td>39.5</td>
<td>38.4</td>
</tr>
<tr>
<td>Home duties/other</td>
<td>23.2</td>
<td>22.6</td>
</tr>
<tr>
<td>Parental education (%)b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University/tertiary</td>
<td>44.2</td>
<td>47.5</td>
</tr>
<tr>
<td>Completed secondary school</td>
<td>32.3</td>
<td>29.0</td>
</tr>
<tr>
<td>Some secondary school or less</td>
<td>23.5</td>
<td>23.5</td>
</tr>
<tr>
<td>Family status (%)b</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single carer</td>
<td>20.3</td>
<td>17.5</td>
</tr>
<tr>
<td>Dual carer</td>
<td>79.7</td>
<td>82.5</td>
</tr>
</tbody>
</table>

*a independent samples t-test; b chi square test; * missing cases excluded
2.4.2 Physical activity participation

Participation in organised sport, number of walking/cycling trips and MVPA in 2004 and 2006 is presented in Table 2.4. Significant decreases in all organised sport and MVPA variables were observed between 2004 and 2006, while the number of weekly walking/cycling trips increased significantly (p<0.001).

Table 2.4: Frequency and duration of weekly organised sport participation, weekly number of walking and cycling trips and daily MVPA participation in 2004 and 2006

<table>
<thead>
<tr>
<th></th>
<th>Cross-sectional</th>
<th>Longitudinal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Organised sport</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Frequency (times/week)</td>
<td>4.5 (4.1)</td>
<td>4.4 (3.8)</td>
</tr>
<tr>
<td>Duration (hrs &amp; mins/week)</td>
<td>5h06m (4h30m)</td>
<td>5h01m (4h19m)</td>
</tr>
<tr>
<td>Walking/cycling trips</td>
<td>6.8 (7.3)</td>
<td>7.3 (7.6)</td>
</tr>
<tr>
<td>Trips per week</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVPA (mins/period)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average day</td>
<td>38.3 (18.1)</td>
<td>39.4 (18.2)</td>
</tr>
<tr>
<td>Weekdays</td>
<td>42.2 (20.3)</td>
<td>44.8 (20.6)</td>
</tr>
<tr>
<td>Weekend days</td>
<td>26.1 (34.0)</td>
<td>24.7 (29.5)</td>
</tr>
<tr>
<td>Critical window (3-6pm)</td>
<td>13.1 (9.9)</td>
<td>14.1 (10.7)</td>
</tr>
</tbody>
</table>

2.4.3 Associations between socio-demographics and physical activity

There were no associations between parent employment status or parent education, and any of the organised sport, walking/cycling trips or MVPA variables in 2004. Family status was associated with walking/cycling trips (B = -0.528, p<0.01), but not with organised sport or MVPA. Where applicable, this association was controlled for in cross-sectional and longitudinal analyses.
2.4.4 Cross-sectional associations between socio-demographics and parenting style

A number of associations between socio-demographic variables and parenting style were observed (Table 2.5). Family status was significantly associated with an authoritarian parenting style (p<0.05), with single parents less likely to be authoritarian than dual parents. Parent employment status was associated with an authoritative parenting style, with responding parents who were at home full-time more likely to be authoritative than those who worked part-time (p<0.01) or full-time (p<0.05). The association between parental employment and indulgent parenting approached significance (p=0.05), with responding parents who were at home full-time more likely to be indulgent than those who worked full-time (p=0.06) or part-time (p=0.07). Similarly, the association between parental employment status and a neglectful parenting style approached significance (p=0.07), with responding parents who were at home full-time less likely to exhibit a neglectful parenting style than those who worked part-time (p=0.06). There were no associations between parental education and parenting style.
### Table 2.5: Cross-sectional associations between socio-demographics and parenting style

<table>
<thead>
<tr>
<th>Parental employment status</th>
<th>Authoritarian (N=220)</th>
<th>p-value</th>
<th>Authoritative (N=219)</th>
<th>p-value</th>
<th>Indulgent (N=220)</th>
<th>p-value</th>
<th>Neglectful (N=219)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time</td>
<td>81 3.53 (0.56)</td>
<td></td>
<td>80 4.06 (0.51)</td>
<td>§</td>
<td>81 3.92 (0.56)</td>
<td>†</td>
<td>80 2.39 (0.53)</td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>87 3.59 (0.60)</td>
<td>¥</td>
<td>87 4.01 (0.41)</td>
<td>‡</td>
<td>87 3.93 (0.57)</td>
<td>†</td>
<td>87 2.46 (0.57)</td>
<td>§</td>
</tr>
<tr>
<td>Home duties/other</td>
<td>50 3.63 (0.57)</td>
<td>0.63</td>
<td>50 4.25 (0.41)</td>
<td>§¥</td>
<td>0.01 50 4.14 (0.47)</td>
<td>†‡</td>
<td>0.05 50 2.25 (0.44)</td>
<td>†</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parental education</th>
<th>Authoritarian (N=220)</th>
<th>p-value</th>
<th>Authoritative (N=219)</th>
<th>p-value</th>
<th>Indulgent (N=220)</th>
<th>p-value</th>
<th>Neglectful (N=219)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>University/tertiary</td>
<td>95 3.58 (0.59)</td>
<td></td>
<td>94 4.13 (0.45)</td>
<td></td>
<td>95 4.01 (0.54)</td>
<td></td>
<td>94 2.44 (0.56)</td>
<td></td>
</tr>
<tr>
<td>Completed secondary school</td>
<td>70 3.54 (0.60)</td>
<td></td>
<td>70 4.07 (0.42)</td>
<td></td>
<td>70 3.94 (0.57)</td>
<td></td>
<td>70 2.34 (0.53)</td>
<td></td>
</tr>
<tr>
<td>Some secondary school or less</td>
<td>50 3.62 (0.52)</td>
<td>0.70</td>
<td>50 3.97 (0.48)</td>
<td>0.12</td>
<td>50 3.92 (0.52)</td>
<td>0.52</td>
<td>50 2.35 (0.49)</td>
<td>0.46</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Family status</th>
<th>Authoritarian (N=220)</th>
<th>p-value</th>
<th>Authoritative (N=219)</th>
<th>p-value</th>
<th>Indulgent (N=220)</th>
<th>p-value</th>
<th>Neglectful (N=219)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single carer</td>
<td>44 3.38 (0.55)</td>
<td>§</td>
<td>44 4.06 (0.44)</td>
<td></td>
<td>44 3.99 (0.61)</td>
<td></td>
<td>44 2.40 (0.56)</td>
<td></td>
</tr>
<tr>
<td>Dual carer</td>
<td>176 3.63 (0.57)</td>
<td>0.01</td>
<td>175 4.06 (0.46)</td>
<td>0.79</td>
<td>176 3.97 (0.53)</td>
<td>0.86</td>
<td>175 2.38 (0.52)</td>
<td>0.86</td>
</tr>
</tbody>
</table>

\*0.1>p>=0.05; \#p<0.05; \$p<0.01: Analysis of variance with Tukey HSD post hoc tests
2.4.5 Cross-sectional associations between parenting style and physical activity

Table 2.6 describes cross-sectional bivariate associations between physical activity variables and parenting style in 2004. An authoritarian parenting style was positively associated with frequency of organised sport participation (p<0.05), with each unit increase in authoritarian parenting resulting in 1.1 additional instances of organised sport participation per week. The number of walking/cycling trips per week was inversely associated with authoritative (p<0.05) and indulgent (p<0.01) parenting, with each unit increase in authoritative parenting resulting in 2.0 fewer walking/cycling trips per week and each unit increase in indulgent parenting resulting in 2.9 fewer walking/cycling trips per week. There was a trend towards an increased duration of organised sport with authoritarian parenting, although this finding was not statistically significant. There were no statistically significant associations between parenting style and MVPA on average days, weekdays, weekend days or the after-school period.
Table 2.6: Bivariate associations between parenting style and organised sport, number of walking/cycling trips and MVPA in 2004

<table>
<thead>
<tr>
<th>Parenting style</th>
<th>Org sport frequency/wk</th>
<th>Org sport duration/wk</th>
<th># walking/cycling trips/wk</th>
<th>Mins MVPA average day</th>
<th>Mins MVPA weekdays</th>
<th>Mins MVPA weekend days</th>
<th>Mins MVPA after-school period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
</tr>
<tr>
<td></td>
<td>(n=203)</td>
<td>(n=202)</td>
<td>(n=222)</td>
<td>(n=140)</td>
<td>(n=152)</td>
<td>(n=125)</td>
<td>(n=148)</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>0.27 (0.02, 0.52)*</td>
<td>1.94 (-0.14, 4.03)</td>
<td>-0.05 (-0.40, 0.31)</td>
<td>0.07 (-0.36, 0.50)</td>
<td>-0.27 (-0.69, 0.15)</td>
<td>0.50 (-0.33, 1.34)</td>
<td>-0.18 (-0.53, 0.16)</td>
</tr>
<tr>
<td>Authoritative</td>
<td>0.04 (-0.28, 0.36)</td>
<td>0.62 (-2.04, 3.28)</td>
<td>-0.45 (-0.88, -0.02)*</td>
<td>0.03 (-0.51, 0.56)</td>
<td>-0.08 (-0.61, 0.46)</td>
<td>0.21 (-0.83, 1.25)</td>
<td>0.00 (-0.44, 0.44)</td>
</tr>
<tr>
<td>Indulgent</td>
<td>0.15 (-0.12, 0.41)</td>
<td>1.26 (-0.94, 3.46)</td>
<td>-0.56 (-0.92, -0.20)**</td>
<td>-0.17 (-0.62, 0.27)</td>
<td>-0.41 (-0.85, 0.03)</td>
<td>0.44 (-0.43, 1.31)</td>
<td>-0.20 (-0.56, 0.17)</td>
</tr>
<tr>
<td>Neglectful</td>
<td>-0.21 (-0.48, 0.07)</td>
<td>-1.35 (-3.64, 0.94)</td>
<td>0.16 (-0.22, 0.54)</td>
<td>-0.05 (-0.51, 0.42)</td>
<td>0.09 (-0.56, 0.37)</td>
<td>0.29 (-0.61, 1.19)</td>
<td>0.11 (-0.27, 0.48)</td>
</tr>
</tbody>
</table>

* controlling for family status; † MVPA analyses adjusted for wear time; *p<=0.05; **p<0.01; transformed data reported in table: Simple linear regression models
In multiple regression analyses, an indulgent parenting style was significantly inversely associated (p<0.05) with walking/cycling trips (B = -2.83; 95% CI (-4.80, -0.86)).

2.4.6 Interactions between parenting style and physical activity according to socio-demographics characteristics

A number of significant interactions were found between socio-demographics, parenting styles and physical activity in 2004 (Figures 2.1-2.6).

Family status

A significant interaction was found between family status and an authoritarian parenting style with walking/cycling trips (F=4.378, p=0.038), with children of single carers who were less authoritarian participating in more walking/cycling trips per week than other children (Figure 2.1).

Figure 2.1: Interaction between family status, authoritarian parenting and walking/cycling trips

Children of single carers who were more authoritative participated in more daily MVPA (F=3.988, p=0.048) and weekday MVPA (F=6.265, p=0.013) (Figure 2.2) than other children, while children of single carers who were less neglectful participated in more daily MVPA (F=5.059, p=0.026), more weekday MVPA
(F=5.236, p=0.024) and more MVPA in the after school period (F=5.196, 
p=0.024) (Figure 2.3) than other children. Children of single carers who were 
more indulgent participated in less daily MVPA than their counterparts (F=5.009, 
p=0.027) (Figure 2.4).

**Figure 2.2:** Interaction between family status, authoritative parenting and 
a) daily MVPA and b) MVPA on week days

**Figure 2.3:** Interaction between family status, neglectful parenting and a) daily MVPA, b) MVPA on weekdays and c) MVPA after school
Figure 2.4: Interaction between family status, indulgent parenting and daily MVPA

Education

Children of responding carers who had completed some secondary school and were more indulgent participated in more MVPA on weekend days than other children (F=5.427, p=0.006) (Figure 2.5).

Figure 2.5: Interaction between parental education, indulgent parenting and MVPA on weekend days
Employment

Children of responding carers who were at home full-time and were less authoritarian participated in a shorter duration (F=4.606, p=0.011) and lower frequency (F=5.664, p=0.004) of organised sport each week and less weekend PA than their counterparts (F=4.061, p=0.020) (Figure 2.6).

Figure 2.6: Interaction between parental employment, authoritarian parenting and a) organised sport duration, b) organised sport frequency and c) MVPA on weekend days

There were no further significant interactions between parenting styles and physical activity according to demographic characteristics.
2.4.7 Longitudinal associations between parenting style and physical activity

Table 2.7 describes associations between parenting style in 2004 and physical activity variables in 2006. Baseline physical activity was controlled for in all analyses. Family status was controlled for in all walking/cycling analyses, and all MVPA analyses were adjusted for accelerometer wear time. No statistically significant associations were found. However, a number of associations approached significance, including an authoritative parenting style and walking and cycling trips (positive association, $p=0.09$) and MVPA in the after school period (inverse association, $p=0.07$), and inverse associations between a neglectful parenting style and frequency ($p=0.05$) and duration ($p=0.05$) of organised sport.

The ‘n’ listed under each physical activity variable is the minimal sample available for that variable in either 2004 or 2006. For each physical activity variable, the difference in the number of participants providing valid data in 2004 and 2006 ranged from 1 to 11. To improve statistical power, however, all participants who provided data in 2006 were included in the analyses, irrespective of whether they had provided data for all physical activity variables in 2004.
Table 2.7: Bivariate associations between parenting style in 2004 and organised sport, number of walking/cycling trips and MVPA in 2006

<table>
<thead>
<tr>
<th>Parenting style</th>
<th>Org sport frequency/wk Estimate (95% CI)</th>
<th>Org sport duration/wk Estimate (95% CI)</th>
<th># walking/cycling trips/ wk* Estimate (95% CI)</th>
<th>Mins MVPA average day Estimate (95% CI)</th>
<th>Mins MVPA weekdays Estimate (95% CI)</th>
<th>Mins MVPA weekend days Estimate (95% CI)</th>
<th>Mins MVPA after school period Estimate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=162)</td>
<td>(n=161)</td>
<td>(n=166)</td>
<td>(n=108)</td>
<td>(n=118)</td>
<td>(n=94)</td>
<td>(n=116)</td>
</tr>
<tr>
<td>Authoritarian</td>
<td>-0.18 (-0.42, 0.06)</td>
<td>-1.05 (-3.11, 1.02)</td>
<td>0.09 (-0.23, 0.41)</td>
<td>-0.22 (-0.78, 0.35)</td>
<td>-0.12 (-0.64, 0.40)</td>
<td>-0.06 (-1.15, 1.04)</td>
<td>-0.31 (-0.70, 0.08)</td>
</tr>
<tr>
<td>Authoritative</td>
<td>-0.00 (-0.33, 0.32)</td>
<td>-0.19 (-2.96, 2.58)</td>
<td>0.36 (-0.06, 0.78)</td>
<td>-0.35 (-1.09, 0.39)</td>
<td>-0.46 (-1.15, 0.23)</td>
<td>0.12 (-1.33, 1.57)</td>
<td>-0.48 (-1.01, 0.04)</td>
</tr>
<tr>
<td>Indulgent</td>
<td>0.05 (-0.20, 0.31)</td>
<td>0.74 (-1.40, 2.89)</td>
<td>0.21 (-0.13, 0.54)</td>
<td>-0.27 (-0.85, 0.30)</td>
<td>-0.28 (-0.81, 0.26)</td>
<td>-0.13 (-1.26, 0.99)</td>
<td>-0.26 (-0.67, 0.15)</td>
</tr>
<tr>
<td>Neglectful</td>
<td>-0.27 (-0.55, 0.00)</td>
<td>-2.30 (-4.64, 0.04)</td>
<td>0.12 (-0.24, 0.48)</td>
<td>0.10 (-0.74, 0.53)</td>
<td>0.09 (-0.50, 0.68)</td>
<td>-0.56 (-1.77, 0.65)</td>
<td>0.06 (-0.40, 0.51)</td>
</tr>
</tbody>
</table>

Baseline physical activity controlled for in all analyses; MVPA analyses adjusted for wear time; *controlling for family status; transformed data reported in table: Simple linear regression models
2.5 Discussion

This study aimed to identify cross-sectional and longitudinal associations between parenting style and a broad range of physical activity outcomes among adolescent girls, including participation in organised sport, walking/cycling trips and objectively assessed MVPA. Further, the study sought to identify possible interactions between socio-demographic factors, parenting style, and physical activity outcomes.

Cross-sectional analyses showed significant bivariable associations between family status and authoritarian parenting, and employment status and authoritative parenting. Further, there were cross-sectional associations between authoritative and indulgent parenting and the number of walking/cycling trips, and authoritarian parenting and frequency of organised sport. There were no significant longitudinal associations between parenting and physical activity, although a number of associations approached significance.

In relation to previous literature on parenting, there is very little research specific to physical activity with which to compare the results of the current study, although authoritative parenting has previously been positively associated with a number of favourable child and adolescent health outcomes and behaviours (Baumrind 1991). In contrast, the current study found inverse cross-sectional associations between authoritative parenting and walking/cycling trips in 2004, while the positive longitudinal association between authoritative parenting in 2004 and walking/cycling trips in 2006 approached significance. The inverse association in 2004 is possibly reflective of authoritative parents’ increased provision of support for their child, which may manifest itself in non-active transport options. The potential positive association between authoritative parenting and active transport in 2006 may reflect authoritative parents’ recognition of adolescents’ growing independence.

The current research also found an inverse association approaching significance between authoritative parenting in 2004 and MVPA in the after-school period in
Given previous findings regarding authoritative parenting and positive cognitive outcomes for children (Grigorenko & Sternberg 2001), it is possible that those parents who are more authoritative may have more of a focus on the academic opportunities for their daughters, and less on physical activity participation. Further exploring the reasons for this finding using a qualitative study design may provide an interesting focus for future research.

A positive cross-sectional association between authoritarian parenting and organised sport frequency was observed in the current study, while the positive association between authoritarian parenting and organised sport duration approached significance. It is possible this finding may be related to authoritarian parents’ placement of demands on their child, strict enforcement of rules and monitoring of behaviour (Baumrind 1991), which may be applied to their daughter’s participation in organised sport. Again, exploring this notion qualitatively may be appropriate.

The current research found an inverse cross-sectional association between indulgent parenting and the number of weekly walking/cycling trips undertaken in 2004. This may be explained by indulgent parents’ increased provision of support for their child in the form of motorised transport, thereby reducing the need for their child to use more active transport options. In the current study, each unit increase in indulgent parenting resulted in almost three fewer weekly walking/cycling trips for adolescent girls. This is a substantial amount of activity, which may represent a missed opportunity to make a contribution to achieving physical activity guidelines and overall physical activity (Saksvig et al. 2012). Investigating the nuances of this relationship may therefore be important.

Significant interactions were found between: family status, an authoritarian parenting style and number of walking/cycling trips; family status, authoritative parenting and daily and week day MVPA; family status, neglectful parenting and daily, week day and after school MVPA; family status, indulgent parenting and daily MVPA; education, indulgent parenting and MVPA on weekend days; employment, authoritarian parenting and duration and frequency of organised sport; and, employment, authoritarian parenting and weekend MVPA. These
interactions suggest the relationships between these variables are complex. They also provide direction for further research and intervention, in particular the need to better understand how physical activity practices manifest within different parenting styles and in light of personal socio-demographic circumstances. For example, single parents who exhibit low levels of authoritarian parenting may provide useful insights into how they encourage walking/cycling trips, while parents who have completed some secondary school or less and are not indulgent may require additional informational support to facilitate MVPA for their children on weekend days. Similarly, more authoritarian parents who work part-time may benefit from guidance or strategies to include organised sport in their children’s routine. Indeed, it is possible that strategies and materials to facilitate physical activity participation may need to be tailored to individual socio-economic circumstances; hence further exploration of the physical activity-specific practices employed within each of the parenting styles is required.

In the current study, longitudinal analyses revealed significant decreases in organised sport and MVPA and increases in walking/cycling trips between 2004 and 2006. These decreases in organised sport and MVPA are consistent with the literature (Australian Bureau of Statistics 2004, Cavill et al. 2001, Dovey et al. 1998, Gavarry et al. 2003, Hardy et al. 2008). In their longitudinal study of adolescent girls’ physical activity, Kimm and colleagues (2000) observed significant declines in both self-reported and objectively assessed physical activity. The consistency of observations regarding these declines among girls provides substantial evidence for the need to address physical activity among this target group.

The observed increase in active transport between 2004 and 2006 in the current study is also consistent with the literature (Salmon & Timperio 2007), and is perhaps reflective of an increased independence and ability to negotiate traffic among the sample. Given the contribution that active transport appears to make to achievement of physical activity guidelines (Tudor-Locke et al. 2002a) and overall physical activity (Saksvig et al. 2012), it is important to ensure physical and social environments continue to be supportive of active transport behaviours.
There are a number of limitations to this study. Firstly, these analyses utilised an existing dataset in which the items used to assess parenting style were global measures and were not specific to physical activity. Secondly, parent respondents were predominantly mothers, a finding which is consistent with other health-related research (Lioret et al. 2010, Siponen et al. 2013, Tandon et al. 2012). Further, the relatively small sample size, and narrow age range of participants, limits the generalisability of the findings. In particular, the samples of participants providing valid MVPA data at follow-up were small. However, in terms of demographic characteristics there were no significant differences between those who participated in 2004 and those who participated in 2006. Characteristics of non-participants at baseline were not assessed, so it is possible that non-participants were different to those who agreed to participate. However, the longitudinal nature of the study and the inclusion of objective measures of physical activity and a broad range of physical activity outcomes are methodological strengths.

It is possible that some of these limitations, in particular the sample size and the global measures of parenting style, may have contributed to a lack of significant associations. Future research should attempt to develop physical activity-specific measures of parenting styles and practices, and test these within larger, more representative samples. Further, while parenting style is a stable characteristic which is established early in a child’s life (Rhee et al. 2006), the practices implemented within these parenting styles may evolve as children age, and may vary according to personal circumstances (e.g., different socio-demographic characteristics). Therefore, investigating these influences, and physical activity-related parenting practices in particular, in a younger sample of girls may be warranted.

2.6 Conclusions

This study provides unique data on parenting styles and their influence on physical activity, and also the interactions socio-demographic characteristics have with these relationships. While few associations between parenting style and
physical activity were observed, the direction of those associations and the number of associations approaching significance suggests the need to further explore this area. The present study adds to the current body of literature on parenting styles and adolescent health outcomes by providing data on an under-researched area, and further complements existing literature on family environmental influences on physical activity.

In order to better understand the potential influence of parenting on girls’ physical activity, an in-depth exploration of these relationships is required. This may be enhanced by gaining the perspectives of parents and their daughters in relation to physical activity parenting. In particular, the identification and development of measures of parenting styles and practices specific to physical activity would augment understanding of this complex area. Further, given the significant decline in physical activity participation during the transition from childhood to adolescence, investigating these associations in girls before they reach adolescence is crucial to help inform interventions.
3.1 Introduction and Rationale

Chapter 2 described several associations between parenting styles and girls’ physical activity that were significant or approaching significance. This suggests that while there may be a relationship between overall parenting style and physical activity, and that this relationship may interact with various socio-demographic factors, further exploration of this area is required. Few studies have specifically examined how parenting style influences physical activity, and only basic physical activity-specific parenting practices, such as role modelling and provision of logistic support, have been identified (Davison et al. 2003, Jago et al. 2009b). Further, these previously identified practices have not traditionally been viewed and discussed within the broader context of parenting style. Given the limited measures of physical activity parenting identified in the literature, it is necessary to fully explore the myriad ways in which physical activity parenting may manifest. To facilitate this in-depth understanding, a qualitative approach is necessary to fully comprehend the complexities of physical activity parenting.

Qualitative approaches often occur in the natural settings of participants, and are used to investigate behaviours and beliefs that are meaningful to the participant (Savin-Baden & Major 2013). They provide rich, deep data and a contextual understanding of participants’ point of view (Liampittong & Ezzy 2005), and in a

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2 Preliminary results from this study have been:

a) Presented at the National Physical Activity Conference (NPAC) in Brisbane, October 2009 (see Appendix 4);

b) Presented at the ISBNPA Annual Scientific Meeting in Melbourne, June 2011 (see Appendix 5);

c) Presented at the Australian Conference of Science and Medicine (ACSM) in Sport in Fremantle, October 2011 (see Appendix 6); and

d) Presented at the ISBNPA Annual Scientific Meeting Pre-Conference Parenting Workshop in Houston, May 2012 (see Appendix 7).
health context are considered an appropriate method to understand and interpret health issues and human behaviour (Baum 2008). Methods of collecting qualitative data include interviews, focus groups and observation, and these methods are considered legitimate means of conducting research in the area of physical activity (Thomas et al. 2005). As such, a qualitative approach is a suitable method to further explore the range of strategies employed by parents to promote their daughter’s physical activity.

Further, while it has been suggested that parents and children are similar in their reporting of parental support for physical activity (Barr-Anderson et al. 2010), parental overestimation of children’s physical activity is common (Corder et al. 2010, Corder et al. 2012). Hence, collecting data from parents and daughters is likely to provide a more meaningful and comprehensive picture of the relationship between physical activity parenting practices and styles and girls’ physical activity.

This study (Study 2: A qualitative exploration of family and parental influences on girls’ physical activity) aimed to use a qualitative approach, in particular in-depth interviews, to further explore some of the limitations in the diversity of physical activity-related parenting styles and practices observed in Chapter 2 and the literature. The specific aims of this study are described in the following section.

3.2 Aims

This qualitative exploration of family and parental influences on girls’ physical activity involved a series of in-depth interviews and aimed to:

1. Identify parenting practices that parents employ in relation to their daughter’s physical activity;
2. Identify girls’ perceptions of their parents’ support for physical activity;
3. Examine synergies between parents’ and girls’ views of parental support for physical activity;
4. Qualitatively examine possible changes in physical activity-related parenting practices during the transition from childhood to adolescence; and,

5. Gain an in-depth understanding of how parenting style may influence girls’ physical activity.

Due to the extent of issues explored and the richness of these qualitative data, the findings relating to these aims will be presented in several chapters: Aim 1 in Chapter 4; Aim 2 in Chapter 5; and Aims 3, 4 and 5 in Chapter 6. An overview of the methods used will be provided in the current chapter (Chapter 3), with methodological details specific to each aim provided in the corresponding chapters.

3.3 Method

This study used a qualitative methodology in the form of a series of in-depth semi-structured interviews with parent-daughter dyads. In-depth interviews are a common source of data collection in qualitative studies (Thomas et al. 2005). They are described as an appropriate technique for eliciting detailed information about individual’s understandings and experiences (Liampittong & Ezzy 2005) and are a commonly used method in health-related research (Liampittong & Ezzy 2005). Further, as questions regarding parenting style could potentially be perceived as sensitive, a data collection technique whereby participants may be more prepared to discuss matters of a sensitive nature (Liampittong & Ezzy 2005) due to the development of the necessary rapport or confidence between the participants and interviewer (Liampittong 2013) was required.

The study aimed to recruit families from a mix of high and low socio-economic areas, and a mix of years 5-7 (aged 10-12) and years 8-10 (aged 13-15) girls with a range of physical activity levels. Two interviews with each participating family were planned, the first with one or both parent/s and the second with the daughter. Consistent with qualitative methodologies (Liampittong & Ezzy 2005), participants were recruited until ‘saturation’ was reached, that is, no new
information was forthcoming. It was anticipated that this would occur after interviewing between 30 and 40 families.

Ethical clearance was obtained from the Deakin University Health Research Ethics Committee (DU-HREC) (EC 72-2007), the Department of Education and Early Childhood Development Victoria for Government schools (SOS003869) and the Catholic Education Office of Melbourne for Catholic schools (GE08/0009).

3.3.1 Sample selection and recruitment

A multi-stage recruitment process was employed. In the first instance, recruitment was conducted via primary and secondary schools in metropolitan Melbourne. All schools within metropolitan Melbourne were ranked according to the Socio-Economic Index for Areas (SEIFA) Index of Relative Disadvantage score of their postcode (Australian Bureau of Statistics 2008). Schools were then stratified into low, medium and high SEIFA tertiles. Ten schools were randomly selected from each of the high and low SEIFA tertiles. A mix of government and non-government schools were included. The initial contact with the school was made via the school Principal who received a plain language statement, a consent form and a written invitation to participate in the study (Appendix 8 and 9). Of the 20 schools approached, four (20%) returned their written consent forms and agreed to participate. Schools that did not return their consent form were followed up via telephone, and reminded about their invitation to participate in the study. This follow-up technique did not elicit further participating schools. The most common reasons for non-participation included current participation in another research project, prior participation in research and lack of time for participation.

For consenting schools, the contact details of teachers responsible for physical education in years 6 and 8 were obtained. These teachers were then contacted to determine the most appropriate time for the researcher to deliver information and materials for girls to take home to their parents (Appendix 8 and 9). All girls in participating classes received a pack containing information about the project (in the form of a plain language statement), an invitation to participate for both the
girl and her parents, consent forms for both the girl and her parents and a reply paid envelope. All four consenting schools were located in high SEIFA areas.

Twelve girls and their parents were recruited via schools. This was considered an insufficient sample size to provide suitably comprehensive and diverse data; hence an additional recruitment method was devised to target adolescent girls, particularly those from lower SEIFA areas. An amendment to the initial ethics application was submitted and approval was received.

A purposive sampling technique (Liamputtong & Ezzy 2005) was employed, whereby two large shopping centres in low SEIFA areas were identified and centre management telephoned and provided with verbal information about the study. Permission to approach and recruit girls and their parents was sought. One of the two shopping centres identified agreed to participate, by allowing the researchers to set up a small stand in the mall and approach parents and their daughters who appeared to be in the target group. Each person approached was screened to ensure they fell within the age range of the target group. Those that met the age criteria and were interested in the study were provided with verbal and written information about the project. Those girls and their parents who agreed to participate signed a written consent form and provided their telephone number in order to schedule an interview at a later date. While the total number of potential participants approached was not recorded, 25 of the 31 families who agreed to participate in the research actually completed an interview.

3.3.2 Measures

A semi-structured interview schedule, based on constructs from the Family Influence Model (Kimiecik & Horn 1998) and parenting literature (Baumrind 1971), was developed and piloted with a convenience sample of three girls in the sample demographic group and their parents. A brief self-complete survey was also developed for parents, containing items relating to demographic information and physical activity levels. Minor modifications pertaining to wording and order of questions were made based on feedback received from both parents and girls. The modified interview schedule was then further piloted with another parent and
daughter from the sample demographic, with no additional modifications required. All interview schedules are included in Appendices 10 and 11.

Parents’ semi-structured interview

The parent interviews commenced with some brief word association activities to assist in relaxing participants and encouraging them to think broadly about physical activity, rather than just organised sport or structured exercise. For example, parents were asked complete sentences starting with ‘Physical activity is...’ and ‘As a parent I think it is important that my child...’. These word association exercises were for illustrative purposes only and the results were therefore not analysed and are not presented.

Parents were asked questions regarding their attitudes toward their daughter’s physical activity and parenting practices such as rules and strategies they employ in relation to their daughter’s physical activity. Where appropriate, parents were also asked if they and their partner shared similar views regarding their daughter’s physical activity participation, and whether they felt differently about their daughter participating than they did about her siblings’ participation (where applicable). Examples of questions included ‘In what ways do you encourage your daughter to be physically active? Has this changed over time?’, ‘What are some of the things you do to support your daughter to be physically active? (Prompts: can you tell me more about these things?)’ and ‘Do you and your partner (if applicable) share similar views about your daughter’s physical activity? (Prompts: why/why not? how does this impact on your daughter’s activity levels?)’.

Parents were also asked to respond to a series of statements which typified the four parenting styles developed by Baumrind (1971). Examples of these statements included ‘I am clear about my parental role’ and ‘I punish my daughter for disobedience’. Parents were requested to indicate whether they never, rarely, sometimes, often or always parented in that manner. While these items are more quantitative in nature, they were posed within the qualitative interview framework to allow for discussion and elaboration if required.
Parents’ self-complete survey

For descriptive purposes, demographic information and information regarding parents’ physical activity levels was collected from parents, via a brief self-administered survey at the completion of the interview. Demographic items included age, education level, employment status, parity and marital status. Parents’ activity levels were established using a self-administered form of the Active Australia survey, which assesses walking for transport and leisure and MVPA during leisure-time or in the yard (Timperio et al. 2004b). This survey has been found to be both reliable (Brown et al. 2004) and valid (Timperio et al. 2004b).

Girls’ semi-structured interview

Similar to parents’ interviews, the girls’ interviews commenced with some brief word association activities in which they were asked to complete sentences beginning with, for example, ‘Physical activity makes me feel...’ and ‘My parents think physical activity is...’. Again, these exercises were conducted to help relax the participant and get them thinking about physical activity; hence the results have neither been analysed nor reported.

Girls were asked questions regarding their perceptions of their parents’ support (or otherwise) for physical activity, and the types of strategies implemented by parents with regard to their daughter’s physical activity. Questions included ‘What sort of rules do your parents have about what you can do after school and on weekends?’ and ‘In what way do your parents help you to be physically active?’.

Girls were also asked to respond to an abridged set of statements regarding their parents’ parenting style. Statements included ‘My parents give me reasons for their directions’ and ‘My parents encourage me to tell them what I am thinking and feeling’.
Finally, girls’ physical activity levels were established by the interviewer, using a simple and previously validated measure (Prochaska et al. 2001), at the end of each interview. This measure was a single item assessing accumulation of MVPA on each of the days in the previous week (Prochaska et al. 2001). Girls who engaged in 60 minutes or more of MVPA on each of the days in the previous week were considered sufficiently active.

### 3.3.3 Data collection

Permission was sought from all participants for interviews to be audio-recorded for transcription and analysis. Interviews were conducted in the participant’s home. Most interviews were conducted in the after-school period, with the remainder being conducted early in the evening or on the weekend.

The parent interviews ran for approximately 40 minutes each, and interviews with girls averaged 20 minutes each. Each participant received a movie voucher as compensation for donating their time to the research.

An experienced interviewer, either the PhD candidate or a trained interviewer, conducted all interviews. A trained observer was present at all interviews to take notes and to support the interviewer. Interviewers and observers were trained by the PhD candidate in interviewing techniques and use of audio equipment. The PhD candidate regularly listened to recordings of interviews conducted by other interviewers to ensure consistency and acceptability of interview technique.

### 3.3.4 Analyses

Interviews were transcribed verbatim by ‘Transcriber Online’, a professional transcribing service, and imported into Nvivo 8 to assist with data management. Each participant was allocated a unique identification number and all data were labelled and matched by this number for the purpose of analysis. No names appeared on any interview transcripts. Identifying information (such as participant lists and consent forms) and data were stored separately, each in locked filing
cabinets. Analyses did not identify individual participants and only aggregate level data are reported.

Data were initially open-coded by the candidate, under the guidance of an expert in qualitative research, with codes closely reflecting the interview transcripts. Clusters or categories of similar or related codes were then constructed and themes subsequently formed. Memos were created to record ideas, coding decisions, concepts and draft emergent codes and categories. Categories were also examined according to parenting style (dichotomised using median split into high vs low for each of the four parenting styles), age of daughter (younger vs older), socio-economic status (high vs low SEIFA area, based on postcode from where the participant was recruited) and daughters’ physical activity levels (sufficiently active vs insufficiently active, based on whether or not participants met physical activity guidelines). Synergies in perceptions of support strategies between parent-daughter dyads were also explored.

3.4 Results

Socio-demographic characteristics of the sample are presented in Table 3.1 below. In total, 39 parents and 37 daughters participated. The majority of parents were recruited from a low SEIFA area (n=23) and were aged between 40 – 49 years (n=30). Approximately half (n=20) had completed a university or tertiary education and worked part-time (n=19). Almost all were in a married/defacto relationship (n=34) and had two or more children (n=34). Thirty-one interviews were conducted with mothers only, no interviews were conducted with fathers only, and four interviews were conducted with both parents. The ages of participating daughters were fairly evenly spread between 10-12 years of age (n=16) and 13-15 years of age (n=21). Two sets of sisters (four girls in total), who were all in the target age group, were included in the sample.
Table 3.1: Socio-demographic characteristics of the sample

<table>
<thead>
<tr>
<th></th>
<th>Low SEIFA (n=23 parents)</th>
<th>High SEIFA (n=16 parents*)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35-39</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>40-44</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>45-49</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>50-54</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some school/completed school</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Technical or trade certificate</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>University or tertiary</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Part-time</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Home duties/unemployed/other</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Two</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Three or more</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td><strong>Relationship to child</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Father</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>Age of participating daughter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-12 years</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>13-15 years</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>

*One parent of a girl recruited from a high SEIFA area did not provide complete demographic and physical activity data due to difficulties with written English

While the vast majority of parent participants were sufficiently active, very few daughters participated in 60 minutes or more of moderate-to vigorous-intensity physical activity on all days in the previous week (Table 3.2).
Table 3.2  Proportion of the sample that was sufficiently active

<table>
<thead>
<tr>
<th></th>
<th>Parents</th>
<th>Daughters</th>
</tr>
</thead>
<tbody>
<tr>
<td>% sufficiently active*</td>
<td>73</td>
<td>8</td>
</tr>
</tbody>
</table>

*Parents: 150 mins or more MVPA across at least 5 sessions; daughters: 60 mins or more MVPA on all days in the previous week.

3.5 Discussion

As results relating to the aims of this study will be presented and discussed in the following chapters, this brief discussion will relate primarily to the recruitment methods used and socio-demographic characteristics of the sample.

Recruitment via schools was challenging, in relation to both school and participant consent. Only four of the 20 schools approached agreed to participate, despite participation having minimal impact on staff and student time. Those schools who did not want to be involved cited reasons primarily related to current or prior participation in other research projects. The four schools who agreed to be involved were forthcoming in allowing the PhD candidate access to students, yet only 12 participants were obtained via this method. Anecdotal evidence from the 12 daughters and parents who were recruited via this manner indicated that the concept of participating in an interview was quite intimidating, and they believed that parents in particular would benefit from the opportunity to further discuss what participation entailed with the PhD candidate before consenting to participate. While both parents and daughters were provided with written information about what participation entailed, only the daughters were provided with a verbal explanation about the study and this information may not have been accurately conveyed to parents. At the completion of the interviews, many participants indicated that the experience was much easier and more rewarding than they had anticipated.

The above experience is consistent with the literature in the area, suggesting that recruitment of adolescent research participants is a time consuming and
challenging endeavour (Spigarelli 2008, Nguyen et al. 2012). While Nguyen and colleagues (2012) found that recruiting adolescents to an obesity intervention study was relatively cost-effective via school newsletters, and schools being recognised as a logical avenue for accessing adolescents (Riesch et al. 1999), the current study found school recruitment challenging. The lack of success with this method of recruitment necessitated adopting an alternative recruitment method. Recruitment via shopping centres was less problematic, possibly because parents were provided with face-to-face information about the study, and their potential concerns regarding participating in an interview were able to be alleviated. This is consistent with Daley’s (2013) review of the challenges in recruiting adolescents to participate in qualitative research. Though primarily in relation to focus group recruitment, Daley suggests having a team member explain the focus of the study to adolescents and their parents and providing them with the opportunity to ask questions may minimise recruitment challenges by providing participants with some familiarity and connection to the study (Daley 2013). 

Further, it has been suggested that adolescents congregate in shopping centres to relax and “hang out”, hence may be more amenable to being approached to participate in research (Bloom et al. 2006). This finding is consistent with the current study, whereby recruitment via shopping centres was less challenging than via schools.

Of those parents who agreed to participate, it was predominantly mothers who made themselves available for interview. This is consistent with the literature, with mothers often acting as the responding parent in health-related research (Lioret et al. 2010, Siponen et al. 2013, Tandon et al. 2012). In the current study, the over-representation of mothers in the sample may be reflective of the time of day interviews were conducted, as the majority took place in the after-school period, when in most cases the mother rather than the father was present in the home. Fathers were more likely to also participate when the interview was conducted in the early evening.

Another potential limitation of this study is that the sample was relatively homogenous, despite attempts to recruit from both high and low SEIFA areas.
While qualitative research does not seek to recruit a population representative sample, a more diverse sample may elucidate a wider range of thoughts, perceptions and attitudes. Although the sample in the current study was recruited based on SEIFA, approximately half the parent participants were well educated, employed (either full-time or part-time) and most were either married or in a defacto relationship. Further, most of the sample had favourable views about physical activity, thereby potentially limiting generalizability of results. This homogeneity may have influenced results to a degree; however, as will be discussed in the following chapters, a diverse and comprehensive range of responses were obtained.

3.6 Conclusions

Recruitment of a sample to participate in in-depth interviews was challenging in the current study. While schools provide a captive audience, and as such are often used for recruitment purposes, they may not be an appropriate avenue to recruit parents for in-depth interviews as they do not necessarily provide the opportunity to verbally communicate with parents prior to recruitment. Other avenues which afford that face-to-face opportunity may offer a more effective recruitment process.

Despite challenges in recruitment, the sample who participated in the current study provided a wealth of information on physical activity parenting, which will be described in detail in the following chapters.
CHAPTER 4: A QUALITATIVE EXPLORATION OF PARENTS’ SUPPORT FOR THEIR DAUGHTERS’ PHYSICAL ACTIVITY

4.1 Introduction

The previous chapter described the Methods for Study 2 involving qualitative research to further explore physical activity parenting practices and identify the diverse range of strategies implemented by parents to facilitate their daughters’ physical activity. The current chapter will address Aim 1 and present the findings from the in-depth interviews with parents.

4.2 Aim

The aim of this chapter was to:

1. Identify parenting practices that parents employ in relation to their daughters’ physical activity.

4.3 Method

The qualitative methodology of this study has been fully described in Chapter 3. Methodological details specific to Aim 1 are summarised here. Briefly, thirty-nine parents, from a mix of high and low SEIFA areas in metropolitan Melbourne, were recruited via schools or a shopping centre to participate in an in-depth interview. Thirty-one semi-structured interviews were conducted with mothers and four interviews were conducted with both parents. Interviews sought information on what parents did to support their daughter’s physical activity and their attitudes to physical activity in relation to their adolescent daughter, and took approximately 40 minutes to complete.
Data were managed in Nvivo 8 and open-coded, with categories of codes then constructed and themes subsequently formed. Results relating to parents’ perceptions of physical activity parenting practices are presented below.

4.4 Results

Numerous physical activity-specific parenting practices were evident in the data. These included previously identified practices such as the provision of logistic and instrumental support, plus some additional strategies not previously published in the literature such as the development of an active family culture. Themes relating to attitudes towards physical activity were also identified. In general, while attitudes to physical activity were generally positive, some parents did have concerns about their daughter’s physical activity, particularly in relation to the amount of activity their daughters participated in. These findings are discussed in detail below.

4.4.1 Attitudes towards physical activity

Responding parents appeared to have very strong views when asked about their attitudes to physical activity and sport as a child, describing either very favourable or particularly unfavourable attitudes. While several reported that physical activity and sport was ‘boring’, ‘not important’ or ‘horrible’, many indicated that it was ‘fun’, ‘very important’ and a ‘part of life’. All parents had a positive attitude towards their daughter’s physical activity, despite a significant proportion displaying negative personal opinions about physical activity or sport in their own childhood.

A number of key elements regarding positive attitudes toward their daughter’s physical activity emerged. Some parents were overwhelmingly positive, indicating that physical activity was important for their daughter and an essential part of a balanced lifestyle. Others suggested it was a great way to channel their daughter’s energy and many considered the social aspects were of great importance.
Several parents observed that physical activity was particularly important for their daughter as a means of preventing weight gain. Physical activity was viewed as a means of losing or maintaining weight, as indicated in the following quote from a mother of a 14 year old:

“… she’s had a weight problem most of her life... early puberty so she stacked the weight on, so I used to try and get her out at least 3 times a week for walking for 35 mins a day and even then she still stacked it on”.

Some parents acknowledged their daughter’s preferences for sweet food, and, as typified by the following quote from a mother of a 14 year old, used physical activity as a means of rationalising the consumption of unhealthy foods:

“I think it’s good for her... with all the issues of weight and everything I find with girls it’s a better way of saying ‘at least if you do physical activity you don’t have to watch what you eat so much because you can burn those calories off’”.

4.4.2 Concerns regarding physical activity

The concerns parents had regarding their daughter’s participation fell into four clear categories: tiredness and burnout; cost and time implications of activity; the need to balance physical activity with other things; and, the amount of encouragement required. Many, however, had no concerns regarding the type or amount of physical activity their daughters participated in. Several parents reported concern about tiredness, possible burnout and the physical manifestations of physical activity such as injuries, as illustrated by this mother of a 13 year old girl:

“I’m a bit wary of them overdoing it and sustaining an injury that might be long term”.

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Similarly, others were concerned about the amount of physical activity their daughters were involved in, and the subsequent need to limit involvement due to either financial or time constraints. Several parents acknowledged the need for their daughters to find a balance between physical activity, lifestyle, diet and sleep. Finally a number of parents were concerned about the amount of encouragement required to get their daughter to participate, or her propensity to prefer sedentary behaviours, as illustrated by this mother of a 14 year old girl:

“She would prefer to sit on the couch... needs a lot of encouragement... she’s not very self-motivated”.

While several parents indicated that their daughters needed substantial encouragement to participate and were often reluctant, many also stressed the importance of not forcing their daughter to participate in a particular activity if she didn’t want to.

4.4.3 Perceptions of daughter’s attitude towards physical activity

When asked about their perceptions of their daughter’s attitude towards physical activity, nearly all parents highlighted their daughter valued the social aspects of physical activity. This was viewed as an integral factor in many girls’ decisions to participate, whether the participation was competitive or otherwise. Many, though not all, parents suggested their daughter had a very positive attitude towards physical activity, she ‘loves it’, ‘lives for it’ and ‘enjoys it’, and others indicated that their daughter was cognisant of the physical and mental health benefits of physical activity.

A number of parents indicated that physical activity was good for their daughter’s self-esteem. As indicated by this quote from a father of a 13 year old, physical activity was perceived as giving their daughter a feeling of confidence, particularly if she was struggling in other areas:

“... academically she’s not up there but this is something she is good at... and it gives them a lot of self-esteem”.
The concept of competition tended to polarise parents; many indicated that their
daughter loved it and thrived on it, but others reported their daughter was put off
by the thought of competition and actively avoided competitive activities. Others
reported that competitive school sports and the need to wear uniforms were
viewed negatively by their daughter, as illustrated by this mother of an 11 year
old:

“She enjoys non-competitive activities where it’s just… you know her
doing something active. But not… yeah… she actively avoids competitive
sport... So yeah, I think experiences at school have turned her off”.

Where applicable, parents were asked if they had different feelings around their
daughter’s participation compared with her siblings. Most parents reported no
difference, although several noted that their children all had very different
personalities and differing levels of motivation for physical activity; hence
different support strategies were required for each child.

4.4.4 How parents support their daughter’s physical activity

A wide range of support strategies were identified by parents, including those
involving emotional, informational and instrumental/logistic support, as well as
those which were more strategic and long term in their focus, such as creating an
‘active culture’ within the family.

Instrumental/logistic support

The most salient responses were around instrumental/logistic support. The most
frequently cited strategy within this category was the provision of transport, with
nearly all parents reporting that this was an important way for them to support
their daughter’s physical activity. Other mechanisms relating to logistic support
included paying fees, paying for and laundering uniforms, purchasing appropriate
footwear, ensuring that girls received adequate sleep and appropriate nutrition,
and ensuring the availability of equipment in the home such as trampolines,
basketball rings and bicycles. This is evidenced in the following quote by a mother of a 14 year old:

“By making it as easy as I can for her to do it, by getting her places and fitting mealtimes and other kids’ activities and that sort of stuff around so that we can make it all work”.

One parent summarised many of these strategies as ‘removing barriers’ to her daughter’s participation, and making physical activity ‘the easy option’.

Parents also emphasised the importance of taking an active interest in any physical activity their daughter was doing, such as watching games, taking on an administrative role (e.g. coach or manager), and ultimately ‘enjoying the successes and sharing the losses’.

Parents reported providing the opportunity to try new activities was essential as a means of enabling their daughters to find something they enjoy. Parents felt that exposing their daughter to a range of activities, or even suggesting appropriate activities, was a good way of supporting participation. Several parents reported trying to steer their daughters towards team-based activities, so their daughter would realise the social benefits of physical activity and develop friendship networks with other active girls.

**Informational support**

Parents also cited numerous strategies related to informational support as a means of supporting their daughter’s physical activity, such as discussing the importance and benefits of physical activity with their daughter. Emphasising the social aspects of physical activity was considered crucial by many parents. As a father of an 11 year old suggested, he and his wife had tried to:

“... lay the foundation that participation in sport is important for the social aspect and also for the fitness”, and,
teach his daughter that:

“… participation in sport gives you friends and networks and team enjoyment and success that is shared and all those sort of things”.

Other parents emphasised the fun, social aspects of physical activity in order to encourage their daughters to participate, with one parent indicating that her daughter was ‘happy to do activity socially but not from a love of the activity itself’. Some parents indicated they also discussed the health benefits of physical activity with their daughters, and why physical activity is necessary. One mother felt that this wasn’t a particularly successful strategy, however, and that emphasising the fun and social elements of physical activity was more effective.

**Emotional support**

Parents highlighted that being enthusiastic about their daughter’s participation was important, and this was typified by verbally encouraging her and asking her how she was going to ensure she was enjoying her activity. Parents noted the necessity to provide verbal encouragement, particularly in situations where their daughter was reluctant to participate, for example when their friends were dropping out of an activity. Some parents reported they had to employ a number of strategies relating to team sport participation, including reminding their daughter of her commitment to a team, forcing her to attend team activities, and talking with her about honouring responsibilities. Verbal encouragement was also used as positive reinforcement for girls’ participation.

**Developing an active culture within the family**

Many parents considered participating as a family was an important means of supporting participation, for example going for family bike rides, family walks, and participating in physical activity as a family, as depicted in the following quote from a mother of an 11 year old:
“So then if we go down to the beach then it’s sort of in a family arrangement to get us all down there, if we don’t then we do a fair amount of bush fire preparation recently which gets the whole family involved in healthy physical activities, out there carting loads of trees up and down”.

Several parents talked about developing an active culture in the family from an early age, whereby physical activity was considered the norm. There was a sense that developing an active culture resulted in girls participating of their own volition, rather than needing to be encouraged. This is demonstrated in the following quote from the mother of an 11 year old:

“... it’s much less parent driven now... because we encouraged it from an early age... they now see the need to get outside and be active”.

Finally, encouraging their daughter to go outside was cited by parents as a means of supporting their daughter’s physical activity, and the provision of unstructured physical activity opportunities around the house was also viewed as important, as illustrated by this father of an 11 year old:

“... we have bought a trampoline and we have a basketball ring in the front yard... we have bought them all bicycles”,

this mother of an 11 year old:

“... encourage her to play outside every day, purchase equipment for the home”,

and this mother of an 11 year old:

“We’ve always had equipment, like gym mats and things like that that they can, right from when they were little kids that they would be active with”.

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4.4.5 Physical activity rules

Many parents did not have rules regarding physical activity, but for those who did, these rules grouped into three categories. These categories included committing to activities once they had commenced, limits around the number of physical activities their daughter was involved in and mandatory use of appropriate safety equipment.

A number of parents indicated they felt strongly that their daughter should continue with a particular activity once she had committed to it. Comments supporting this notion included ‘she has to stick with it, she can’t stop half way through’, ‘I’ve paid for the season, you play for the season’ and ‘its 100% or not at all’. These comments appeared to apply equally to team (e.g. netball) and individual (e.g. swimming) activities.

Many parents reported limits around the number of physical activities their daughter participated in, for either financial or organisational reasons, or to ensure ‘everything gets done’, including homework, sleep, eating and resting. Some parents limited the number of organised physical activities to two per week (some indicating one team-based and one individual activity was permitted), but this was often dependent on the number of siblings in the family.

The final category of rules around physical activity was in regard to the use of safety equipment. Many parents noted the importance of bike helmets, safety pads, sports bras and other protective equipment, as illustrated by this mother of an 11 year old:

“... their bicycle helmets, with skateboards there’s pads and knee pads and so general safety gear is really important”.

Others reported that their daughter was not allowed to participate in ‘dangerous activities’ while others reported ‘general rules around safety’. These general rules around safety were discussed in the context of the types of activities girls were allowed to do after school, particularly as they related to personal safety and the
level of autonomy they were permitted, as illustrated by this mother of a 13 year old girl:

“So… you know, rules about being out late… Knowing who she is with…you know not walking by herself at night… That sort of general safety issues so that we know that… she’s not quite 14 so… you know, we need to make sure exactly what she is doing…”.

4.4.6 Preferred after-school physical activities

Parents were asked what types of activities they preferred their daughter to do after school. Many stated they didn’t really put any constraints on their daughter, and that they could do whatever they liked. Some reported that they preferred their daughter to have something to eat and a rest when she got home, before starting homework or other activities. One suggested that she felt it was appropriate for her daughter to watch television as she had walked home from school and needed a rest.

Many parents felt it was important that their daughter did something outside, and a wide range of unstructured physical activities were provided as examples, such as playing with the dog or jumping on the trampoline as suggested by these mothers of an 11 and 12 year old respectively:

“But when it’s a really nice day I actually, I really like the fact that they get some unstructured time outside and play with the dog and do some chores, which, you know, they’ll do their best to avoid”,

“I’d love her to walk the dog every night but that doesn’t always happen... When the weather is nice encouraging her to get out on the trampoline or something”.

A few suggested they preferred their daughter to engage in team sports after school rather than individual activities, as they preferred the social nature of team
sports, while others, such as this mother of a 14 year old mildly autistic girl, suggested that individual activities were more appropriate:

“She’s not really a team player in that she gets really shy so we worked on the netball and basketball but then she wouldn’t get on the court so the walking up and down with the dog and the paper round, that’s what I’m encouraging because that’s what she can achieve”.

The above quote also illustrates this mother’s insight in facilitating her daughter’s involvement in a physically active part time job.

While parents certainly indicated homework was important, most reported that their daughter had no difficulties in getting it completed. There was not a sense that having homework impacted adversely on physical activity opportunities or vice versa.

### 4.4.7 Barriers to parents getting girls physically active

Many parents experienced little or no difficulty in getting their daughter to be physically active, particularly if she received positive reinforcement about her participation. This is illustrated in the following quote from the mother of an 11 year old:

“… she gets lots of accolades... so I think that’s helped her continue”.

Others reported that their daughter needed a lot of encouragement to be physically active. These parents tended to respond to their daughter’s unwillingness to participate in one of two ways. Some parents forced their daughter to participate, for example ‘have to force her to do something if it’s already been paid for’ and ‘at this stage I’m still insisting but still trying to rationalise why I’m being a bit of a boss about it’. Others acknowledged there was little point in forcing the issue, for example ‘if she doesn’t want to do it she won’t do it’ and ‘we can’t really force her to do it, those days are long gone’.
Some parents indicated that while they generally didn’t experience difficulties in getting their daughter to be physically active, there were times when she was too tired or had an injury and it was then more of a challenge to encourage participation.

4.4.8 Parental views and responsibility around physical activity

There was a discussion with each participant about whether they and their partner (where applicable) had consistent or shared views around their daughter’s physical activity. All participants reported sharing a similar view with their partner; even those who were separated or divorced still expressed a consistency of attitudes. There was also a universal sense that these shared views had a positive impact on girls’ participation, as illustrated by comments such as ‘it helps because she can see the values we have’, ‘she knows we’re supporting her’ and ‘it reinforces her views and increases her enjoyment’.

It was often the mother who reported having the primary responsibility for her daughter’s physical activity, though many mothers indicated this was from a practical perspective only in that they worked fewer hours and had more time to devote to their children’s participation. Others reported sharing the responsibility, while very few reported that fathers had primary responsibility. There was a notable differentiation of tasks, with mothers more involved from a practical or logistical perspective, and fathers from an active participation/coaching perspective.

4.4.9 Most effective methods to encourage participation

Parents were asked to consider the most effective ways to encourage physical activity participation among adolescent girls, whether it was a strategy they had employed themselves, or something they had seen other parents implement. A wide variety of strategies were reported, which fell into several categories, including role-modelling, co-participation, facilitating early involvement in physical activity and fostering a positive attitude and enjoyment of physical activity.
Role modelling

Role modelling was the most salient response, with this mother of an 11 year old saying that:

“Role modelling is a lot of it, why should she do it if I’m not?”.

Similarly, many parents reported ‘practicing what you preach’, ‘being a role model first and foremost’ and ‘leading by example’. Several parents acknowledged they could probably do more to set an example, or could have started setting an example earlier. As illustrated by this mother of an 11 year old:

“I probably could do a bit more to sort of set that”,

and this mother of a 13 year old:

“I probably would have myself started doing things earlier... I sort of wish I had done that, so that she could maybe think, my mother does that and I would like to too”.

Parents acknowledged their own limitations and some seemed to portray a sense of guilt that they didn’t participate as much as they thought was ideal. This is encapsulated by this comment from a mother of a 15 year old:

“I suppose showing them... although I’m not much of an example”,

and likewise from this mother of a 14 year old:

“… even though we’re not true examples of, but the actual parents should be physically active”.

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Co-participation and early involvement in physical activity

Participating with their daughter or as a family was also considered a key strategy for encouraging participation. Parents suggested things like ‘building into your weekend family time to go and do stuff’, ‘encouraging family outings’ and ‘participating with them’ to try to set an example and develop an active culture within the family. Parents also noted that this co-participation needed to start at a very early age. The importance of early involvement was critical for both structured and unstructured activities, as suggested by this mother of an 11 year old:

“… it starts a long time ago... it starts when they’re tiny... and it’s being involved with them. And it’s doing a bit of research about the sport and knowing something about it”,

this mother of an 11 year old:

“… even like playing with kids in the pool and stuff, it starts really, really young”,

and this mother of a 10 year old:

“It’s getting the basics right, and the early learning that really is important”.

Some parents felt that if girls weren’t physically active by the time they reached adolescence, it was too late to try and change their habits.

The concept of early involvement to promote ongoing participation was reflected in the types of activities that parents tried to get their daughters involved in. Several parents reported trying to get their daughters involved in team-based activities from an early age so that they developed friendships with like-minded peers. Others reported encouraging their daughter to participate in a variety of
activities from pre-school age, or trying a range of positions within one sport, in order to build a diverse range of skills and increase confidence.

Many parents discussed the notion of finding an activity that suited their daughter, from an ability perspective but also from a social perspective. This often entailed encouraging them to try a wide range of activities till they found one that suited them and that they enjoyed. As described by this mother of a 13 year old:

“You’ve got to try to choose something they will keep going with... or that they enjoy, that’s the important thing”.

Fostering a positive attitude and enjoyment

Other parents suggested responding positively to whatever their daughter wanted to try, in the belief that displaying a positive attitude towards their daughter’s physical activity would facilitate enjoyment and participation. For example, ‘getting them to their physical activity on time with all of the appropriate equipment...and not whining and moaning about it’ and ‘trying not to groan and moan about driving them there and back’ was considered an important means of facilitating participation. Similarly, some parents suggested that removing barriers to participation was essential, such as ‘opening doors’ and ‘making it as easy as possible for them’. Some parents reported scheduling family meals around physical activity as a means of making it easier for their daughter to participate.

Some felt that focusing on aspects other than competition was important. As indicated by this mother of an 11 year old, physical activity need not be about competition, and there are benefits from participating irrespective of the outcome:

“I know our culture in Australia is very much around... competitive sports and I don’t think that’s the only way to get fit”.

Similarly, another mother of a 13 year old was conscious about her children participating against each other, and hence reported:
“We haven’t got them all in the same type of sport... so they are not openly competing against each other... we were sort of careful and chose different things for them”.

Interestingly, some parents were initially reluctant to nominate the ‘best’ way to encourage participation. Several answered by rephrasing in the negative, for example ‘well I know what not to do’. Practices unlikely to promote participation included not ‘pushing them’ or being critical as illustrated by this mother of a 14 year old:

“Saying ‘you shouldn’t have missed that goal’... they’re actually putting negative vibes... rather than saying ‘it was bad luck you missed that goal, next time you’ll have a better shot’”.

‘Ugly’ or ‘pushy parent syndrome’ was mentioned by a number of participants as unlikely to promote physical activity.

4.5 Discussion

The current study enabled the identification of a diverse range of strategies implemented by parents to support their daughter’s physical activity. It also elicited a wealth of information on parents’ attitudes towards physical activity, their reasons for encouraging physical activity and their perceptions about their daughter’s physical activity.

The current research indicates that many parents had negative attitudes towards physical activity in their youth, yet had overwhelmingly positive attitudes towards their daughter’s physical activity. This is despite evidence which suggests that negative early life physical activity experiences may negatively influence adult physical activity among women of lower socio-economic status (Ball et al. 2006) and women with depressive symptoms (Azar et al. 2010). All participants considered physical activity important for their daughter, a finding which has been positively associated with both organised and unstructured physical activity
(Heitzler et al. 2006). While there is evidence which suggests a positive correlation between adolescent attitudes and their own physical activity (Van der Horst et al. 2007), and parental attitudes and beliefs and their children’s physical activity (Kimiecik & Horn 1998, Kimiecik et al. 1996), there is little research which examines parental attitudes towards their own physical activity, either as an adult or a child, and their child’s physical activity. It is possible that these parents could identify valuable lessons on how they overcame previous negative feelings towards physical activity, or avoided imparting these negative attitudes onto their daughters. Further, it is possible that these parents have, either consciously or sub-consciously, incorporated the reasons for their childhood attitudes towards physical activity into their interactions with their daughter around physical activity to ensure that she has a more positive outlook.

In general, parents displayed a comprehensive understanding of the range of benefits of physical activity, and several indicated they discussed these with their daughter. While there is some literature on parent/child discussions of benefits of physical activity, or parental provision of ‘informational support’, it has often been reported as part of a composite measure, and as such has not been established as an influence on physical activity by itself (Beets et al. 2010). The current study indicates that this is a strategy often used by parents, hence assessing the effectiveness of this strategy and its potential impact on physical activity is imperative.

A number of parents reported encouraging physical activity as a means of weight loss for their daughter. While this encouragement may be provided with the best of intentions, qualitative (Shrewsbury et al. 2010) and longitudinal research (Davison & Deane 2010) among adolescent girls suggests that this may in fact have a detrimental effect. In their qualitative study examining parent/adolescent interactions around weight management, Shrewsbury and colleagues found that adolescents preferred their parents to take an indirect approach, that is, encourage physical activity without referring specifically to weight loss (Shrewsbury et al. 2010). Davison and Deane (2010) observed that while parental encouragement of physical activity for weight loss was not associated with girls’ objectively assessed physical activity, it was prospectively associated with higher BMI among
adolescent girls and greater concern about weight after controlling for baseline characteristics and covariates. These unintended negative consequences are of concern, given the practice of encouraging adolescent girls to be physically active as a weight management strategy was evident in the current study. Hence, a quantitative indication of the prevalence of this practice is warranted.

Parents in the current study clearly recognised the importance of unstructured activity in their daughter’s routine, and supported this by providing equipment around the home and opportunities to be outside. There is some evidence to support the effectiveness of these strategies, with a cross-sectional positive association between physical activity and the number of exercise-related items in the home observed in a sample of rural American youth (Pate et al. 1997). Similarly, longitudinal research has shown an inverse association between the availability of physical activity equipment in the home and weight gain among girls (Timperio et al. 2008), and equipment accessibility has been shown to cross-sectionally indirectly influence physical activity among adolescent girls via perceived self-efficacy (Motl et al. 2007). Further, the encouragement of time spent outdoors has previously been positively associated with physical activity among youth (Sallis et al. 2000).

A number of parents indicated they believed that physical activity habits needed to be established early in life, indeed some parents spoke of their efforts to develop an ‘active culture’ within the family. This is supported by evidence suggesting that, among adolescents, previous physical activity is positively associated with current physical activity (Sallis et al. 2000). Further, the importance of establishing positive physical activity habits early in life has been recognised from both a tracking (Telama 2009) and health (Andersen et al. 2011, Hills et al. 2011, Boreham & McKay 2011, Biddle & Asare 2011) perspective. However, the extent to which parents attempt to establish a physically active lifestyle within their family has not been quantified.

Many parents in the current study acknowledged the role of peer influences by steering their daughter towards team sport. This is consistent with the literature, which suggests peer support is related to MVPA among youth (Heitzler et al. 2006).
2010), and in particular adolescent girls (Beets et al. 2007). Similarly, the importance of partnering with peers when exercising is well established, as adolescents who exercise with peers perceive more benefits of physical activity than those who don’t exercise with friends (King et al. 2008). In their qualitative study, Jago and colleagues (Jago et al. 2009a) observed the importance of friendship groups in initiation and maintenance of youth physical activity. Despite the widely accepted role of peers in the provision of social support for physical activity (Heitzler et al. 2010), not all parents in the current study mentioned this as a strategy to encourage their daughter’s physical activity. Hence, some parents may benefit from additional support or assistance in cultivating or implementing these types of strategies.

The notion of removing barriers to physical activity appears to be an important one, at least from a parental perspective. Although the evidence is still inconclusive (Van der Horst et al. 2007), it is likely that perceived barriers to physical activity may influence participation among adolescents (Heitzler et al. 2010). Further, it has been reported that parents also face barriers in facilitating physical activity for their child (Smith et al. 2010), and this is particularly prevalent among those of lower socio-economic status (Thompson et al. 2009, Eime et al. 2013). This is consistent with the current research, where, irrespective of socio-economic status, participants reported limiting activities for financial reasons. It is therefore essential to provide parents, especially those from lower socio-economic areas, with support strategies to overcome their own and their daughter’s barriers to physical activity, and assist in identifying lower cost physical activity opportunities that are easily accessible.

Role modelling was the most frequently cited strategy when parents were asked about the best means of encouraging participation among adolescent girls. The evidence in this area, however, generally shows no association between parental and child or adolescent physical activity (Van der Horst et al. 2007, Jago et al. 2010). It is interesting that parents strongly believed in this strategy as the best way to encourage physical activity among their daughters. Further, in the current study, some parents portrayed a sense of guilt that they were not sufficiently active to provide an example for their daughter. This is consistent with qualitative
research by Gordon-Larsen and colleagues (2004), where lack of active parental role modelling was identified as a key theme by parents. Given the benefits of physical activity for all age groups, rather than suggesting to parents that role modelling is not necessarily effective, it may be prudent to educate parents, where applicable, on the range of additional strategies shown to have an association with adolescent physical activity participation.

Further, the literature on co-participation, that is, parents and children participating together, is more convincing, with a positive association observed between the direct involvement of parents and child and adolescent physical activity (Beets et al. 2010), and this association is stronger for younger children than for adolescents (Beets et al. 2010). Consistent with qualitative work by Thompson and colleagues (2009), this particular strategy was viewed as important by a number of parents in the current study. Hence, parents of younger children in particular should be encouraged to continue their role modelling of physical activity, but do so in a joint effort with their children.

Encouragement for physical activity was also widely recognised as important by parents, and has been shown to be positively associated with physical activity in a number of cross-sectional (Davison et al. 2003, King et al. 2008), longitudinal (Bauer et al. 2008, Bradley et al. 2011) and review studies (Gustafson & Rhodes 2006, Van der Horst et al. 2007, Beets et al. 2010). The notion of ‘encouragement’, in both the current study and the literature, included specific strategies such as verbal encouragement and praise, provision of logistic support including transport, paying of fees and purchasing of equipment, and watching children participate. Parental encouragement has also been linked to perceived barriers among adolescents, with those adolescents who didn’t receive parental encouragement more likely to report barriers (King et al. 2008). It is therefore imperative that parents continue to provide encouragement for their daughter’s physical activity, and, as the participants in this study did, consider the myriad of ways in which encouragement may manifest.

Finally, several strategies or practices not previously seen in the literature were identified in this study, including exposure to a wide range of activities,
encouraging the uptake of physically active part-time employment, ensuring adequate hydration and nutrition, scheduling meals around physical activity and developing an active culture within the family. While a lack of time is often reported as a barrier to physical activity (Welch et al. 2009), it appears the parents in this study are able to prioritise physical activity within their schedules, thereby reinforcing the importance of physical activity within their family. It may be beneficial to further explore some of these strategies and determine their association with physical activity in a quantitative study design.

### 4.5 Conclusions

This qualitative work clearly indicates that the range of strategies implemented by parents is more diverse than what is currently examined in the literature. While several of the strategies identified have previously been captured in the literature, they have often been assessed as part of a composite measure, making it difficult to determine the relative influence of individual strategies. Further, the emergence of strategies previously absent from the literature suggests the need to develop and test a comprehensive range of measures which capture the strategies or specific practices that parents employ to facilitate their daughters’ physical activity.

In addition, it is essential that these practices be considered from the daughters’ points of view, to determine whether synergies exist between parents’ and daughters’ views. Further, examining these strategies within the overall context of parenting style, which to date is notably absent from the literature, is also warranted. These concepts will be discussed in the following chapters.
CHAPTER 5: A QUALITATIVE EXPLORATION OF GIRLS’ PERCEPTIONS OF THEIR PARENTS’ SUPPORT FOR PHYSICAL ACTIVITY

5.1 Introduction

The previous chapter presented the results of qualitative work undertaken to identify the practices that parents employ in relation to their daughter’s physical activity. This chapter addresses Aim 2 in Study 2 and builds on Chapter 4 by exploring parental support for physical activity from the perspective of adolescent girls.

5.2 Aim

This chapter aimed to:

1. Identify girls’ perceptions of their parents’ support for physical activity.

5.3 Method

As identified in the previous chapter, this study included a series of in-depth semi-structured interviews with parent-daughter dyads from a mix of high and low socio-economic areas. This chapter presents data from interviews undertaken with a mix of years 5-7 (aged 10-12; N=16) and years 8-10 (aged 13-15; N=21) girls. The socio-demographic characteristics of their parents are presented in the previous chapter. Girls were asked questions pertaining to their attitudes to physical activity, parental support for physical activity, impact of siblings on physical activity participation, rules around physical activity and changes in physical activity over time. The interviews with the girls were conducted in their homes and lasted an average of 20 minutes. Data were transcribed by a
professional transcription service and managed in Nvivo 8. Data were open-coded, categories were created and themes subsequently identified.

5.4 Results

Participants identified numerous ways in which their parents supported them to be physically active. These included the provision of encouragement, logistic support, emotional support, co-participation, informational support and parental involvement. In general, girls reported positive attitudes towards physical activity, including the opportunity to participate with friends and feelings of personal satisfaction. Further, girls articulated the impact siblings had on their physical activity and discussed the barriers they faced in being physically active. These issues are discussed in detail below.

5.4.1 Attitudes towards physical activity

The majority of the sample displayed positive attitudes towards physical activity. These attitudes were categorised as relating to fun/enjoyment, the opportunity to participate with friends, the associated sense of achievement, fitness benefits, working in teams and feelings of personal satisfaction.

The fun/enjoyment aspect was cited most frequently by participants, often in conjunction with spending time with friends, as indicated by this 11 year old girl ‘I like having fun with my friends’ and these two 13 year old girls ‘I find it fun to walk home with somebody’ and ‘I like being able to have fun and play sport but also if you’re with friends then you can enjoy it’. Many girls also noted that physical activity, and sport in particular, provided the opportunity to meet other people and make new friends, as evidenced by this quote ‘You get to meet lots of people from other age groups and things’ (13 year old). Others highlighted the benefits of working in teams, such as this 11 year old girl who said ‘you don’t have to do it all by yourself, you have people helping you’.

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Fitness was a recurrent concept, with many participants citing fitness as a benefit of physical activity. Similarly, several noted that they felt better about themselves after participating, as indicated by this participant:

“I don’t know. There’s just some feeling that you get when you’re running or doing something like that that makes me feel kind of better about myself and about the things that I’m doing and I’m not just sitting on a couch watching television and eating something unhealthy. I’m thinking about it and doing something good” (13 year old).

A few participants mentioned benefits in relation to body image, such as ‘it’s nice to think you’ll be looking good’ (12 year old) and weight management, such as ‘you can eat anything you want and work it off’ (15 year old).

The notion of goal attainment was reflected in the way some respondents talked about the sense of achievement associated with physical activity, as illustrated by this 11 year old girl:

“… being able to achieve certain goals is really nice”;

and this 11 year old girl:

“Sometimes, like when we’re on a holiday, if we did a long walk, when you got to the finish it was like ‘yes, I did it’”.

Dislikes about physical activity clustered around several key themes: resulting tiredness; injuries and soreness; forced participation; organised/competitive sport; competing priorities; and the time involved in participation. Some girls cited a combination of reasons for their dislike of physical activity, such as this 10 year old who said:

“Well I’m not so great at the running. I don’t like the running part of some things. I like long distance more than sprints… And I don’t really like the ones where you get heaps and heaps puffed as well. Like the really
running around and… I don’t like ball games as much either… I like the bigger ones better than like tennis balls or something. And, like netball is ok except I don’t like the shooting part of it… And soccer is fun but I don’t like the competitive side of it. And I don’t know any of the rules, I just like kicking the ball. As long as it’s not too competitive”.

As illustrated by the above quote, issues such as perceived competence and the competitive nature of some activities appear to have a role in influencing attitudes towards physical activity.

Those girls who believed they participated in a substantial amount of physical activity commonly cited tiredness, injuries and the amount of time devoted to physical pursuits as negative aspects of physical activity, such as:

“I don’t like when it hurts. After I’ve done a lot of it. It really hurts.” (10 year old),

“Sometimes it’s really tiring” (13 year old), and

“Sometimes it tires you out. And, um, it takes up a lot of time, so like, say, if it was like, if you could get healthy by like a little bit of time that’d be like better” (14 year old).

In contrast, those who reported participating less cited disliking being forced to participate and that physical activity was boring, as indicated by this 13 year old:

“Sometimes the things can be a bit boring or like some sports at school they’re not the funnest games or sometimes they can be a bit childish and boring to us and we don’t really feel like joining in. Well if we play like warm-up games, I can’t think of anything we’ve played recently because we’ve had like footy but yeah I don’t know, just a bit like we’d rather do other things”.
Others reported a dislike of team games, such as this 15 year old who stated:

“Games where you have to go in teams because I never get picked and like... I never get the ball thrown to me or anything”.

A few respondents reported more diverse reasons for disliking physical activity, including ‘the fact that I go really red afterwards’ (14 year old), ‘sometimes we have to play it with boys and its really annoying... and sometimes the sport teacher we have is really mean’ (12 year old), ‘it makes me sweat’ (13 year old) and ‘it means getting up early and stuff like that, so that’s not always a good thing either’ (15 year old).

5.4.2 Parental support for physical activity

Several categories of responses emerged in relation to parental provision of support for physical activity, including encouragement, logistic support, emotional support, co-participation, informational support and parental involvement. Many girls were able to describe multiple strategies employed by their parents to support their physical activity.

Encouragement and emotional support

Girls frequently cited ‘encouragement’ as the primary strategy parents employed to support their physical activity. When probed, this encouragement appeared to primarily encompass verbal encouragement such as ‘Do your best. Don’t stop. Don’t give up...’ (13 year old) and suggestions to engage in particular activities, for example ‘...and they encourage me to ride my bike to school’ (10 year old).

This type of support is consistent with emotional support, a construct which encompasses a variety of support strategies. For example, girls acknowledged their parents’ emotional support in terms of watching them participate, cheering them on and being there to encourage them.

Other strategies for encouraging participation cited frequently by girls included encouragement to go outside, as evidenced by this 10 year old girl:
“They ask me to go out sometimes. Sometimes they bribe me if I don’t want to but not very regularly”,

and this 13 year old:

“They send me out of the house. Um, that’s basically it, because when I go outside the only thing I can do is exercise”.

**Logistic support**

Logistic support in the form of transport provision and payment of fees was cited frequently by girls, as indicated by this 13 year old ‘They drive me everywhere… to get to my places I need to be’ and this 14 year old ‘They take me places and of course pay for my tennis and other sports’. Several girls noted that if their parents were unable to provide transport they would make alternative arrangements, as explained by this 11 year old ‘Well my mum organises with a friend to take me to netball training’.

**Co-participation**

Parental co-participation or assistance with skill development was also mentioned by several participants. This is illustrated by the following quotes: ‘Sometimes we go for bike rides, sometimes dad comes and plays basketball at the front and sometimes we go to the park and play cricket and we play cricket in the backyard. Sometimes we go for walks...’ (11 year old), and ‘They like practice with me sometimes in the garden’ (13 year old).

**Informational support**

The provision of informational support was noted by some girls, who reported that their parents suggested appropriate activities for them to participate in, such as this 13 year old who said ‘they’re like “what about this sport” and stuff. Like “that’d be good for you” and stuff’.
Parental involvement

Finally, some girls recognised a broad range of strategies implemented by their parents to support physical activity, as illustrated by this 11 year old:

“Well they encourage me all the time. Like they come pretty much to every single netball game I’ve played, unless we have something on and they have to go away, but they encourage me all the time, they help me practice out here, they take me to all my trainings and take me to my games. So they do heaps for me, yeah... they buy my uniform... they buy my runners. They do take care of my injuries. Mum tells me to rest, I don’t listen to her usually”.

Similarly, as illustrated by this 13 year old girl, the wide variety of roles undertaken by parents was acknowledged:

“Yeah they stay and watch us play. My mum she is in charge of the... fixtures so she’s very involved with like the club and stuff and she scores sometimes at my games because there’s like a roster. She comes and watches”.

5.4.3 Decision making around physical activity

Most girls felt they predominantly made decisions themselves around their physical activity, sometimes in consultation with their parents. Some girls indicated they would check with their mothers once they had decided what they wanted to do, mainly for logistical reasons such as transport, as illustrated by this 13 year old:

“Well if I suggest I want to do something I usually talk to mum about it because I’m with her… more often she’d be taking me to more things”.

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Similarly, others indicated their mothers had more influence relative to their fathers in relation to physical activity decision making, as evidenced by this 13 year old:

“Usually dad gets in about what’s safe and what’s not. And mum just kind of puts her foot down. Says I can’t do that about the things that dad says that I am allowed. It’s either safety or we can’t get you there in time”,

and this 13 year old:

“Well I don’t know it’s just mum has the say and everything I suppose”.

Others indicated decision making around physical activity was a joint responsibility, such as this 10 year old who said:

“I would ask my mum and dad. There’s not really one in particular. I’d probably get them both together and ask them”.

Several girls reported being given options by their parents, but ultimately they made their own decision regarding physical activity, such as this 11 year old who said:

“I decide a little bit as well. Usually they give me ideas and then I say yes, I want to do that or no, I don’t want to do that. It’s me making the choices but they are giving me ideas”.

Overall girls reported making decisions in consultation with their mothers or with both parents more often than with their fathers only.

5.4.4 Family rules regarding physical activity

Most girls initially reported their parents didn’t have specific rules around physical activity, other than setting upper limits regarding the amount of
organised physical activity undertaken. Some suggested their parents encouraged them to have a balanced lifestyle, as illustrated by this 11 year old girl who said:

“Well I guess they kind of make it like a balance, like I have to get my rest, I have to have the food, I have to have the activities and it all kind of balances out”.

Some girls reported that achieving a balance resulted in limiting physical activity to some extent.

When probed further, many indicated their parents had rules around the way they spent their time, and this sometimes impacted negatively on their physical activity. Girls commonly cited rules around homework completion, stating that their parents expected them to complete their homework before engaging in physical and other activities.

Girls gave examples of rules around restricting time spent indoors, and suggested that this had positive impacts on their physical activity. For example, this 11 year old girl noted that she wasn’t allowed to spend too much time on the computer ‘I use the computer a lot, sometimes they say get off and go outside’ or watching television ‘On the weekends we are not allowed to watch TV in the day, we have to play outside, and after school’. This 13 year old reported being encouraged by her parents to go outside:

“Well if it’s like a nice day they’ll try to encourage us to go outside and do something outside. They’ll just be like “oh it’s a nice day outside, why don’t you go out and play?” or something”, as did this 12 year old:

“She encourages me to walk Gracie (dog) and go out and ride my bike instead of just sitting on the couch. Like I’m not allowed to watch TV after school until I’ve done my homework and taken Gracie for a walk and everything”.
Participants mentioned other rules around safety after dark and spending time with friends, though these were not viewed by participants as impacting on their physical activity in any way.

5.4.5 Parental barriers to physical activity

Girls were asked if their parents did anything that prevented them being physically active, but overwhelmingly girls reported that their parents were in general very encouraging of physical activity, as illustrated by this 11 year old ‘Yeah, I don’t think in any way they stop me; they’re always encouraging me, they’re always trying to make me do more’. A couple of participants noted that they were sometimes unable to participate due to their parents’ inability to provide transport, or when their parents requested they do extra chores, but overall parents were not perceived to present any significant barriers to participation.

Some girls noted that they would like to do more if it were financially possible, as illustrated by this 13 year old girl who said:

“Well they haven’t got a problem with me doing it but it’s more the cost of the sport and so it’s… often if I can’t… if they don’t allow me to do a sport because it’s too expensive, but they have nothing really against me doing it, just that they don’t want to have to spend all that money”.

When asked what their parents could do to make it easier to participate, several girls suggested co-participation. This concept is illustrated by this 13 year old:

“Maybe like join in with our sport sort of things and play with us at home or something”,

this 10 year old:

“Maybe they could come outside with me and play ball games with me and stuff”,
and this 14 year old:

“Well maybe go for a run with me or something. Doing something with me”.

Some respondents indicated having more equipment available around the house would make participation easier, as illustrated by this 12 year old:

“Maybe providing more things, like to have around the house that we can use to be more active”.

Others suggested that being more flexible with regards to competing priorities might be of benefit, as suggested by this 15 year old:

“Well, maybe because like I really want to join an outside school hockey team but the thing is I’ve got lots of homework and stuff and they are saying that homework and stuff comes first, and like if I can manage to put my time around it then maybe I can do it, but they’re not sure”.

Overall, however, most respondents indicated that their parents made it very easy for them to participate in physical activity.

5.4.6 Impact of siblings on physical activity

There were a diverse range of responses in relation to the impact of siblings on physical activity. Many girls believed their siblings were encouraging, and as a result they themselves probably did more physical activity, or enjoyed it more. This is evidenced by the following quotes:

“I think it makes me more active because there’s always someone…” (13 year old),

“... because if I didn’t have a sister or brother, like my sister comes out in the garden with me and we like do passes for netball and stuff. If I didn’t
have them I really wouldn’t have anyone to like practice with because mum and dad are usually busy or like making dinner or something like that... I play in the same netball team as my sister so she like encourages me and stuff” (13 year old),

“I think it helps me. Well she (sister) comes out with me and she like stays out there with me so I don’t feel alone and I don’t have to come inside and everything” (10 year old), and

“I think it increases it because if you have like a little brother or sister then they always want to run around and stuff” (14 year old).

These girls appeared to appreciate the companionship and increased opportunities for participation offered by their siblings. One girl noted that having siblings had exposed her to new sports, saying:

“It really opens my eyes to different sports because we all do different sports… And it really shows me how good some sports are. They actually encourage me to do some sports and think about doing some sports, yeah…” (13 year old).

Conversely, several participants felt that siblings had a negative impact on their physical activity. There appeared to be two reasons for these negative associations. Some girls indicated that it was logistically difficult for their parents to help transport multiple children to activities, hence they participated less than they wanted to. This is evidenced by the following quotes:

“Well they do a lot as well, so we can’t really do that much… they can’t take us everywhere” (13 year old),

“I think actually less because they’ve got more places to be” (13 year old), and
“Really annoying because he normally comes before me. Because his training’s on Tuesdays and Thursdays and games are on Sundays which really are annoying” (14 year old).

Secondly, some girls indicated the nature of their relationship with their sibling was not conducive to participation, as illustrated by these quotes:

“Makes me not want to be on her team. I don’t know. Just… It’s just she’s annoying. If we get in a fight we’ll be picking on each other. You did this, why didn’t you do that, you could have done this, you could have done that” (11 year old), and

“Um, well sometimes he says I kind of suck at sport but then I don’t really listen to him. Um, we usually end up arguing” (13 year old).

A few girls suggested that having siblings had very little or no impact on their physical activity, and they would do the same amount regardless of their siblings’ level of participation or interest. Others highlighted that having siblings increased the competitive nature of physical activity, particularly when siblings played the same sport. Others provided examples of competitive but informal games they played with their siblings.

Some girls noted that their siblings were quite different to themselves in relation to preferences for or attitudes towards physical activity, as evidenced by this 11 year old who said:

“I’m a bit more committed to sport than she is because she’s more the kind of read a book but have fun all the time. Yeah, she’s more the walk the dog girl and do a little bit”.
5.4.7 Changes in physical activity over time

Most girls believed their physical activity had increased over time, with several stating they had more options available to them as they got older. These girls linked the increased opportunities to the secondary school environment:

“Well I guess since going to high school especially, it’s my physical activity I’ve been doing more of it. And yeah I guess I kind of do different things than I used to. So instead of just doing stuff at school I play outside of school as well, not just PE at school, or things like that. Well school… my school encourages people a lot to get physically active and do sports and stuff like that. Whereas at primary school I guess it wasn’t such a big thing. Yeah. I guess that’s the main change” (15 year old), and

“So, we like, do more running stuff and we do more things in PE, like, we have like, different sections of sport we can choose, like Boxercise… it’s like, fitness and stuff” (15 year old).

Similarly, a couple of girls noted that the increased exposure, with age, to other activities resulted in increased participation, as illustrated by this 13 year old:

“I’ve kind of gained some others and opened my eyes to different sports that I’d never even heard of. I’m more aware of things that I can do and yeah… I just know more about everything”.

Some girls noted the nature of participation had changed, that their ability had increased and they were more competitive, as illustrated by this 10 year old:

“Because I’m older and I have the ability to do more and I’m getting stronger and everything”
and this 15 year old:

“… like I dropped quite a few things that I reckon I could have kept up for a while… but yeah… I sort of… getting older there is a lot more to do and stuff so it’s sort of… There are a lot more commitments and… like doing homework and that sort of thing, and school and all of that”.

As illustrated by this 14 year old, it is possible that increasing feelings of self-consciousness with age, hamper participation:

“I think you do less when you get older. When you’re little you just want to run. When you’re older you just don’t run as much, well you don’t really think of what you look like afterwards when you’re little you just do it and then when you’re older you’re like…”.

Similarly, one 13 year old girl noted that her reasons for participation changed as she got older, stating that:

“I think, I get to this stage everyone like cares about how they look and stuff, so they like want to go on runs to tone their body and stuff… I don’t think people when they’re like little, they don’t really care and they’re usually like pretty skinny and stuff”.

A few girls believed their participation hadn’t changed over time, while several thought it had decreased. As evidenced by this 13 year old, competing priorities made it difficult to maintain their level of participation:

“I’ve wanted to win more I guess. I guess I try harder now about good games than like the social part”.
5.5 Discussion

The current study elicited a wealth of information on girls’ attitudes towards physical activity, their perceptions surrounding their parents’ support for physical activity, barriers to physical activity and the influence of siblings on physical activity. While girls were not asked to focus on any particular type of activity, their responses tended to relate to organised activity, rather than incidental or overall physical activity.

Participants in this study recognised a diverse range of support strategies provided by their parents. Consistent with qualitative research undertaken by Wright and colleagues (2010), logistic support (referred to as tangible support by Wright et al.) was the most common type of support identified. Findings relating to the provision of emotional support were also consistent with the literature (Wright et al. 2010), with girls citing numerous examples of parental provision of emotional support. These types of support have previously been positively associated with physical activity (Heitzler et al. 2006), hence future research should determine how parents can best be supported to implement these types of strategies.

Many participants could clearly articulate the health and social benefits of physical activity. Findings relating to developing a positive body image and physical activity as a weight management strategy are consistent with the literature (Allender et al. 2006), with participants in the current study citing both of these concepts as advantages of physical activity. However, Davison and Deane (2010) cautioned that using weight management as a means of encouraging participation among adolescent girls may have unintended negative outcomes, such as higher concern about weight and higher BMI. While many girls clearly recognise the potential weight management benefits of physical activity, overtly encouraging participation as a means of managing body weight may not necessarily be in their best interests.
In relation to social benefits, participants appeared to appreciate the social opportunities that physical activity afforded them. Similar to other studies (Humbert et al. 2006, Allender et al. 2006, Jago et al. 2009a, Yungblut et al. 2012), this study found that the potential for social interaction was a key factor in girls’ participation, and this appeared to apply to both structured and unstructured activities. Recognising and articulating the social benefits of physical activity may be an important means of encouraging participation among adolescent girls, and the potential role of parents in this endeavour should be further investigated.

Several participants displayed a negative attitude towards physical activity, specifically in relation to resulting tiredness and organised or competitive sport. Davison’s (2010) research into adolescent girls’ disinclination towards physical activity suggested perceived exertion or fatigue was a common reason for girls disliking physical activity, while Allender and colleagues’ (2006) review noted that competitive activities contributed to negative attitudes towards physical activity among girls. These findings clearly have implications for the types of physical activity opportunities offered to adolescent girls.

Similarly, some girls noted negative aspects of physical activity such as the requirement to participate with boys and getting hot and sweaty. This is consistent with Allender and colleagues’ (2006) review of qualitative studies and Yungblut’s recent qualitative work (Yungblut et al. 2012) which suggests that these types of factors are particularly influential for girls. Girls also reported these factors led to feelings of self-consciousness, which has been identified as a barrier to girls’ participation (Robbins et al. 2003).

Consistent with the literature (Humbert et al. 2006, Yungblut et al. 2012, Sallis et al. 2000, Davison et al. 2010), in the current study perceived competence influenced participation in either a positive or negative manner. For those girls who appeared to perceive themselves as being skilled, a sense of achievement was reported as a benefit of physical activity. Those who believed they were less competent reported that this was a barrier to participation. This finding is consistent with the literature, some of which has shown a positive association between perceived competence and fundamental movement skills competence.
The importance of perceived competence in influencing participation should be a key consideration when designing early physical activity programs and opportunities for girls.

Numerous participants reported that increasing demands on time, particularly in relation to homework, hampered their opportunities to be physically active. Similarly, Humbert and colleagues (2006) observed time pressures caused by homework was an important barrier to physical activity among youth, while Robbins et al. (2003) found that a perceived lack of time was a key barrier to physical activity among adolescent girls. Investigating means of overcoming these barriers is crucial if physical activity in this important target group is to increase.

Many girls in the current study reported that their siblings had a positive influence on their physical activity, a finding consistent with the cross-sectional (Bagley et al. 2006, Bringolf-Isler et al. 2010, Davison 2004, Hesketh et al. 2006), longitudinal (Cleland et al. 2011, Timperio et al. 2008) and review (Sallis et al. 2000) literature. Cross-sectionally, Bagley et al. (2006) observed girls with siblings participated in more physical activity than those without siblings, while having younger siblings was associated with greater vigorous physical activity among adolescents (Bringolf-Isler et al. 2010). Similarly, Hesketh and colleagues (2006) observed a cross-sectional association between presence of siblings and adolescent physical activity, particularly among girls, while Davison (2004) found that more active girls reported significantly higher levels of sibling support than less active girls. In their longitudinal studies, Cleland and colleagues (2011) found sibling co-participation was associated with higher levels of physical activity among girls, and Timperio et al. (2008) observed that, among girls, sibling physical activity was associated with decreases in BMI z-score over 3 years.

Despite the overall consistency of findings in this area, several participants in the current study indicated having siblings ‘put them off’ physical activity, a finding clearly inconsistent with the literature. The potential negative influence of siblings on adolescent girls’ physical activity should be further examined.

Participants reported a certain level of autonomy in relation to decision making around physical activity. Specifically, this involved girls either asking their
parents whether they could participate in particular activities they were interested in, or being given a choice of a range of activities suggested by their parents. Others indicated that mothers were relatively more influential when it came to decisions around physical activity than fathers. Few studies report on physical activity decision making, and given adolescents’ growing independence and autonomy this may be an important area for future research.

Finally, in contrast to the literature (Van der Horst et al. 2007), many participants reported increased participation in physical activity over time. This perception is interesting, given the substantial longitudinal evidence using objective measures of physical activity documenting a decline in participation with age, particularly among girls (Armstrong et al. 2000, Bradley et al. 2011, Cleland et al. 2011). However, some participants acknowledged their physical activity had decreased with age, and, consistent with the literature, this was often the result of competing priorities and other demands on their time (Humbert et al. 2006). However, the accuracy of these perceptions was not established in the current study.

5.6 Conclusions

Results from the current study suggest adolescent girls are well aware of the numerous benefits afforded to them by physical activity, and recognise the diverse range of ways that their parents support them in being physically active. While some of these support strategies are evident in the literature, their association with physical activity is yet to be conclusively determined.

Further, the potential negative influence of siblings on adolescent girls’ physical activity and the concept of autonomy in relation to decision making around physical activity are not discussed in any depth in the literature, and may provide a focus for future research.

In the following chapter, findings from this qualitative work will be further discussed in the context of participants’ physical activity levels and parenting
style, and synergies between perceptions of parents and daughters around parental support for physical activity will be explored.
6.1 Introduction

The previous chapters presented results from parents’ and daughters’ perspectives around parental facilitation of physical activity (Aims 1 and 2). This chapter addresses Aims 3-5 in Study 2 and builds on these findings by presenting the qualitative themes in the context of potential synergies between parent/daughter dyads and key demographic factors including presence of siblings, age of participating daughter, physical activity level of daughter and SEIFA area. It also discusses the findings within a parenting style framework.

6.2 Aims

The specific aims of this chapter were therefore to:

1. Examine thematic synergies between parents’ and girls’ views of parental support for physical activity;
2. Qualitatively examine perceived changes in physical activity-related parenting practices during the transition from childhood to adolescence; and,
3. Gain an in-depth understanding of how parenting style may influence girls’ physical activity.

6.3 Method

As stated in Chapter 3, 39 parents and 37 daughters participated in an in-depth, semi-structured interview. In addition to open-ended questions around attitudes to and support for physical activity, participants also responded to a series of statements about parent-child interactions, previously described by Saunders and
colleagues (2012) as being reflective of the four parenting styles developed by Baumrind (1971) (i.e. authoritative, authoritarian, indulgent and neglectful). Parents were asked to indicate how frequently they parented in that manner (never, rarely, sometimes, often or always). Despite these items being quantitative in nature, posing them within the qualitative interview framework allowed for discussion and elaboration when required. Parents and daughters were asked similar questions to allow for identification of possible synergies between parents’ and daughters’ views.

As described in Chapter 3, physical activity levels of parents and daughters were determined using validated measures (Brown et al. 2002, Prochaska et al. 2001), and demographic information was collected from parents via a brief self-report survey.

6.3.1 Analyses

Items representing each parenting style were grouped and mean parenting style scores for each participant were calculated, consistent with procedures used in Chapter 2, Study 1: Associations between parenting style and girls’ physical activity (Saunders et al. 2012). The sample was subsequently dichotomised for the purposes of analysis into those above the mean (exhibiting relatively high levels of each parenting style) and those below the mean (exhibiting relatively low levels of each parenting style).

Data were examined according to parenting style (high vs low as described above for each of the four parenting styles), age of the participating daughter (younger: 10-12 years vs older: 13-15 years), socio-economic index for areas (SEIFA) (Australian Bureau of Statistics 2008) of residential postcode (those residing in higher vs lower SEIFA postcodes) and daughters’ physical activity level (sufficiently active vs insufficiently active based on whether or not participants met the physical activity guidelines), as determined by participants’ response to the screening question (Prochaska et al. 2001). Synergies in perceptions of support strategies between parents and daughters were also identified, as were
parent and daughter reported changes in parental support for physical activity over time. Qualitative analyses have previously been described in detail in Chapter 3.

6.4 Results

Overall, synergies were observed among parents and daughters, and some perceived changes in parenting practices from childhood to adolescence were reported. Further, parenting style appeared to result in slightly different themes, albeit relatively minor, with respect to physical activity parenting in this sample. These findings are discussed in detail below.

Synergies among parents and daughters

In general, synergies were evident among parent/daughter dyads, particularly in relation to the provision of support for physical activity, with both parents and daughters citing a similarly diverse range of support strategies. A few minor differences were observed, including girls reporting being told to go outside more often than their parents reported. Girls’ awareness of their parents’ use of this strategy is illustrated in the following two quotes:

“Um, like I have to study for a while and then I have to go outside, then I can go back in and so, like, breaks outside. Um, if I’m having breaks they’re about like 15 minutes, but if I’m actually like, um, I was planning to do sport I’d probably go outside for about an hour” (13 year old),

“I use the computer a lot, sometimes they say get off and go outside, I am not allowed to play basketball outside if it's too late... On the weekends we are allowed to watch TV, but in the day we have to play outside” (11 year old).

Parents did acknowledge this strategy, as evidenced by the following quote by a mother of a 12 year old, but cited it less frequently than did girls:
“Well it is a bit of an issue in our house, so there is a lot of talk about why she needs to go outside and do something other than tellie or couch or lie on the swing reading a book, which is pretty much her preference”.

Other small differences between parent and daughter report of support strategies were observed. These differences included the provision of informational support being noted by both parents and daughters, but cited more frequently by parents. In addition, girls provided more examples of specific support strategies such as co-participation, engaging in physical activities as a family and their parents helping them with their physical activity skills, while parents talked about these strategies more broadly in the context of developing an active family culture and lifestyle. This is typified in the following quotes, both from mothers of 11 year olds:

“You know, if she’s not playing sport she’s riding a bike or on the scooter or on the trampoline or taking the dog for a walk. I don’t think she thinks about it, it’s just a natural part of what she does. It’s her lifestyle. It’s our lifestyle”,

“Not make a deal of it. I think the worst thing would be is if we sort of called it physical activity and tried to schedule it in and make a fuss. But it’s just part of what she does”.

Further, girls typically reported more physical activity rules than did their parents, though many of the examples provided by girls pertained to limiting sedentary behaviour and general rules around personal safety rather than rules about physical activity itself. Parent-reported rules were often in relation to commitment to a team or an activity once it had been paid for, or expectations around their daughter giving her best effort. This is evidenced by this quote from the mother of a mildly autistic 14 year old:

“Only within her limits, she can’t swim very well, so obviously you can’t chuck her in the deep end of the pool, but really not, you push yourself
even at PE. She says ‘I can’t do that, I can’t do it’, but I go ‘yes, you can, I
don’t care if you come last, you can do it’”.

Most girls reported being required to complete homework or chores before
engaging in physical activity, but this was not as frequently mentioned by parents.
This is illustrated in the following three quotes:

“Well I guess it’s that if you do sport then you have to get all your
homework done as well, you can’t just like put it off and not do it... it’s
probably keeping a good balance of the two, so like playing... when I play
sport I can’t do that all the time, so I have to do homework or housework
or anything like that as well, not just sport” (15 year old),

“I have to do my homework and then I can do whatever I want” (14 year
old), and

“Well if I have a chore to do or something I have to do that before I go out
and do any physical activity” (10 year old).

While parents and girls almost unanimously acknowledged the social benefits of
physical activity, parents often spoke about this more conceptually in relation to
teamwork and cooperation. This is illustrated in the following quote from the
father of a 13 year old:

“She hasn’t got too many close girlfriends at school but this is an activity
where they’re all reaching for a common goal and so there’s no bitchiness
about who is doing what. They’re all working towards a common goal, it’s
important that she’s working with the girls and they’re not working against
her”.

Girls’ physical activity levels

Parents’ perceptions regarding their daughters’ participating in sufficient activity
were generally not supported by girls’ self-reported levels of physical activity.
Only three of the participating girls reported doing ‘sufficient’ physical activity, that is, at least one hour of MVPA per day for the last seven days. A further two girls indicated that in a usual week they were sufficiently physically active, but the week prior to the interview had been atypical. This is in contrast to parents, who in general reported that their daughters were very active, with many parents actively monitoring their daughter’s physical activity due to their perception that their daughter was highly active. This is typified by the following quotes:

“There’s tiredness and fatigue, particularly being a 12 year old, and I actually have to make sure she gets adequate rest - and she’s actually injured her knee a little bit, just letting her know that sitting down and resting it for a couple of days is actually beneficial” (mother of an 11 year old), and

“No, it’s really just keeping a lid on her and not letting her get the rest of her life out of balance because of the amount of sport and stuff she does” (mother of a 15 year old).

Some parents appeared to be unaware of the need for their daughter to participate in at least 60 minutes of MVPA per day, as illustrated by this quote from a mother of an 11 year old:

“We both realise it’s important for her to be active for at least sort of twenty minutes, half an hour a day. That’s what we hope she’s sort of taken away from our years of drumming it into her”.

Perceived changes in physical activity and support over time

Parents in particular indicated that their daughter’s physical activity participation had changed over time. This is illustrated in the following quotes:

“Very much increased once they hit from about year four in primary school onwards and it’s just been a steady increase from there” (mother of a 13 and 15 year old), and
“Yes as they got older we’ve got more structured sport whereas when they were, you know, under five it was just playing with friends, not so much competition stuff” (mother of a 12 year old).

Parents also acknowledged the changing nature of participation had necessitated the introduction of additional support strategies to help their daughter maintain participation, as evidenced by this quote from the mother of a 12 year old:

“I talk to her about the reasons why she should be (physically active) so that hopefully even though she’s a bit reluctant she understands that it’s necessary. Particularly as she’s left primary school where a lot of the activity was formalised for her so after school basketball, she was there more for being part of the team than actually developing basketball skills, but she turned up every week. So she hasn’t got that sort of structured sport with training now. I put pressure on her to walk this little one (referring to dog). I think it’s just talking to her about why it’s worth her while when she would prefer not to”.

The vast majority of girls felt that their parents did more to support their physical activity now than previously, often as a result of their increased participation, as evidenced by this 13 year old:

“Yeah, probably more. Maybe because I do more playing, because as you get older… I don’t know, they just want me to be involved more”.

Some girls, who felt they were participating less as they aged, believed that this resulted in increased involvement from their parents, as illustrated by this 11 year old:

“When I was doing the other sports they weren’t encouraging other activities as much. Now that I’m not doing them, they are encouraging me to do walking to school, playing outside and stuff like that”.
Others noted that their parents just tended to be more encouraging as they got older, as illustrated by this 12 year old:

“Well, yeah they encourage us more to do sport now because when we were little we didn’t really have to do anything. But now she’s sort of… Mum and Dad, they encourage us to do sport as we’re getting older”.

Others felt that the level of support hadn’t changed at all, and that their parents had always been supportive.

Perceived differences between girls and their siblings in relation to physical activity

Where applicable, parents were asked if they felt any differently about their daughter participating compared to her siblings. The vast majority reported that they treated their daughter no differently to her siblings, while acknowledging that some children required more encouragement than others. Specifically in relation to gender differences, some parents reported that they treated their daughters exactly the same as their sons with regard to physical activity, as evidenced by the following quote from the father of a 13 year old:

“... we’ve encouraged her whenever she has wanted to do something, we certainly haven’t been negative about it in anyway and the fact that we’ve treated her like one of the boys I suppose, you know, taking a few knocks that sort of thing in life and just being kind to her I suppose to let her know it’s okay”.

Similarly, one mother of an 11 year old noted options for girls, particularly in relation to organised sport, had increased in recent decades, as evidenced by the following:

“I think girls are much more encouraged, there’s a lot more sports around for girls now than there ever has been. And I think it’s a lot more
encouraged and seen as a... it was traditionally a boys’ thing to do. It was really important to get your sons into sport once upon a time”.

In contrast, one mother noted that the cultural norms around physical activity were different for their daughter compared with their son, as illustrated by the following quote from the mother of a 12 year old:

“It’s culturally like he’s influenced in a whole different way than her. I think with boys they’re sort of, who they are is defined by how good they are at sport and it’s actually created some issues about how he sees other kids at school because they’re very sporty kids and the confidence and an automatic admission into certain social groups because they’re good at footy... when they’re not you’ve got to sort of carve your identity. He’s at an all boy’s school so that probably adds another dimension too”.

**Thematic differences in perceptions according to SEIFA**

The only minor difference observed between parents from higher and lower SEIFA residential postcodes was around limiting activities based on finances, with parents from lower SEIFA postcodes citing this strategy slightly more frequently than parents from higher SEIFA postcodes. No other socioeconomic differences in support for physical activity were observed.

**Thematic differences in perceptions according to age of participating daughter**

There were very few thematic differences in attitudes towards or perceptions of physical activity among parents of younger and older girls and the girls themselves. There were some minor differences in relation to parental support for physical activity, with younger girls more frequently reporting co-participation with their parents. Older girls more frequently reported making their own decisions around physical activity, while younger girls reported their parents more commonly made physical activity related decisions. Even younger girls reported that they believed their physical activity participation had increased over time.
Thematic differences in perceptions according to parenting style

Overall there were few differences in results based on parenting style; however, there were some minor variations as described below.

Authoritative

Although not exclusive to more authoritative parents, parental concerns regarding injuries and burnout were cited more frequently by authoritative parents. Similarly, a preference for their daughter to participate in outside activities after school was noted more frequently, but not exclusively, by more authoritative parents, as evidenced by the following quote from the mother of a 12 year old:

“When the weather is nice encouraging her to get outside on the trampoline or something. Yes, one of the reasons I was happy to get the dog was so that would be another activity”.

Similarly, this more authoritative mother of an 11 year old acknowledged her preference for her daughter to participate in outdoor activities, but also indicated how she facilitated this through the provision of equipment:

“I really encourage them to get out so I don’t mind what outside sport it is... There’s a basketball ring, there’s basketballs, there’s tennis balls, there’s tennis rackets, there’s everything. Yeah. Well I don’t think there is everything, but there’s a huge amount and I don’t mind which it is”.

More authoritative parents also reported fewer difficulties in getting their daughter to be physically active.

Authoritarian

Those parents who were more authoritarian tended to emphasise commitment when describing how they supported their daughters’ physical activity. For example, this mother of an 11 year old remarked:
“… will often turn around and say I don't want to go the training tonight I'm too tired or I want to go to a birthday party or I want to do something else. I will say hang on a minute you are the one who wanted to play in this team, you are committed and you have to go to the training whether you like it or not”.

Further, more authoritarian parents cited payment of fees as a means of support more often than less authoritarian parents. Parents who were less authoritarian more often reported allowing their daughter to relax after school or watch television, while more authoritarian parents reported encouraging particular types of activities, such as outdoor activities or team-based activities.

As illustrated in the following quote from the mother of a 12 year old, parents who were more authoritarian more often reported difficulties in getting their daughter to be physically active:

“I think logically she understands that it’s important, emotionally she would sometimes like to reject it because when it gets a bit tough she would prefer to give up. She doesn’t with other things but just with physical activity. So yes, at this stage I’m insisting, but still trying to rationalise why I’m being a bit of a boss about it”.

When asked about the best ways to encourage participation, less authoritarian parents tended to acknowledge the importance of focussing on participation rather than competition. For example, this father of an 11 year old said it was important to:

“… enjoy their participation regardless of whether they are successful either individually or team wise. Participation is as much of the success as anything... A lot of coaches are driven by success, you know the kids that aren't really good get pushed aside which is really sad because participation is what is important, the ability to participate in a non-threatening environment without the pressure of success”.
Further, while some more authoritarian parents acknowledged the importance of participating from an early age, this theme was more evident in responses from less authoritarian parents. This is illustrated by the following quote from the mother of an 11 year old:

“I think inclusiveness and involvement at an early age is great... it’s getting the basics right, and the early learning that really is important”.

*Indulgent*

Parents who were more indulgent more commonly reported not forcing their daughter to participate, in comparison to those who were less indulgent. This is evidenced by the following quotes:

“I try and encourage her to be active and do active things but while recognising that I don’t think there is any point in pushing her into things like netball because she doesn’t enjoy it” (mother of an 11 year old), and

“I like her to participate if she’s happy, I don’t want to force her into anything she doesn’t want to do” (mother of a 10 year old).

In contrast, these less indulgent parents of an 11 year old said:

“… we not only encourage it but we mandate it” (father), and

“… basically it is a mandatory thing in this family” (mother).

More indulgent parents typically reported risk of injury as a concern regarding their daughters’ physical activity, while less indulgent parents often reported no concerns. Less indulgent parents were more likely to report setting limits around the number of activities their daughter could participate in, and emphasising the importance of commitment once their daughter had agreed to something. This is evidenced in the following quotes:
“We’ve got to drive them everywhere and it wasn’t working and so the
customers also all like music so years and years ago I said you can do one
sport and one instrument and that’s what I can pay for in time and money”
(mother of a 13 year old), and

“If she commits to a sport she has to complete the year doing it” (mother
of a 14 year old).

In relation to preferred after-school activities, more indulgent parents frequently
reported allowing their daughter to do whatever she wanted after school. This was
in contrast to less indulgent parents, who were more prescriptive in what they
preferred their daughter to do after school, as demonstrated by this mother of an
11 year old girl:

“I really like the fact that they get some unstructured time outside and play
with the dog and do some chores”.

In relation to the best ways to encourage participation among girls, more
indulgent parents in particular noted the importance of allowing their daughters to
try a range of activities in order to find something that suited them, as illustrated
in the following quotes:

“So I think it’s better to find something that they actually enjoy so they
want to do it rather than turning them off… I know our culture in Australia
is very much around the sports and competitive sports and I don’t think
that’s the only way to get fit… It doesn’t really matter if you’re going out
for a nice brisk walk or you know climbing at an indoor rock centre or…the
you know just going for a hike” (mother of an 11 year old), and

“… by allowing them to try as many different sports until they find
something that they like to do” (mother of a 10 year old).
Neglectful

Parents who were relatively more neglectful reported a less diverse range of support strategies; these were primarily limited to provision of transport, payment of fees, verbal encouragement and watching their daughter participate. Further, these parents reported fewer rules around physical activity.

Those parents who were less neglectful more frequently stressed the importance of avoiding negative implications of physical activity participation, such as complaining or being derogatory. This is evidenced in the following quotes:

“... you know, getting them to their physical activity on time with all of the appropriate equipment and those sorts of things and not whinging and moaning about it” (mother of a 13 year old),

“... well not to groan and moan about driving them there and back” (mother of a 14 year old), and,

“... you need to encourage them, but I’ve seen parents where, you know the games over and they say ‘oh you should have got the ball off that other kid’ or you know ‘you shouldn’t have missed that goal’ and you know they’re actually putting negative vibes… they’re sort of putting the kid down rather than saying, you know ‘it was bad luck you missed that goal. Next time you’ll have a better shot’. You know, it’s just they’re sort of putting the kid down” (mother of an 11 year old).

6.5 Discussion

These thematic analyses revealed numerous synergies among parent/daughter dyads in relation to provision of support for physical activity, as well as some notable differences. Further, there were some perceived changes in physical activity support strategies over time as adolescent girls matured, as well as
differences in the provision of support for physical activity according to parenting style.

As described, overall synergies existed between parents and daughters in relation to perceived parental support for physical activity. Although not a qualitative study, this finding is consistent with work by Barr-Anderson and colleagues (2010), who, in their small cross-sectional study, found high levels of agreement between parent/child dyads in relation to family support for physical activity. The authors observed that, in comparison to parental reports, child perceptions of family support were more strongly associated with physical activity. Further, the authors acknowledged the need for qualitative research to further explore potential differences in how parents and children define and perceive parental support. The current study addresses this recommendation, finding that despite the overall synergies in parent-child report, some minor differences were observed, highlighting the importance of collecting data from both parents and daughters. One of these differences related to girls reporting being encouraged to go outside more frequently than did parents. It may be that encouraging their daughter to go outside is not considered by parents as a strategy to specifically support physical activity, but rather part of their overall expectations regarding use of discretionary time.

Further, in the current study physical activity rules were discussed more frequently among the girls than among their parents, although as identified previously these rules often related to television viewing and computer use rather than physical activity. Most of the literature in this area (for example, Salmon et al. 2005b, Zabinski et al. 2007, Hohepa et al. 2009) similarly relates to rules about television or sedentary behaviour, rather than rules directly pertaining to physical activity, hence a discussion of this finding in light of the literature is difficult. However, quantitatively assessing differences in parent-child report of physical activity rules may be an interesting focus for future research, particularly given the notion that television viewing may displace physical activity during the after school period (Hohepa et al. 2009).
Parents in the current study appeared to perceive their daughters to be more active than they actually were. This is consistent with Corder et al.’s (2012) research which compared parent-reported child physical activity with objectively assessed child physical activity in the US. That study found that, in general, parents overestimated their child’s physical activity, and this overestimation was particularly prevalent among parents of girls. Similarly, in a cross-sectional study of children aged 9-10 years and their parents in the UK (Corder et al. 2010), 80% of parents of inactive children incorrectly believed their child was sufficiently active. Further, qualitative research (Bentley et al. 2012) shows that parents who believe their child to be active or very active do not see the need to increase their child’s physical activity, hence these misperceptions clearly have implications for family promotion and encouragement of physical activity.

Most parents in this study believed their daughter’s physical activity had increased over time, a finding which was generally supported by girls’ own perceptions. This is clearly inconsistent with the literature, with numerous cross-sectional (De Cocker et al. 2011, Troiano et al. 2008) and longitudinal (Cleland et al. 2011, Bradley et al. 2011) studies showing a decrease in participation with age among girls. While this finding may be a reflection of the type of activity parents are focussing on, for example organised sport, this misperception clearly presents a challenge for the promotion of physical activity to this important target group.

Results were mixed in relation to changes in parental support over time, with some girls believing that parental support had increased, others reporting that it had decreased, and yet others reporting no change. One consistent finding was that perceived parental encouragement increased with age, which is congruent with the literature in relation to how the provision of different types of parental support may change over time (Duncan et al. 2005b). Duncan and colleagues (2005b) suggest that encouragement and informational support may become increasingly influential as children age, while other studies (Alderman et al. 2010) suggest that overall parental influence in relation to physical activity diminishes as children age. It is possible that this increasing parental provision of encouragement may be in response to girls’ declining participation with age,
however research in this area is limited and further investigation of the changing nature of parental support is warranted.

While the presence of siblings has been positively associated with time spent in MVPA, particularly among girls (Hesketh et al. 2006, Bagley et al. 2006), and more active adolescent girls have reported higher levels of sibling support than low active girls (Davison 2004), few studies have qualitatively examined the perceived influence of siblings on adolescents’ physical activity. In particular, whether parents with more than one child have different attitudes towards physical activity between their children has not been explored. While parents in the current study in general did not appear to have differential attitudes towards their children’s physical activity, consistent with the literature some parents did acknowledge the existence of gender stereotypes as they related to primarily organised sport (Alley & Hicks 2005).

Very few differences based on socioeconomic status were observed in the current study. This is consistent with previous reviews of correlates of physical activity among adolescents (Sallis et al. 2000, Van der Horst et al. 2007), in which socioeconomic status was found to have no association with physical activity. However, Biddle and colleagues (2005), in their review of correlates of physical activity among adolescent girls, found that socio-economic status was positively associated with physical activity, and suggested this might be particularly important for organised sport with its associated transport and participation costs. This is consistent with work by Eime and colleagues (2013), who observed associations between socio-economic status and sport club membership among adolescent girls, and found these associations were mediated by family support. Consistent with the literature, in the current study parents from lower SEIFA postcodes more frequently reported limiting their daughter’s physical, primarily sporting, activities for financial reasons. These findings further support the need to assist parents, particularly those residing in lower SEIFA postcodes, to encourage and provide support for their daughter’s physical activity participation.

Few differences between younger and older girls were observed, although younger girls reported co-participation more frequently than older girls. This
finding is consistent with work by Alderman and colleagues (2010), who, in their longitudinal study, noted a significant decrease in the time parents spent engaging in physical activity with their children. This finding may warrant further investigation, to determine whether this is initiated by parents or a result of children’s declining participation.

In the current study, parenting style appeared to result in different discussions, albeit minor, regarding provision of parental support for physical activity. In particular, parents who were more authoritative discussed encouraging their daughters to go outside more often, and, importantly, reported facilitating this by providing equipment and activities for their daughter to engage with outdoors. This is consistent with the purported increased demandingness and responsiveness of the authoritative parent (Lamborn et al. 1991), in that these parents have firm expectations around their child’s behaviour, but also provide a high level of support to facilitate the expected behaviour.

More authoritarian parents appeared to have an increased emphasis on commitment to sporting activities and structured after-school activities. This is consistent with the authoritarian parental typology, whereby parents are firm and directive (Lamborn et al. 1991), and with Chapter 2, Study One which found a cross-sectional association between authoritarian parenting and organised sport participation among adolescent girls. Further, more authoritarian parents discussed difficulties in encouraging their daughter to be physically active, relative to less authoritarian parents. This finding is unique to this study and warrants further investigation as it is possible that authoritarian parents’ insistence on their daughter’s physical activity participation is having an adverse impact on girls’ participation. While there is little research in this area in the physical activity context, child feeding literature supports the notion that forcing consumption of particular healthy foods has a negative impact on child food consumption patterns (Patrick et al. 2005).

Indulgent parents more often discussed not forcing their daughter to participate in physical activity. This again is consistent with the literature on parenting style, which suggests indulgent parents place few demands on their child (Okagaki
Finally, those parents who were less neglectful relative to other parents more frequently reported making conscious decisions to avoid any negative associations of physical activity in an effort to encourage their daughter’s participation. This is an interesting finding which may warrant further examination.

There are a number of limitations to this study. As described previously, the sample was relatively homogenous, despite efforts to recruit a diverse sample. This may have limited the ability to systematically investigate thematic differences according to socio-demographic and behavioural factors. A varied range of results was still obtained, however, with some notable differences across key demographic criteria. Self-selection bias is evident to a degree, in that any participants agreeing to volunteer their time to participate in an interview about physical activity are likely to have a vested interest in the topic. Despite their likely interest in the area, however, numerous participants reported difficulties in getting their daughter to be physically active, hence a wide range of perspectives were uncovered. Finally, in relation to parenting style, the parents in this sample in general were very supportive of their daughter’s physical activity participation; hence those classified as relatively less supportive for the purposes of thematic analyses were still quite supportive. This relatively high level of support may be a result of self-selection bias or social desirability bias. Obtaining data from a more diverse group of parents, particularly in relation to parenting style, may have yielded different results.

This study provides numerous avenues for future research. In particular, the range of physical activity parenting strategies identified could be assessed quantitatively in a larger sample. Given the minor differences observed between parents and daughters in their perceptions of support for physical activity, it would be useful to collect such data from both groups to determine the extent of these differences. Further, it would be prudent to collect data from parents who do little to support their daughter’s physical activity to determine what barriers they face.
6.6 Conclusion

Overall, this qualitative study has identified numerous additional strategies that parents employ to facilitate their daughter’s physical activity. These strategies included ensuring adequate hydration, nutrition and rest, steering their daughter towards team-based activities and mandating participation from a very young age. To capture the prevalence of these strategies and examine their associations with physical activity, measures of the myriad of ways in which parents facilitate their daughter’s physical activity must be developed and tested. Further parenting styles appear to influence physical activity among adolescent girls; hence future research into physical activity parenting should consider the influence of these factors.
7.1 Introduction

In Chapter 4, numerous strategies, additional to those in the published literature, which parents employ to facilitate their daughter’s physical activity were identified. These strategies included ensuring adequate hydration, nutrition and rest, steering their daughter towards team-based activities and mandating participation from a very young age. To capture the prevalence of these previously unstudied strategies and examine their associations with physical activity, measures of such strategies must be developed and tested.

While basic parenting practices are emerging as a focal point in the physical activity literature, these are often not discussed within the context of parenting style, hence potentially overlooking an important relationship. Indeed, recent work by Hennessy and colleagues (2010) demonstrates that parenting style moderates associations between parenting practices and youth physical activity.

Examining the potential influence of parenting style and practices on physical activity presents numerous challenges. As described previously, while research in the field of child nutrition has facilitated the development of comprehensive measures to assess parenting styles and practices in relation to child feeding behaviour (Hughes et al. 2005), few such measures exist for the assessment of these concepts in a physical activity context (Sleddens et al. 2012). In addition, few existing measures of physical activity parenting provide appropriate psychometric data. Study 3 seeks to address these challenges by developing and

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3 Preliminary results from this study will be:
   a) Presented at the ISBNPA Annual Scientific Meeting in San Diego, May 2014 (see Appendix 18).
testing measures of strategies employed by parents to facilitate their daughter's physical activity.

7.2 Aims

Study 3 aimed to examine parental facilitation of adolescent girls’ physical activity and to develop and test questionnaire/survey items measuring strategies employed by parents to facilitate their daughter's physical activity. These items were informed by previous qualitative and quantitative research, as described in Chapters 2-6. The psychometric properties of these measures were tested in a sub-sample of adolescent girls and their parents. The specific objectives of this chapter were to:

1. Develop and test physical activity-specific measures of parenting styles and practices for adolescent girls and for parents;
2. Assess the test-retest reliability of physical activity-specific measures of parenting styles and practices in a sub-sample of adolescent girls and their parents; and,
3. Determine the association between physical activity parenting and adolescent girls’ physical activity among parent-daughter dyads.

7.3 Method

This study employed a cross-sectional design and involved an online survey of adolescent girls aged 11 - 15 years and one or both of their parents. Girls were recruited by the candidate through schools in the Perth metropolitan area. A sub-sample of girls and their parents participated in a reliability study by completing the same questionnaire on two occasions, two to three weeks apart.

7.3.1 Ethics

Ethics approval was received from the Deakin University HEAG (Faculty of Health) (approval number HEAG-H 148_11, granted 20 December 2011). Cross-institutional ethics approval was granted by the University of Western Australia HREC (approval number RA/4/1/5178, granted 21 December 2011). To enable
recruitment via schools, ethics approval was also received from the Western Australian Department of Education and Training and the Catholic Education Office of Western Australia (granted 5 July 2012 and 23 March 2012 respectively). A Working with Children Check was completed by the candidate.

7.3.2 Sample size calculations

The study was adequately powered to meet the objectives, allowing for clustering at school level. A sample size of 300, for example, was considered sufficiently powered at 80% and a significance level of 0.05 to detect an effect size on physical activity as small as 0.042 with 5 independent variables included in a linear regression model. Allowing for a school clustering effect of 0.018 (Salmon et al. 2011), it was calculated that a total sample of 350 girls was required. For the reliability component of the study, it was estimated that 60 participants would provide sufficient power for the calculation of intra-class correlations (Hume et al. 2006).

7.3.3 Sample selection and recruitment

A complete register of secondary or K-12 schools in the Perth metropolitan area was obtained and all schools were allocated a ranking via random number generation. The top 100 ranked schools were approached via an email to the school Principal between July and October 2012. The email included an invitation to participate in the research, and, as attachments, a plain language statement and a consent form (see Appendix 12 and 13). Those schools that did not respond were followed up via telephone approximately one week after the initial email. One of the schools was ineligible to participate as they did not have any students of the required age. In total, 33 schools agreed to participate (33%). Reasons for not participating included prior involvement with other research projects, an unwillingness to further burden teaching staff and an inability to commit to the project.

Once schools agreed to participate, Principals were asked to nominate a staff member with whom the candidate could liaise. A time (or times) for the candidate
to visit the school and speak with girls in years 8, 9 and 10 was scheduled. The candidate visited each school at the arranged times and spoke briefly with all girls in the target group between August and December 2012.

After speaking with the assembled girls about the study and physical activity more generally, an information pack addressed to the parent was distributed to each student. The information pack contained a plain language statement and consent form for parents, a plain language statement and consent form for girls (see Appendix 12 and 13) and a reply-paid envelope. A teabag was also included with the parents’ materials to ‘assist’ them with survey completion and an invitation to participate in a prize draw for one of ten $50 iTunes vouchers was included for girls.

Girls were requested to take the information pack home to discuss with their parents. Those girls and their parents who were interested in participating were encouraged to return their signed consent forms in the reply-paid envelope. In total, the candidate presented the study to 6170 students in years 7-10, across 33 schools. A total of 592 parent-daughter dyads returned their consent forms, a response rate of 9.6%. Of these, three parent-daughter dyads withdrew from the study due to relocation or time commitments, and 494 parents and 414 daughters completed the survey. This included 384 parent-daughter dyads.

7.3.4 Measures

Survey measures

Two online surveys, one for parents and one for daughters, were developed and piloted. The surveys were firstly piloted with 11 academics to confirm face validity and to assess readability and comprehension. After a number of minor modifications to wording and question order, the survey was then piloted with a convenience sample of six members of the target audience, that is, girls in the target age group and their parents. Minor wording modifications were subsequently made to the girls’ questionnaire. Questionnaires took approximately 15 minutes for girls to complete and 10 minutes for parents to complete.
The surveys were hosted by Deakin University Health Surveys using Opinio survey software (Softonic 2013). Data were stored securely on the Deakin server and could only be accessed by the candidate’s principal supervisor. Survey invitations were emailed to each participant’s email account. Participants had previously been provided with a unique identification number, to enable matching of parent and daughter data. Participants were instructed to enter their unique identifier at the commencement of the survey. Reminder emails were sent to participants 7 days, 10 days and 12 days after the initial survey invitation to encourage completion.

The online survey was unable to remain open for an extended period due to host server restrictions. To capture data from all participants who returned consent forms over the six month period, four discrete data collection ‘waves’ were scheduled. Each wave occurred for a two week period during school term, in September 2012, October 2012, December 2012 and February 2013. Participants who were unable to complete their survey during a previous wave were again invited to complete it during subsequent waves.

**Parent survey**

The parent survey contained socio-demographic items and items on physical activity-related parenting practices and styles as described below. The full survey can be found in Appendix 14.

**Socio-demographic items**

Parents or carers reported demographic characteristics including their relationship to the child in the study, residential postcode, parity, age, educational attainment (collapsed into some secondary school or less; completed secondary school, technical college or apprenticeship; university/tertiary qualification), employment status (collapsed into employed full-time; employed part-time; home duties full-time; self-employed/other) and marital status (collapsed into married/defacto; separated/divorced/never married/widowed).
Physical activity-related parenting practices and styles

Parents responded to 30 items about their physical activity-related parenting practices and styles (Table 7.1). Each item was developed by the candidate and was based on the qualitative work described in Chapters 3-6. Examples included ‘I pay for my daughter’s physical activity fees and uniform’, ‘I help my daughter improve her physical activity skills’ and ‘I insist my daughter participates in physical activity’. Response options (and scoring) were the same for all items and were on a five-point scale: never (1); rarely (2); sometimes (3); often (4); always (5). A ‘not applicable’ (6) option was also included, although these responses were re-coded as missing prior to analysis. The test-retest reliability of these items is described in the results section of this chapter.

Daughter survey

The daughter survey contained socio-demographic items, items to assess girls’ perceptions of their mothers’ and fathers’ physical activity-related parenting practices and styles and girls’ physical activity levels as described below. The full survey is available in Appendix 15.

Demographics

Girls reported their date of birth, residential postcode, school attended, number of siblings and family members with whom they reside.

Physical activity-related parenting practices and styles

Girls responded to the items developed by the candidate described in Table 7.1 firstly in relation to their mother and secondly in relation to their father. Examples included ‘My mum suggests physical activities I might enjoy’ and ‘My dad provides equipment for me to be physically active at home’. Response options were on a five-point scale as described above, and test-retest reliability is described in the results section of this chapter.
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<th>Parenting practices:</th>
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<tr>
<td>My mum/dad suggests physical activities I might enjoy*</td>
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<tr>
<td>My mum/dad provides transport to help me to get to physical activities</td>
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<tr>
<td>My mum/dad encouraged me to be physically active when I was really young</td>
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<td>I see my mum/dad being physically active</td>
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<td>My mum/dad makes sure I eat healthy foods after I have been physically active</td>
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<td>My mum/dad makes sure I drink lots of water during physical activity</td>
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<td>My mum/dad tries to help me improve my physical activity skills</td>
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<tr>
<td>My mum/dad helps out at my physical activity by doing things such as scoring, coaching, timing</td>
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<td>My mum/dad pays for my physical activity fees and uniform</td>
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<tr>
<td>My mum/dad makes me do physical activity when I don’t really want to</td>
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<td>My mum/dad participates in physical activities with me</td>
</tr>
<tr>
<td>My mum/dad talks to me about why physical activity is good for my health</td>
</tr>
<tr>
<td>My mum/dad talks to me about the social aspects of physical activity</td>
</tr>
<tr>
<td>My mum/dad makes sure I get enough rest after I do physical activity</td>
</tr>
<tr>
<td>My mum/dad lets me try lots of physical activities to see which ones I enjoy</td>
</tr>
<tr>
<td>My mum/dad thinks physical activity is important for our whole family</td>
</tr>
<tr>
<td>My mum/dad nags me to do physical activity</td>
</tr>
<tr>
<td>My mum/dad provides equipment for me to be physically active at home</td>
</tr>
<tr>
<td>My mum/dad watches me participate in physical activity</td>
</tr>
<tr>
<td>My mum/dad encourages me to go outside</td>
</tr>
<tr>
<td>My mum/dad insists that I do physical activity</td>
</tr>
<tr>
<td>My mum/dad complains about me being physically active</td>
</tr>
<tr>
<td>Parenting styles:</td>
</tr>
<tr>
<td>My mum/dad has really strict rules around physical activity</td>
</tr>
<tr>
<td>My mum/dad encourages me to do my best at physical activity</td>
</tr>
<tr>
<td>My mum/dad doesn’t really mind if I don’t do any physical activity</td>
</tr>
<tr>
<td>My mum/dad doesn’t really care what physical activity I do</td>
</tr>
<tr>
<td>My mum/dad gets frustrated if I don’t do any physical activity</td>
</tr>
<tr>
<td>My mum/dad expects me to do well at physical activity</td>
</tr>
<tr>
<td>My mum/dad doesn’t encourage me to do any physical activity</td>
</tr>
<tr>
<td>My mum/dad lets me do whatever I want in regard to physical activity</td>
</tr>
</tbody>
</table>

*All items were adapted for either parents or daughters e.g. I suggest physical activities my daughter might enjoy/ My mum suggests physical activities I might enjoy/ My dad suggests physical activities I might enjoy.*
Physical activity

Girls’ physical activity was assessed using the International Physical Activity Questionnaire – Adolescent (IPAQ-A), a version of the International Physical Activity Questionnaire – Long Form (IPAQ-L), which has been modified and validated for adolescents (Hagströmer et al. 2008). This instrument includes items on physical activity within the school, transport, home and leisure domains, and collects data on walking, moderate- and vigorous-intensity activity. Within each of the four domains, respondents are asked about the number of days in the previous week they were physically active within that domain, the intensity of their activity and the duration of their activity. For example, vigorous physical activity during breaks at school is assessed by asking ‘During the last 7 days, on how many days did you do the following, during breaks at school, for at least 10 uninterrupted minutes…. VIGOROUS physical activity, that takes hard physical effort and makes you breathe much harder than normal, like running…’ and ‘How much time did you usually spend during breaks at school on one of those days doing vigorous physical activities?’. The IPAQ-A has been shown to have significant though modest validity in comparison with accelerometer data (Ottervaere et al. 2011), particularly among older adolescents (Hagströmer et al. 2008). The reliability of this instrument is yet to be reported; hence test-retest reliability has been assessed in the current study and reported in the results section of this chapter.

7.3.4 Data management

Data were managed and analysed using IBM SPSS Statistics Version 21 (2012).

Physical activity

Physical activity data were cleaned and truncated consistent with IPAQ guidelines (The IPAQ Group 2005) and specific procedures for the adolescent version (De Cocker et al. 2011). Where it was evident that the participant had reported total
minutes rather than hours, this was amended. For example, participants who reported 45 hours of walking on a usual day were recorded as participating in 45 minutes of walking. Participants who reported in excess of 180 minutes per day in a particular activity were truncated to 180 minutes (The IPAQ Group 2005).

Domain- and intensity-specific weekly totals were computed by multiplying the time spent in that particular form of activity by the number of days on which that activity was reported. Weekly totals were truncated consistent with established procedures (De Cocker et al. 2011, The IPAQ Group 2005). Truncation procedures were applied as follows: total weekly transport physical activity was truncated to 1290 minutes per week (1 case; 0.2% of the sample) (De Cocker et al. 2011); total weekly LTPA was truncated to 1680 minutes per week (2 cases; 0.5% of the sample) (De Cocker et al. 2011); total weekly walking and total weekly MPA were truncated to 1260 minutes per week (4 cases and 9 cases; 1% and 2% of the sample respectively) (De Cocker et al. 2011); and total weekly MVPA was truncated to 2540 minutes per week (4 cases; 1% of the sample) (De Cocker et al. 2011). None of the scores for VPA required truncation. While De Cocker and colleagues (2011) recommend truncating total weekly school physical activity to 1800 minutes, this was considered inappropriate for the Australian school system. The time available for physical activity during school hours is specific to the Australian school context; hence weekly physical activity within the school domain was truncated to 900 minutes (3 hours x 5 days). Only one case (0.2% of the sample) required truncation within this domain.

Data transformation

Physical activity data were all positively skewed, with numerous zeroes, and were therefore transformed. As suggested by Tabachnick and Fidell (2007), a constant of 1 (minute) was added to all physical activity variables, before using a Log10 transformation.
7.3.5 Statistical analyses

Data were analysed using IBM SPSS Statistics 21. Test-retest reliability of physical activity and parenting items was assessed by determining intra-class correlation coefficients (ICC) for each. Factor analysis (principal components analysis with varimax rotation) was employed to develop scales, and Cronbach’s alphas were calculated to determine the internal reliability of the scales.

Transformed physical activity data were used for all statistical analyses and generation of p-values. Unless specified otherwise, transformed data have been reported in tables, with corresponding back-transformed values described in text.

Descriptive statistics were used to present the demographic characteristics of the sample. To determine the extent of clustering by school, ICCs were generated (Table 7.2). An ICC could not be computed for total weekly moderate physical activity as there was no variation between schools for this variable. While none of the ICCs were significant, those for transport physical activity and LTPA approached significance, suggesting there may be a clustering effect for these outcome variables.

Table 7.2: Intra-class correlations for clustering of physical activity outcome variables by school

<table>
<thead>
<tr>
<th>Outcome</th>
<th>ICC</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total weekly school PA</td>
<td>0.048</td>
<td>0.248</td>
</tr>
<tr>
<td>Total weekly home PA</td>
<td>0.003</td>
<td>0.885</td>
</tr>
<tr>
<td>Total weekly transport PA</td>
<td>0.053</td>
<td>0.099</td>
</tr>
<tr>
<td>Total weekly LTPA</td>
<td>0.076</td>
<td>0.103</td>
</tr>
<tr>
<td>Total weekly walking</td>
<td>0.006</td>
<td>0.817</td>
</tr>
<tr>
<td>Total weekly vigorous PA</td>
<td>0.006</td>
<td>0.726</td>
</tr>
<tr>
<td>Total weekly MVPA</td>
<td>0.007</td>
<td>0.766</td>
</tr>
</tbody>
</table>
Further, linear mixed models were generated to assess the association between randomly selected independent (parenting style and practices) and dependent (physical activity) variables, allowing for clustering by school. Results from these linear mixed models were compared with results from standard linear regression models for selected outcome variables to confirm the extent of clustering by school. As minimal differences were found, clustering by school was deemed non-significant for all outcome variables except transport physical activity and LTPA. Therefore, linear mixed models were used for transport physical activity and LTPA outcomes, while standard linear regression models were used for the remaining outcomes.

For each parenting factor, Pearson’s correlations between daughters’ reports regarding their mother’s parenting, daughters’ reports regarding their father’s parenting and parent self-report were determined.

To determine the relative strength of association between parenting factors and girls’ physical activity, multivariable models were run for, firstly, all factors relating to mothers, secondly, all factors relating to fathers, and lastly, all parent-reported factors. Specifically, multivariable mixed effects linear regressions were conducted for transport physical activity and LTPA outcomes, while multivariable linear regressions were run for all other physical activity outcomes.

Where specific socio-demographic variables were associated with the outcome, they were controlled for in analyses. For all analyses, a p-value of <0.05 was used to denote statistical significance.

7.4 Results

7.4.1 Demographic characteristics

The mean age of the girls (n=414) in the sample was 14.5 years. The mean age of the responding parent (n=494) was 46.1 years. The majority were mothers (89%), employed either full-time or part-time (77%) and were married or in a defacto
relationship (89%). More than two-thirds of responding parents (69%) had completed a university or tertiary qualification (Table 7.3). When comparing parents whose daughters also completed the survey with those whose daughters did not, a significant difference was observed with regard to the respondent’s relationship to the child in the study (p<0.05).

Table 7.3: Demographic characteristics of the total sample of parents and complete parent/daughter dyads

<table>
<thead>
<tr>
<th></th>
<th>Parent complete but not daughter (N=110)</th>
<th>Complete dyads (N=384)</th>
<th>All parents (N=494)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (Mean (SD))</td>
<td>46.5 (5.6)</td>
<td>46.1 (4.8)</td>
<td>46.1 (5.0)</td>
<td>.925†</td>
</tr>
<tr>
<td>Number of children</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>0-2</td>
<td>58.2</td>
<td>57.8</td>
<td>57.9</td>
<td>.789‡</td>
</tr>
<tr>
<td>3-4</td>
<td>38.2</td>
<td>37.0</td>
<td>37.3</td>
<td></td>
</tr>
<tr>
<td>5+</td>
<td>3.6</td>
<td>5.2</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>Relationship to child in study</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>82.7</td>
<td>90.6</td>
<td>88.9</td>
<td>.041‡</td>
</tr>
<tr>
<td>Father</td>
<td>15.5</td>
<td>9.1</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>Guardian</td>
<td>1.8</td>
<td>0.3</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>0.9</td>
<td>3.9</td>
<td>3.2</td>
<td>.285‡</td>
</tr>
<tr>
<td>High, tech or trade school</td>
<td>27.3</td>
<td>27.6</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>University/tertiary</td>
<td>71.8</td>
<td>68.5</td>
<td>69.2</td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Married/defacto</td>
<td>86.4</td>
<td>89.6</td>
<td>88.8</td>
<td>.444‡</td>
</tr>
<tr>
<td>Separated/divorced/other</td>
<td>13.6</td>
<td>10.4</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Employment status</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>33.9</td>
<td>32.5</td>
<td>32.9</td>
<td>.689‡</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>46.8</td>
<td>42.9</td>
<td>43.7</td>
<td></td>
</tr>
<tr>
<td>Home duties full-time</td>
<td>13.8</td>
<td>16.7</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>Self-employed/other</td>
<td>5.5</td>
<td>7.9</td>
<td>7.4</td>
<td></td>
</tr>
</tbody>
</table>

† Independent samples t-tests; ‡ Chi square tests
7.4.2 Test-retest reliability of parenting and physical activity items

Test-retest reliability was determined in a sub-sample of students (n=61) and parents (n=74) participating in the online survey. These participants completed the online questionnaire on two separate occasions, two to three weeks apart, which is a typical time period for test-retest reliability studies (Booth et al. 2002b). Independent samples t-tests and chi-square tests were run to determine whether there were any differences between those who participated in the reliability study and those who did not. There were no significant differences for any socio-demographic or outcomes variables between the reliability sub-sample and the overall sample.

Test-retest reliability of parenting items

Test-retest reliability for each of the items relating to parenting practices and styles was assessed, with most having moderate to excellent ICCs (see Table 7.4) (Sim & Wright 2000, Jago et al. 2009b). In general, ICCs ranged from 0.42 to 0.76 for daughters’ reports of their mother’s parenting, from 0.42 to 0.82 for daughters’ reports of their father’s parenting and from 0.40 to 0.89 for parent self-report.

The following items had poor reliability: ‘my mum pays for my physical activity fees and uniform’ (ICC=0.16), ‘my mum has really strict rules around physical activity’ (ICC=0.30), ‘my dad has really strict rules around physical activity’ (ICC=0.30) and ‘I make sure my daughter drinks lots of water during physical activity’ (ICC=0.36). These items were retained in the analyses, however, as the ICCs for their corresponding items for daughter and/or parent report had acceptable reliability.

One item (‘I don’t encourage my daughter to do any physical activity’) had poor test-retest reliability when reported by parents (ICC=0.11) and modest reliability when reported by daughters (ICC=0.42), hence was removed from subsequent analyses.
Table 7.4:  Test-retest reliability of parenting items

<table>
<thead>
<tr>
<th>Items</th>
<th>ICCs Daughter report re: mother</th>
<th>ICCs Daughter report re: father</th>
<th>ICCs Parent report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parenting practices:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum/dad suggests physical activities I might enjoy*</td>
<td>.68</td>
<td>.69</td>
<td>.63</td>
</tr>
<tr>
<td>My mum/dad provides transport to help me to get to physical activities</td>
<td>.70</td>
<td>.73</td>
<td>.74</td>
</tr>
<tr>
<td>My mum/dad encouraged me to be physically active when I was really young</td>
<td>.54</td>
<td>.67</td>
<td>.53</td>
</tr>
<tr>
<td>I see my mum/dad being physically active</td>
<td>.59</td>
<td>.57</td>
<td>.74</td>
</tr>
<tr>
<td>My mum/dad makes sure I eat healthy foods after I have been physically active</td>
<td>.76</td>
<td>.74</td>
<td>.63</td>
</tr>
<tr>
<td>My mum/dad makes sure I drink lots of water during physical activity</td>
<td>.51</td>
<td>.51</td>
<td>.36</td>
</tr>
<tr>
<td>My mum/dad helps out at my physical activity by doing things such as scoring, coaching, timing</td>
<td>.74</td>
<td>.56</td>
<td>.69</td>
</tr>
<tr>
<td>My mum/dad pays for my physical activity fees and uniform</td>
<td>.75</td>
<td>.63</td>
<td>.89</td>
</tr>
<tr>
<td>My mum/dad makes me do physical activity when I don’t really want to</td>
<td>.16</td>
<td>.68</td>
<td>.52</td>
</tr>
<tr>
<td>My mum/dad participates in physical activities with me</td>
<td>.44</td>
<td>.60</td>
<td>.68</td>
</tr>
<tr>
<td>My mum/dad talks to me about why physical activity is good for my health</td>
<td>.70</td>
<td>.69</td>
<td>.62</td>
</tr>
<tr>
<td>My mum/dad talks to me about the social aspects of physical activity</td>
<td>.59</td>
<td>.66</td>
<td>.58</td>
</tr>
<tr>
<td>My mum/dad makes sure I get enough rest after I do physical activity</td>
<td>.70</td>
<td>.82</td>
<td>.59</td>
</tr>
<tr>
<td>My mum/dad lets me try lots of physical activities to see which ones I enjoy</td>
<td>.75</td>
<td>.79</td>
<td>.71</td>
</tr>
<tr>
<td>My mum/dad thinks physical activity is important for our whole family</td>
<td>.57</td>
<td>.68</td>
<td>.40</td>
</tr>
<tr>
<td>My mum/dad nags me to do physical activity</td>
<td>.64</td>
<td>.60</td>
<td>.69</td>
</tr>
<tr>
<td>My mum/dad provides equipment for me to be physically active at home</td>
<td>.51</td>
<td>.60</td>
<td>.60</td>
</tr>
</tbody>
</table>

Continued over page
| My mum/dad watches me participate in physical activity | .74 | .63 | .61 |
| My mum/dad encourages me to go outside | .55 | .47 | .68 |
| My mum/dad insists that I do physical activity | .70 | .72 | .71 |
| My mum/dad complains about me being physically active | .68 | .57 | .62 |

**Parenting styles:**

| My mum/dad has really strict rules around physical activity | .30 | .30 | .49 |
| My mum/dad encourages me to do my best at physical activity | .75 | .65 | .54 |
| My mum/dad doesn’t really mind if I don’t do any physical activity | .62 | .57 | .50 |
| My mum/dad doesn’t really care what physical activity I do | .44 | .42 | .41 |
| My mum/dad gets frustrated if I don’t do any physical activity | .62 | .63 | .74 |
| My mum/dad expects me to do well at physical activity | .67 | .66 | .65 |
| My mum/dad doesn’t encourage me to do any physical activity | .42 | .42 | .11 |
| My mum/dad lets me do whatever I want in regard to physical activity | .57 | .61 | .64 |

*All items were adapted for either parents or daughters e.g. I suggest physical activities my daughter might enjoy/ My mum suggests physical activities I might enjoy/ My dad suggests physical activities I might enjoy.
Test-retest reliability of physical activity items

ICCs were run for all IPAQ-A items (see Appendix 16 for complete findings). In general, respondents were able to reliably report the frequency (number of days) they engaged in a particular activity in the previous week (Sim & Wright 2000, Jago et al. 2009b), but not the duration (number of hours and minutes) spent on a usual day in each activity. ICCs ranged from 0.37 to 0.80 for frequency and 0.00 to 0.59 for duration.

ICCs were also calculated for domain- and intensity-specific weekly totals (Table 7.5). With the exception of physical activity within the home and transport domains, all ICCs were acceptable (Jago et al. 2009b).

Table 7.5: Test-retest reliability of IPAQ-A domain- and intensity-specific totals (mins/week)

<table>
<thead>
<tr>
<th>Domain- and intensity-specific totals derived from IPAQ-A*</th>
<th>ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Domain</strong></td>
<td></td>
</tr>
<tr>
<td>School PA</td>
<td>0.48</td>
</tr>
<tr>
<td>Home PA</td>
<td>0.24</td>
</tr>
<tr>
<td>Transport PA</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
<td></td>
</tr>
<tr>
<td>Leisure-time PA</td>
<td>0.57</td>
</tr>
<tr>
<td>Walking</td>
<td>0.45</td>
</tr>
<tr>
<td>Moderate-intensity PA</td>
<td>0.54</td>
</tr>
<tr>
<td>Vigorous-intensity PA</td>
<td>0.54</td>
</tr>
<tr>
<td><strong>Total weekly MVPA</strong></td>
<td>0.59</td>
</tr>
</tbody>
</table>

* Total weekly PA within each domain and intensity

7.4.3 Factor analysis of items relating to parenting styles and practices

Parenting practices and styles were collapsed based on the results of factor analysis (principal component analysis with varimax rotation), used to identify
underlying structure. Initially the parenting practices and styles were entered into separate factor analyses, but it became apparent that there were minimal differences in the constructs being assessed by the parenting practice and style items, and it was therefore decided that all items should be combined for factor analysis. Factor analyses were conducted separately for daughters’ reports of their mother’s parenting (Table 7.6), daughters’ reports of their father’s parenting (Table 7.7), and parent self-report (Table 7.8).

For daughters’ reports of their mother’s parenting, all items loaded onto one of six factors (categories) with Eigenvalues >1 (Table 7.6). The six factors identified reflected the concepts of ‘developing healthy physical activity habits’, ‘logistic support’, ‘forcing physical activity’, ‘modelling and co-participation’, ‘indulgent/neglectful parenting’ and ‘physical activity expectations’.

The internal reliability of each of these factors was assessed, with Cronbach’s alpha scores ranging from 0.46 for ‘physical activity expectations’ to 0.87 for ‘developing healthy physical activity habits’. Most of these Cronbach’s alphas are considered acceptable (Sim & Wright 2000). As Cronbach’s alpha values are sensitive to the number of items in the scale (Pallant 2005), the low Cronbach’s alpha for ‘physical activity expectations’ may be attributable to the fact that that scale contained only two items. Analyses indicated that none of the Cronbach’s alpha scores would have increased with removal of any of the items from the scales. While one individual item (‘my mum expects me to do well at physical activity’) had an ICC below 0.4, this item was retained in the analysis due to its contribution to the overall scale.
Table 7.6:  Description of factors and factor loadings arising from factor analysis: daughters’ reports of their mother’s parenting

<table>
<thead>
<tr>
<th>Items</th>
<th>PA habits</th>
<th>Logistic support</th>
<th>Forcing PA</th>
<th>Modelling</th>
<th>Indulgent neglectful</th>
<th>PA expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>My mum makes sure I get enough rest after I do physical activity</td>
<td>.757</td>
<td>.768</td>
<td>.716</td>
<td>.657</td>
<td>.558</td>
<td>.805</td>
</tr>
<tr>
<td>My mum makes sure I eat healthy foods after I have been physically active</td>
<td>.707</td>
<td>.727</td>
<td>.714</td>
<td>.630</td>
<td>.500</td>
<td></td>
</tr>
<tr>
<td>My mum makes sure I drink lots of water during physical activity</td>
<td>.689</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum talks to me about the social aspects of physical activity</td>
<td>.596</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum talks to me about why physical activity is good for my health</td>
<td>.591</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum tries to help me improve my physical activity skills</td>
<td>.545</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum encourages me to go outside</td>
<td>.507</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum lets me try lots of physical activities to see which ones I enjoy</td>
<td>.464</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum thinks physical activity is important for our whole family</td>
<td>.458</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum provides equipment for me to be physically active at home</td>
<td>.457</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum provides transport to help me to get to physical activities</td>
<td>.457</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum watches me participate in physical activity</td>
<td>.727</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum pays for my physical activity fees and uniform</td>
<td>.716</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum helps out at my physical activity by doing things such as scoring, coaching, timing</td>
<td>.657</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
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</tr>
<tr>
<td>My mum encourages me to do my best at physical activity</td>
<td>.558</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum encouraged me to be physically active when I was really young</td>
<td>.500</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum nags me to do physical activity</td>
<td></td>
<td>.768</td>
<td>.716</td>
<td>.657</td>
<td></td>
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</tr>
<tr>
<td>My mum gets frustrated if I don’t do any physical activity</td>
<td>.705</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
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</tr>
<tr>
<td>My mum insists that I do physical activity</td>
<td>.705</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
<td></td>
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</tr>
<tr>
<td>My mum makes me do physical activity when I don’t really want to</td>
<td>.705</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
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</tr>
<tr>
<td>My mum suggests physical activities I might enjoy</td>
<td>.475</td>
<td>.716</td>
<td>.714</td>
<td>.630</td>
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<td></td>
</tr>
<tr>
<td>My mum participates in physical activities with me</td>
<td></td>
<td>.780</td>
<td>.716</td>
<td>.630</td>
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</tr>
<tr>
<td>I see my mum being physically active</td>
<td></td>
<td>.767</td>
<td>.716</td>
<td>.630</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued over page
<table>
<thead>
<tr>
<th>Items</th>
<th>PA habits</th>
<th>Logistic support</th>
<th>Forcing PA</th>
<th>Modelling</th>
<th>Indulgent neglectful</th>
<th>PA expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>My mum doesn’t really care what physical activity I do</td>
<td>.761</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My mum lets me do whatever I want in regard to physical activity</td>
<td>.733</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My mum doesn’t really mind if I don’t do any physical activity</td>
<td>.558</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum has really strict rules around physical activity</td>
<td>.737</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My mum complains about me being physically active</td>
<td>.724</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>My mum expects me to do well at physical activity</td>
<td>.395</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Factor</th>
<th>Eigenvalue</th>
<th>% variance</th>
<th>Mean score for each parenting factor (SD)*</th>
<th>Cronbach’s alpha for each parenting factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA habits</td>
<td>8.24</td>
<td>28.4</td>
<td>3.72 (0.79)</td>
<td>0.87</td>
</tr>
<tr>
<td>Logistic support</td>
<td>2.56</td>
<td>8.8</td>
<td>4.16 (0.79)</td>
<td>0.82</td>
</tr>
<tr>
<td>Forcing PA</td>
<td>1.68</td>
<td>5.8</td>
<td>3.18 (0.91)</td>
<td>0.79</td>
</tr>
<tr>
<td>Modelling</td>
<td>1.54</td>
<td>5.3</td>
<td>2.96 (0.98)</td>
<td>0.66</td>
</tr>
<tr>
<td>Indulgent neglectful</td>
<td>1.24</td>
<td>4.3</td>
<td>3.09 (0.87)</td>
<td>0.57</td>
</tr>
<tr>
<td>PA expectations</td>
<td>1.16</td>
<td>4.0</td>
<td>2.06 (0.70)</td>
<td>0.46</td>
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</tbody>
</table>

*Range is 1-5, with higher values indicating higher presentation of these characteristics*
Similarly, for daughters’ reports of their father’s parenting, all items again loaded onto one of six factors (categories) with Eigenvalues >1 (Table 7.7). The six factors identified were consistent with those described above, that is, ‘developing healthy physical activity habits’, ‘logistic support’, ‘forcing physical activity’, ‘modelling and co-participation’, ‘indulgent/neglectful parenting’ and ‘physical activity expectations’. Cronbach’s alpha scores ranged from 0.53 for ‘physical activity expectations’ to 0.86 for ‘developing healthy physical activity habits’, most of which are considered acceptable (Sim & Wright 2000), and analyses indicated that none of the Cronbach’s alphas would have increased with removal of items. The ‘physical activity expectations’ scale again contained only two items, hence the low Cronbach’s alpha.
Table 7.7: Description of factors and factor loadings arising from factor analysis: daughters’ reports of their father’s parenting

<table>
<thead>
<tr>
<th>Items</th>
<th>PA habits</th>
<th>Modelling</th>
<th>Logistic support</th>
<th>Forcing PA</th>
<th>Indulgent neglectful</th>
<th>PA expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>My dad talks to me about the social aspects of physical activity</td>
<td>.785</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>My dad talks to me about why physical activity is good for my health</td>
<td>.734</td>
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<td></td>
</tr>
<tr>
<td>My dad makes sure I get enough rest after I do physical activity</td>
<td>.663</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My dad lets me try lots of physical activities to see which ones I enjoy</td>
<td>.504</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>My dad suggests physical activities I might enjoy</td>
<td>.487</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My dad encourages me to go outside</td>
<td>.436</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My dad thinks physical activity is important for our whole family</td>
<td>.433</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My dad makes sure I drink lots of water during physical activity</td>
<td>.419</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My dad makes sure I eat healthy foods after I have been physically active</td>
<td>.407</td>
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<td></td>
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<td></td>
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<tr>
<td>I see my dad being physically active</td>
<td></td>
<td>.746</td>
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</tr>
<tr>
<td>My dad participates in physical activities with me</td>
<td></td>
<td>.737</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>My dad helps out at my physical activity by doing things such as scoring, coaching, timing</td>
<td></td>
<td>.652</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My dad tries to help me improve my physical activity skills</td>
<td></td>
<td></td>
<td></td>
<td>.597</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My dad pays for my physical activity fees and uniform</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.731</td>
<td></td>
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<tr>
<td>My dad provides transport to help me to get to physical activities</td>
<td></td>
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<td></td>
<td></td>
<td>.726</td>
<td></td>
</tr>
<tr>
<td>My dad watches me participate in physical activity</td>
<td></td>
<td></td>
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<td></td>
<td>.571</td>
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<tr>
<td>My dad encourages me to do my best at physical activity</td>
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<td>.485</td>
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<tr>
<td>My dad provides equipment for me to be physically active at home</td>
<td></td>
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<td></td>
<td></td>
<td>.449</td>
<td></td>
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<tr>
<td>My dad encouraged me to be physically active when I was really young</td>
<td></td>
<td></td>
<td></td>
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<td>.424</td>
<td></td>
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<tr>
<td>Items</td>
<td>PA habits</td>
<td>Modelling</td>
<td>Logistic support</td>
<td>Forcing PA</td>
<td>Indulgent neglectful</td>
<td>PA expectations</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>My dad nags me to do physical activity</td>
<td>.793</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>My dad gets frustrated if I don’t do any physical activity</td>
<td>.740</td>
<td></td>
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<tr>
<td>My dad insists that I do physical activity</td>
<td>.681</td>
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<tr>
<td>My dad makes me do physical activity when I don’t really want to</td>
<td>.608</td>
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<tr>
<td>My dad expects me to do well at physical activity</td>
<td>.393</td>
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<tr>
<td>My dad doesn’t really care what physical activity I do</td>
<td></td>
<td></td>
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<td></td>
<td>.791</td>
<td></td>
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<tr>
<td>My dad lets me do whatever I want in regard to physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.713</td>
<td></td>
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<tr>
<td>My dad doesn’t really mind if I don’t do any physical activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.655</td>
<td></td>
</tr>
<tr>
<td>My dad complains about me being physically active</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.831</td>
</tr>
<tr>
<td>My dad has really strict rules around physical activity</td>
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<thead>
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<th>8.43</th>
<th>2.39</th>
<th>1.61</th>
<th>1.46</th>
<th>1.21</th>
<th>1.11</th>
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<tr>
<td>% variance</td>
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<td>5.6</td>
<td>5.0</td>
<td>4.2</td>
<td>3.8</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean score for each parenting factor (SD)*</th>
<th>3.57 (0.83)</th>
<th>3.14 (0.98)</th>
<th>4.10 (0.77)</th>
<th>2.99 (0.89)</th>
<th>3.07 (0.89)</th>
<th>1.47 (0.69)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronbach’s alpha for each parenting factor</td>
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<td>0.78</td>
<td>0.77</td>
<td>0.75</td>
<td>0.60</td>
<td>0.53</td>
</tr>
</tbody>
</table>

*Range is 1-5, with higher values indicating higher presentation of these characteristics
For parents’ self-report of physical activity parenting, factor analysis produced seven factors with Eigenvalues >1 (Table 7.8). Six of the factors reflected the concepts identified previously, that is, ‘developing healthy physical activity habits’, ‘logistic support’, ‘forcing physical activity’, ‘modelling and co-participation’, ‘indulgent/neglectful parenting’ and ‘physical activity expectations’. However, an additional factor was identified, reflecting the concept of ‘physical activity nurturing’. One item, ‘I expect my daughter to do well at physical activity’, did not load onto any factor and was subsequently excluded.

The internal reliability of each of these factors was assessed. The factors ‘physical activity expectations’ and ‘indulgent/neglectful parenting’ contained two and three items respectively, hence had low Cronbach’s alphas (0.28 and 0.36 respectively). However, these factors were retained in the analysis to provide consistency with the factors generated by girls’ reports of their mother’s and father’s physical activity parenting. The remaining factors had acceptable Cronbach’s alpha scores (Sim & Wright 2000), ranging from 0.64 for ‘physical activity nurturing’ to 0.77 for ‘logistic support’.
Table 7.8: Description of factors and factor loadings arising from factor analysis: parents’ self-report

<table>
<thead>
<tr>
<th>Items</th>
<th>Logistic support</th>
<th>PA habits</th>
<th>Forcing PA</th>
<th>PA nurturing</th>
<th>Modelling</th>
<th>Indulgent neglectful</th>
<th>PA expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I provide transport to help my daughter get to and from physical activities</td>
<td>.752</td>
<td></td>
<td></td>
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<tr>
<td>I watch my daughter participate in physical activity</td>
<td>.735</td>
<td></td>
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<tr>
<td>I pay for my daughter’s physical activity fees and uniform</td>
<td>.673</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I help out at my daughter’s physical activity by doing things such as scoring, coaching, timing</td>
<td>.662</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I let my daughter try lots of physical activities to see which ones she enjoys</td>
<td>.439</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I help my daughter improve her physical activity skills</td>
<td>.374</td>
<td></td>
<td></td>
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<tr>
<td>I talk to my daughter about the social benefits of physical activity</td>
<td>.806</td>
<td></td>
<td></td>
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<tr>
<td>I talk to my daughter about the health benefits of physical activity</td>
<td>.773</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I suggest physical activities my daughter might enjoy</td>
<td>.639</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>I encourage my daughter to go outside</td>
<td>.338</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I encourage my daughter to do her best at physical activity</td>
<td>.310</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I encouraged my daughter to be physically active when she was really young</td>
<td>.301</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have to nag my daughter to do physical activity</td>
<td>.719</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I get frustrated if my daughter doesn’t do any physical activity</td>
<td>.631</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I make my daughter do physical activity when she doesn’t really want to</td>
<td>.591</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I insist my daughter participates in physical activity</td>
<td>.532</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Continued over page
<table>
<thead>
<tr>
<th>Items</th>
<th>Logistic support</th>
<th>PA habits</th>
<th>Forcing PA</th>
<th>PA nurturing</th>
<th>Modelling</th>
<th>Indulgent neglectful</th>
<th>PA expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I make sure my daughter eats healthy food after being physically active</td>
<td>.751</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I make sure my daughter drinks plenty of water during physical activity</td>
<td>.645</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I make sure my daughter gets enough rest after she’s been physically active</td>
<td>.555</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I provide equipment for my daughter to be physically active at home</td>
<td>.413</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>My daughter sees me being physically active myself</td>
<td>.863</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I participate in physical activity with my daughter</td>
<td>.720</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I think physical activity is important for our whole family</td>
<td>.570</td>
<td></td>
<td></td>
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<tr>
<td>I don’t really care what physical activity my daughter does</td>
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<td></td>
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<tr>
<td>I let my daughter do whatever she wants in regard to physical activity</td>
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<tr>
<td>I don’t really mind if my daughter doesn’t do any physical activity</td>
<td>.467</td>
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<td></td>
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<td></td>
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<tr>
<td>I complain about my daughter being physically active</td>
<td>.635</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I enforce strict rules around my daughter’s physical activity</td>
<td>.621</td>
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</table>

<table>
<thead>
<tr>
<th>Eigenvalue</th>
<th>6.31</th>
<th>2.74</th>
<th>1.80</th>
<th>1.50</th>
<th>1.26</th>
<th>1.26</th>
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<tr>
<td>% variance</td>
<td>21.8</td>
<td>9.5</td>
<td>6.2</td>
<td>5.2</td>
<td>4.4</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>Mean score for each parenting factor (SD)*</td>
<td>4.08 (0.68)</td>
<td>4.00 (0.57)</td>
<td>2.81 (0.84)</td>
<td>4.13 (0.59)</td>
<td>3.76 (0.66)</td>
<td>2.54 (0.81)</td>
<td>1.50 (0.59)</td>
</tr>
<tr>
<td>Cronbach’s alpha for each parenting factor</td>
<td>0.77</td>
<td>0.74</td>
<td>0.66</td>
<td>0.64</td>
<td>0.69</td>
<td>0.36</td>
<td>0.28</td>
</tr>
</tbody>
</table>

*Range is 1-5, with higher values indicating higher presentation of these characteristics
All factors contained a different number of items; hence mean scores (ranging from 1 to 5) were created for each factor to standardise the scores. As described previously, participants who recorded a 6 (not applicable) for any of these items had this score recoded as missing.

7.4.4 Correlations between daughters’ reports and parents’ self-report factors

Pearson correlations between daughters’ reports of their mother’s parenting, daughters’ reports of their father’s parenting and parents’ self-report were calculated. All correlations were positive and significant (p<0.001) (Table 7.9).

Table 7.9: Correlations between daughters’ reports of their mother’s and father’s parenting, and parents’ self-report

<table>
<thead>
<tr>
<th>Factor</th>
<th>Correlation*</th>
<th>Correlation*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daughter/dad</td>
<td>Parent report</td>
</tr>
<tr>
<td>Developing healthy physical activity habits</td>
<td>.78</td>
<td>.30</td>
</tr>
<tr>
<td>Logistic support</td>
<td>.62</td>
<td>.53</td>
</tr>
<tr>
<td>Forcing physical activity</td>
<td>.71</td>
<td>.43</td>
</tr>
<tr>
<td>Modelling and co-participation</td>
<td>.42</td>
<td>.50</td>
</tr>
<tr>
<td>Neglectful/indulgent parenting</td>
<td>.89</td>
<td>.26</td>
</tr>
<tr>
<td>Physical activity expectations</td>
<td>.72</td>
<td>.31</td>
</tr>
</tbody>
</table>

*All Pearson’s correlations significant at p<0.001

As expected, daughters’ reports of their mother’s and father’s parenting were very closely correlated. In comparison, daughters’ reports and parents’ self-reports were less closely correlated.
7.4.5 Physical activity participation

Girls’ participation in physical activity domains and intensities is presented in Table 7.10. Girls whose parents did not complete the survey participated in significantly less LTPA than those girls whose parents completed the survey (p<0.05).

Table 7.10: Total weekly physical activity among the total sample of girls and complete parent/daughter dyads

<table>
<thead>
<tr>
<th></th>
<th>Daughters only (no parent)</th>
<th>Complete parent/daughter dyads</th>
<th>All daughters</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD) (N=30)</td>
<td>Mean (SD) (N=384)</td>
<td>Mean (SD) (N=414)</td>
<td></td>
</tr>
<tr>
<td>Age of daughter (years)</td>
<td>14.7 (0.8)</td>
<td>14.5 (0.8)</td>
<td>14.5 (0.8)</td>
<td>.125</td>
</tr>
<tr>
<td>Duration of PA (mins/wk)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School PA</td>
<td>287.1 (232.1)</td>
<td>259.6 (175.7)</td>
<td>261.6 (180.1)</td>
<td>.965</td>
</tr>
<tr>
<td>Home PA</td>
<td>100.2 (100.7)</td>
<td>111.1 (156.0)</td>
<td>110.3 (152.6)</td>
<td>.554</td>
</tr>
<tr>
<td>Transport PA</td>
<td>117.7 (237.7)</td>
<td>122.1 (167.7)</td>
<td>121.8 (173.4)</td>
<td>.519</td>
</tr>
<tr>
<td>Total LTPA</td>
<td>246.0 (326.0)</td>
<td>354.4 (297.0)</td>
<td>346.6 (300.0)</td>
<td>.023</td>
</tr>
<tr>
<td>Total walking</td>
<td>237.6 (254.7)</td>
<td>238.4 (224.5)</td>
<td>238.4 (226.5)</td>
<td>.837</td>
</tr>
<tr>
<td>Total MPA</td>
<td>369.2 (312.3)</td>
<td>414.8 (281.0)</td>
<td>411.5 (283.3)</td>
<td>.153</td>
</tr>
<tr>
<td>Total VPA</td>
<td>132.1 (164.5)</td>
<td>172.6 (171.7)</td>
<td>169.7 (171.4)</td>
<td>.064</td>
</tr>
<tr>
<td>Total weekly MVPA</td>
<td>724.9 (602.8)</td>
<td>828.1 (493.1)</td>
<td>820.6 (501.7)</td>
<td>.094</td>
</tr>
</tbody>
</table>

Independent samples t-tests

7.4.6 Associations between socio-demographics and physical activity

There were no associations between parent employment status or parent marital status, and any of the physical activity variables. Parental education was positively associated with girls’ total weekly school physical activity (p<0.01), but not with any of the other physical activity variables. Where applicable, this association was controlled for in analyses.
7.4.7 Univariable and multivariable associations between parenting practices and physical activity

Numerous associations between parenting practices/styles and girls’ physical activity were observed (Tables 7.11 and 7.12). These tables contain transformed values, while corresponding back-transformed values have been presented in text. Only the multivariable associations are described in text below, while univariable associations are described and presented in Appendix 17. Tables containing all significant univariable and multivariable back-transformed findings are presented in Appendix 17.

Daughters’ reports of their mother’s physical activity parenting

When all daughters’ reports of their mother’s parenting factors were entered into a multivariable model for each physical activity outcome, numerous associations were observed. For school physical activity, ‘developing healthy physical activity habits’ (1.17; 95% CI 1.04-1.34) and ‘physical activity expectations’ (1.14; 95% CI 1.02-1.29) were positively associated with school physical activity, while ‘modelling and co-participation’ (0.91; 95% CI 0.83-0.99) was inversely associated with school physical activity.

‘Logistic support’ was the only factor significantly associated with household physical activity in multivariable analyses, with this factor having an inverse association (0.68; 95% CI 0.47-0.97), while ‘modelling and co-participation’ was the only factor significantly positively associated with transport physical activity (1.26; 95% CI 1.00-1.58).

Numerous factors were associated with LTPA. These included ‘physical activity habits’ (1.31; 95% CI 0.00-0.72), ‘logistic support’ (1.52; 95% CI 1.18-1.94) and ‘physical activity expectations’ (1.33; 95% CI 1.06-1.65), all of which were positively associated with LTPA, and ‘forcing physical activity’ (0.81; 95% CI 0.66-0.99), which was inversely associated with LTPA.
‘Indulgent/neglectful parenting’ (1.20; 95% CI 1.01-1.43) was positively associated with walking in multivariable analyses. For MPA, VPA and total MVPA, ‘physical activity habits’ (1.17; 95% CI 1.03-1.34; 1.79; 95% CI 1.23-2.59; and 1.20; 95% CI 1.07-1.35 for MPA, VPA and MVPA respectively) and ‘physical activity expectations’ (1.19; 95% CI 1.06-1.32; 1.60; 95% CI 1.18-2.15; and 1.18; 95% CI 1.08-1.30 for MPA, VPA and MVPA respectively) remained significant in multivariable analyses.

**Daughters’ reports of their father’s physical activity parenting**

In multivariable analyses, no significant associations were observed between fathers’ parenting factors and either transport physical activity or walking. School physical activity was positively associated with ‘physical activity expectations’ (1.21; 95% CI 1.08-1.36), home physical activity was positively associated with ‘modelling and co-participation’ (1.44; 95% CI 1.07-1.94), while both LTPA and MVPA were associated with ‘logistic support’ (1.66; 95% CI 1.26-2.20; 1.15; 95% CI 1.03-1.30) and ‘physical activity expectations’ respectively (1.26; 95% CI 1.01-1.58; 1.19; 95% CI 1.09-1.31).

**Parent self-report of physical activity parenting**

None of the parent self-report factors were associated with school or home physical activity in multivariable analyses. There was a positive association between transport physical activity and ‘developing healthy physical activity habits’ (1.80; 95% CI 1.10-2.95), and an inverse association between transport physical activity and ‘logistic support’ (0.64; 95% CI 0.44-0.95). LTPA was positively associated with ‘logistic support’ (2.33; 95% CI 1.79-3.04), and inversely associated with ‘forcing physical activity’ (0.80; 95% CI 0.66-0.96) and ‘physical activity nurturing’ (0.74; 95% CI 0.56-0.98). Walking was positively associated with ‘developing healthy physical activity habits’ (1.49; 95% CI 1.03-2.16) and ‘indulgent/neglectful parenting’ (1.26; 95% CI 1.04-1.53), while MPA was positively associated with ‘logistic support’ (1.24; 95% CI 1.07-1.43) and ‘physical activity expectations’ (1.22; 95% CI 1.07-1.39), and inversely associated with ‘forcing physical activity’ (0.89; 95% CI 0.81-0.99).
VPA was positively associated with ‘logistic support’ (2.21; 95% CI 1.50-3.25) and inversely associated with ‘forcing physical activity’ (0.65; 95% CI 0.49-0.85). Finally, MVPA was positively associated with ‘developing healthy physical activity habits’ (1.22; 95% CI 1.04-1.43), ‘logistic support’ (1.21; 95% CI 1.06-1.37), and ‘physical activity expectations’ (1.17; 95% CI 1.05-1.31), and inversely associated with ‘forcing physical activity’ (0.90; 95% CI 0.82-0.99).
### Table 7.11: Univariable and multivariable associations between parenting practices and weekly physical activity within domains

<table>
<thead>
<tr>
<th>PA parenting scale</th>
<th>School PA (^a)</th>
<th>Home PA</th>
<th>Transport PA (^b)</th>
<th>LTPA (^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
</tr>
<tr>
<td><strong>Daughter/mother</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>.031 (-.012,.074)</td>
<td>-.029 (-.141,.083)</td>
<td>.009 (-.098,.115)</td>
<td>.185***(.103,.266)</td>
</tr>
<tr>
<td></td>
<td>.067* (.006,.129)</td>
<td>.028 (-.141,.197)</td>
<td>-.061 (-.218,.095)</td>
<td>.119* (.001,.237)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>.007 (.004,.132)</td>
<td>-.106 (-.141,.056)</td>
<td>-.003 (-.110,.103)</td>
<td>.214***(.133,.294)</td>
</tr>
<tr>
<td></td>
<td>-.014 (-.072,.044)</td>
<td>-.170* (-.209,.056)</td>
<td>-.040 (-.184,.103)</td>
<td>.180** (.073,.288)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>.014 (.007,.021)</td>
<td>.040 (-.070,.181)</td>
<td>.069 (-.023,.078)</td>
<td>.046 (-.176,.002)</td>
</tr>
<tr>
<td></td>
<td>-.019 (-.064,.026)</td>
<td>.056 (-.023,.160)</td>
<td>.078 (-.038,.193)</td>
<td>-.089* (-.085,.062)</td>
</tr>
<tr>
<td>Modelling</td>
<td>-.017 (-.051,.017)</td>
<td>.004 (-.057,.137)</td>
<td>-.017 (-.057,.034)</td>
<td>.066 (-.028,.017)</td>
</tr>
<tr>
<td></td>
<td>-.041* (-.064,.026)</td>
<td>.025 (-.070,.181)</td>
<td>-.003 (-.064,.064)</td>
<td>.017 (-.057,.091)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>-.007 (-.046,.032)</td>
<td>-.042 (-.145,.061)</td>
<td>.045 (.050,.141)</td>
<td>-.003 (-.078,.071)</td>
</tr>
<tr>
<td></td>
<td>-.002 (-.042,.038)</td>
<td>-.034 (-.140,.072)</td>
<td>.064 (-.334,.162)</td>
<td>.017 (-.057,.091)</td>
</tr>
<tr>
<td>PA expectations</td>
<td>.053* (.004,.102)</td>
<td>.121 (-.043,.230)</td>
<td>.095 (-.060,.194)</td>
<td>.103* (.010,.196)</td>
</tr>
<tr>
<td></td>
<td>.059* (.007,.111)</td>
<td>.093 (-.043,.230)</td>
<td>.067 (.010,.196)</td>
<td>.122* (.027,.218)</td>
</tr>
<tr>
<td><strong>Daughter/father</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>.025 (-.017,.067)</td>
<td>-.039 (-.149,.071)</td>
<td>.040 (-.063,.142)</td>
<td>.201***(.122,.280)</td>
</tr>
<tr>
<td></td>
<td>-.006 (-.068,.057)</td>
<td>-.170 (-.347,.008)</td>
<td>-.068 (-.230,.095)</td>
<td>.052 (-.071,.175)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>.032 (-.013,.077)</td>
<td>-.027 (-.145,.092)</td>
<td>.092 (-.019,.203)</td>
<td>.260***(.175,.343)</td>
</tr>
<tr>
<td></td>
<td>.043 (.020,.106)</td>
<td>-.040 (-.214,.135)</td>
<td>.112 (-.048,.272)</td>
<td>.221*** (.100,.342)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>.013 (-.027,.052)</td>
<td>.053 (-.049,.156)</td>
<td>.045 (.035,.063)</td>
<td>.075 (-.154,.024)</td>
</tr>
<tr>
<td></td>
<td>-.018 (-.063,.027)</td>
<td>.070 (.059,.198)</td>
<td>.064 (-.082,.152)</td>
<td>-.065 (-.154,.024)</td>
</tr>
<tr>
<td>Modelling</td>
<td>.022 (-.013,.057)</td>
<td>.069 .159* (-.059,.198)</td>
<td>.014 (-.082,.152)</td>
<td>.034 (.084,.219)</td>
</tr>
<tr>
<td></td>
<td>-.002 (-.049,.044)</td>
<td>.159* (-.059,.198)</td>
<td>.014 (-.104,.132)</td>
<td>(.055,.124)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>-.013 (-.052,.025)</td>
<td>-.036 (-.024,.162)</td>
<td>-.043 (-.044,.130)</td>
<td>-.006 (-.081,.070)</td>
</tr>
<tr>
<td></td>
<td>-.010 (-.048,.029)</td>
<td>-.007 (-.139,.068)</td>
<td>-.037 (-.104,.132)</td>
<td>-.015 (-.088,.059)</td>
</tr>
<tr>
<td>PA expectations</td>
<td>.079** (.030,.128)</td>
<td>.161* (.034,.135)</td>
<td>.090 (.002,.275)</td>
<td>.102* (.008,.201)</td>
</tr>
<tr>
<td></td>
<td>.084** (.034,.135)</td>
<td>.136 (.028,.295)</td>
<td>.099 (.023,.221)</td>
<td>(.006,.197)</td>
</tr>
</tbody>
</table>
### PA parenting scale

**Parent report**

<table>
<thead>
<tr>
<th>PA parenting scale</th>
<th>Estimate (95% CI)</th>
<th>Estimate (95% CI)</th>
<th>Estimate (95% CI)</th>
<th>Estimate (95% CI)</th>
<th>Estimate (95% CI)</th>
<th>Estimate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy PA habits</td>
<td>.013 (-.053, .079)</td>
<td>.014 (-.081, .110)</td>
<td>-.067 (-.226, .091)</td>
<td>-.091 (-.321, .140)</td>
<td>.070 (-.082, .223)</td>
<td>.256* (.042, .470)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>.007 (-.050, .064)</td>
<td>-.011 (-.086, .065)</td>
<td>-.044 (-.180, .093)</td>
<td>-.019 (-.201, .163)</td>
<td>-.086 (-.220, .047)</td>
<td>-.191* (-.362, -.021)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>.018 (-.027, .063)</td>
<td>.026 (-.029, .080)</td>
<td>-.032 (-.141, .076)</td>
<td>-.032 (-.163, .099)</td>
<td>-.056 (-.160, .047)</td>
<td>-.085 (-.205, .034)</td>
</tr>
<tr>
<td>Modelling</td>
<td>-.006 (-.065, .053)</td>
<td>-.020 (-.087, .047)</td>
<td>-.083 (-.224, .058)</td>
<td>-.049 (-.210, .111)</td>
<td>.034 (-.102, .171)</td>
<td>.150 (.135, .168)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>.022 (-.024, .068)</td>
<td>.035 (-.014, .084)</td>
<td>-.019 (-.130, .092)</td>
<td>-.024 (-.142, .095)</td>
<td>-.058 (-.102, .171)</td>
<td>-.052 (-.135, .168)</td>
</tr>
<tr>
<td>PA expectations</td>
<td>.047 (.018, .122)</td>
<td>.046 (.023, .116)</td>
<td>.093 (-.063, .250)</td>
<td>.117 (-.050, .283)</td>
<td>.117 (.046, .163)</td>
<td>.150 (.058, .162)</td>
</tr>
<tr>
<td>PA nurturing</td>
<td>.009 (-.055, .112)</td>
<td>.015 (-.023, .116)</td>
<td>.027 (-.063, .250)</td>
<td>.083 (-.050, .283)</td>
<td>-.020 (-.228, .067)</td>
<td>-.034 (-.206, .103)</td>
</tr>
<tr>
<td></td>
<td>-.130 (-.055, .073)</td>
<td>-.065 (-.023, .116)</td>
<td>-.130 (-.130, .183)</td>
<td>-.110 (-.277, .083)</td>
<td>-.168 (-.228, .087)</td>
<td>-.212 (-.250, .144)</td>
</tr>
</tbody>
</table>

*Log10 transformed data presented in table; controlling for parental education; linear mixed models *p<0.05; **p<0.01; ***p<0.001; Simple linear regression models (univariable) and multivariable linear regression models
Table 7.12: Univariable and multivariable associations between parenting practices and weekly physical activity intensities

<table>
<thead>
<tr>
<th>PA parenting scale</th>
<th>Walking Estimate</th>
<th>Moderate PA Estimate</th>
<th>Vigorous PA Estimate</th>
<th>Total MVPA Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(95% CI)</td>
<td>(95% CI)</td>
<td>(95% CI)</td>
<td>(95% CI)</td>
</tr>
<tr>
<td><strong>Univariable</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Multivariable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daughter/mother</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>0.007</td>
<td>0.064**</td>
<td>0.270***</td>
<td>0.083***</td>
</tr>
<tr>
<td></td>
<td>(-0.072, 0.086)</td>
<td>(0.026, 0.103)</td>
<td>(0.164, 0.377)</td>
<td>(0.050, 0.117)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>-0.003</td>
<td>0.054***</td>
<td>0.218***</td>
<td>0.065***</td>
</tr>
<tr>
<td></td>
<td>(-0.083, 0.076)</td>
<td>(0.014, 0.093)</td>
<td>(0.109, 0.327)</td>
<td>(0.031, 0.098)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>0.063</td>
<td>0.025</td>
<td>0.129**</td>
<td>0.043***</td>
</tr>
<tr>
<td></td>
<td>(-0.005, 0.131)</td>
<td>(-0.009, 0.059)</td>
<td>(-0.034, 0.225)</td>
<td>(-0.052, 0.022)</td>
</tr>
<tr>
<td>Modelling</td>
<td>0.030</td>
<td>0.009</td>
<td>0.092*</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>(-0.034, 0.095)</td>
<td>(-0.023, 0.040)</td>
<td>(-0.002, 0.181)</td>
<td>(-0.003, 0.053)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>0.062</td>
<td>0.013</td>
<td>-0.099</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(-0.010, 0.135)</td>
<td>(-0.049, 0.023)</td>
<td>(-0.201, 0.004)</td>
<td>-0.004</td>
</tr>
<tr>
<td>PA expectations</td>
<td>0.076</td>
<td>0.068**</td>
<td>0.210***</td>
<td>0.074***</td>
</tr>
<tr>
<td></td>
<td>(-0.013, 0.166)</td>
<td>(0.024, 0.113)</td>
<td>(0.085, 0.335)</td>
<td>(0.035, 0.112)</td>
</tr>
<tr>
<td>Daughter/father</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>0.026</td>
<td>0.064**</td>
<td>0.281***</td>
<td>0.079***</td>
</tr>
<tr>
<td></td>
<td>(-0.048, 0.101)</td>
<td>(0.026, 0.102)</td>
<td>(0.176, 0.386)</td>
<td>(0.046, 0.111)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>0.049</td>
<td>0.068***</td>
<td>0.324***</td>
<td>0.091***</td>
</tr>
<tr>
<td></td>
<td>(-0.031, 0.129)</td>
<td>(0.028, 0.109)</td>
<td>(0.212, 0.436)</td>
<td>(0.056, 0.125)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>0.071*</td>
<td>0.026</td>
<td>0.169***</td>
<td>0.040***</td>
</tr>
<tr>
<td></td>
<td>(-0.001, 0.140)</td>
<td>(-0.010, 0.061)</td>
<td>(-0.069, 0.269)</td>
<td>(-0.010, 0.071)</td>
</tr>
<tr>
<td>Modelling</td>
<td>0.023</td>
<td>0.060***</td>
<td>0.238***</td>
<td>0.058***</td>
</tr>
<tr>
<td></td>
<td>(-0.040, 0.086)</td>
<td>(-0.010, 0.061)</td>
<td>(-0.069, 0.269)</td>
<td>(-0.010, 0.071)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>0.050</td>
<td>0.066</td>
<td>0.238***</td>
<td>0.058***</td>
</tr>
<tr>
<td></td>
<td>(-0.020, 0.121)</td>
<td>(-0.046, 0.027)</td>
<td>(-0.172, 0.035)</td>
<td>(-0.025, 0.038)</td>
</tr>
<tr>
<td>PA expectations</td>
<td>0.074</td>
<td>0.083***</td>
<td>0.152</td>
<td>0.080***</td>
</tr>
<tr>
<td></td>
<td>(-0.017, 0.164)</td>
<td>(0.037, 0.129)</td>
<td>(-0.021, 0.284)</td>
<td>(0.040, 0.119)</td>
</tr>
<tr>
<td>PA parenting scale</td>
<td>Walking Estimate (95% CI)</td>
<td>Moderate PA Estimate (95% CI)</td>
<td>Vigorous PA Estimate (95% CI)</td>
<td>Total MVPA Estimate (95% CI)</td>
</tr>
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<td>-----------------------------</td>
<td>---------------------------</td>
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</tr>
<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable</td>
<td>Univariable</td>
<td>Multivariable</td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>.083 (-.029, .195)</td>
<td>.173* (.012, .334)</td>
<td>.069* (.013, .125)</td>
<td>.216** (.065, .367)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>-.022 (.119, .075)</td>
<td>-.099 (.227, .029)</td>
<td>.093*** (.045, .140)</td>
<td>.341*** (.213, .469)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>.023 (.053, .100)</td>
<td>.021 (-.071, .112)</td>
<td>-.023 (-.061, .15)</td>
<td>-.099 (-.227, .029)</td>
</tr>
<tr>
<td>Modelling</td>
<td>.011 (.090, .112)</td>
<td>-.019 (-.132, .094)</td>
<td>-.047 (-.090, .020)</td>
<td>-.017 (-.132, .094)</td>
</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>.072 (.005, .149)</td>
<td>.101* (.018, .184)</td>
<td>-.003 (-.132, .094)</td>
<td>-.022 (-.132, .094)</td>
</tr>
<tr>
<td>PA expectations</td>
<td>.006 (.105, .117)</td>
<td>.001 (-.116, .118)</td>
<td>.070* (.015, .125)</td>
<td>.085** (.028, .143)</td>
</tr>
<tr>
<td>PA nurturing</td>
<td>.003 (.108, .113)</td>
<td>-.003 (-.138, .132)</td>
<td>-.024 (.015, .125)</td>
<td>-.035 (.028, .143)</td>
</tr>
</tbody>
</table>

Log10 transformed data presented in table; *controlling for parental education; **p<0.01; ***p<0.001: Simple linear regression models (univariable) and multivariable linear regression models.
7.5 Discussion

This study aimed to develop and test physical activity-specific measures of parenting styles and practices for adolescent girls and parents. Further, it sought to assess the test-retest reliability of physical activity-specific measures of parenting styles and practices in a sub-sample of adolescent girls and their parents and determine the association between parental facilitation and adolescent girls’ physical activity among parent-daughter dyads.

In general, the physical activity-specific parenting items had acceptable reliability (Jago et al. 2009b), and the subsequent factors created had acceptable internal consistency (Sim & Wright 2000). Individual IPAQ-A frequency and duration items had fair test-retest reliability (Brown et al. 2004), while domain- and intensity-specific weekly totals had acceptable reliability (Jago et al. 2009b). Numerous univariable and multivariable associations were observed between physical activity-specific parenting practices and physical activity outcomes. In particular, ‘developing healthy physical activity habits’, ‘expectations around physical activity’ and provision of ‘logistic support’ were frequently positively associated with various physical activity outcomes. Finally, daughters’ reports of their parents’ physical activity parenting was more often associated with girls’ physical activity than was the parents’ self-report.

As described in previous chapters, and evidenced in the literature, many of the existing measurement scales to assess physical activity parenting are not particularly comprehensive and have indeterminate validity and reliability (Sleddens et al. 2012, Trost et al. 2013). This study overcomes these limitations by presenting comprehensive and reliable scales to assess physical activity parenting, specifically tailored to separately assess daughters’ perceptions of their mother’s and father’s parenting, and parents’ own perceptions of their physical activity parenting. The test-retest reliability of individual physical activity parenting items in the current study was in general moderate to good; very few items had unacceptable reliability (Sim & Wright 2000, Jago et al. 2009b). Similarly, the internal consistency of each of the scales created was generally acceptable, with Cronbach’s alphas comparable to or better than those cited in the literature (Jago et al. 2009b, Davison & Jago 2009).
The factor analysis findings were interesting with some variability in the individual items contributing to factors from the daughters’ reports of their mother’s parenting, the daughters’ reports of their father’s parenting and the parents’ self-report. For example, the item ‘my mum suggests physical activities I might enjoy’ loaded onto the ‘forcing physical activity’ factor, while ‘my dad suggests physical activities I might enjoy’ loaded onto the ‘developing healthy physical activity habits’ scale. This implies that the practice of suggesting physical activities may be perceived differently by girls, depending on whether it is their mother or father implementing this practice. Few studies examining physical activity parenting actually require adolescents to separately report parenting practices for each parent, and those that have done so have been limited to measures of logistic support and explicit modelling (Davison 2004). These apparent differences in perceptions regarding mothers’ and fathers’ parenting provides a rationale for inclusion of separate measures for daughters’ reports of their mother’s and father’s parenting in future research.

There were some minor differences in the factors generated for parents self-report of parenting practices. In particular, the items which made up the ‘developing healthy physical habits’ scale and the ‘logistic support’ scale for daughters’ reports of their mother’s and father’s parenting actually generated three factors from the parents’ self-report data. An additional factor, ‘physical activity nurturing’, was created for parents’ self-report. This demonstrates the importance of collecting physical activity parenting data from adolescents and parents, a methodological complexity which is often overlooked in the literature (Eime et al. 2013, Jago et al. 2009b, Davison 2004). Further, parent self-report of parenting practices has been found to be a valid measure in other contexts (Hawes & Dadds 2006), further supporting the need to include self-report measures of parenting practices.

As described previously, test-retest reliability for the IPAQ-A is yet to be reported in the literature. The current study contributes to the literature in this area by providing the test-retest reliability for both the individual IPAQ-A items and the domain- and intensity-specific weekly totals. Results indicated adolescent girls could reliably report the frequency (number of days) with which they were active in particular types of activity, but were less consistently able to report duration. When domain- and intensity-specific weekly totals were calculated, ICCs were moderate (Brown et al.
2004). However, the observed ICCs were similar to or better than those reported by Brown and colleagues (2004) in their test-retest reliability study of surveys used to assess population levels of physical activity, including the IPAQ adult version, suggesting that the IPAQ-A is an acceptable instrument to assess self-reported physical activity among adolescents.

In relation to associations between parenting and physical activity, numerous univariable and multivariable associations were observed in the current study, particularly for LTPA, MPA, VPA and total MVPA. Fewer associations were observed between parents’ self-reported physical activity parenting and adolescent girls’ physical activity.

The ‘developing healthy physical activity habits’ scale was consistently associated with physical activity irrespective of whether daughters were reporting on their mother’s or father’s parenting, or parents were self-reporting. Further, the magnitude of these associations were substantial. For example, for daughters’ reports of their mother’s parenting, each unit increase in the ‘developing healthy physical activity habits’ scale was associated with 86% greater VPA. While some of the items which contributed to the ‘developing healthy physical activity habits’ scales are evident in the literature, these have often been classified more broadly as support (Taylor et al. 2002), or policies (Gattshall et al. 2008). This study is the first to describe this scale and demonstrate numerous associations with physical activity.

In the current study there were very few parenting influences on domain-specific physical activity, in particular school physical activity, transport physical activity and home physical activity. It is possible that parenting practices have greater influence on the overall amount of physical activity, rather than physical activity within specific domains, with physical activity-specific parenting practices potentially setting the overall climate for physical activity within the family. ‘Physical activity expectations’ was one of the few parenting practices to be associated with school physical activity, with daughters’ reports of both their mother’s and father’s expectations around physical activity being positively associated with school physical activity in both univariable and multivariable analyses. This finding is interesting as parenting practices which typically occur in the home environment might logically be considered to be of less importance to physical activity in the
school context. There is very little literature with which to directly compare this finding; however, Luthar and colleagues (2006), in their study of extracurricular involvement in sport and other activities among youth, found that high parent expectations regarding extracurricular involvement were beneficial in relation to academic competence and school grades. Hence, it is possible that girls who perceive that their parents have high expectations of them might be driven to succeed in all areas, including physical activity within the school environment.

‘Logistic support’ was also consistently associated with LTPA, MPA, VPA and total MVPA for daughters’ reports of both their mother’s and father’s parenting and parents’ self-report. This is consistent with the literature, with numerous studies showing an association between logistic support and physical activity (Jago et al. 2011, Davison & Jago 2009, Davison et al. 2003). Logistic support is clearly important for adolescent girls’ physical activity, and measures of this construct should be included in studies of physical activity parenting.

In univariable analyses, daughters’ reports of their father’s ‘modelling and co-participation’ was associated with LTPA, MPA, VPA and total MVPA, while daughters’ reports of their mother’s ‘modelling and co-participation’ was associated only with VPA. These associations did not remain significant in multivariable analyses however. There were no associations between parent-reported ‘modelling and co-participation’ and any of the outcome variables. This suggests that daughters’ perceptions regarding their father’s modelling and co-participation seems to be most important in explaining participation in physical activity. There is inconsistency in the literature regarding parental modelling of physical activity, with some studies showing associations between father’s modelling and girls’ (Davison et al. 2003) and boys’ (Edwardson & Gorely 2010a) physical activity, with others showing no association (Hennessy et al. 2010, Jago et al. 2011). However, the current study suggests that, for adolescent girls, father’s modelling of physical activity is important.

In multivariable analyses, numerous inverse associations were observed between parent-reported ‘forcing participation’ in physical activity and outcomes including LTPA, MPA, VPA and MVPA. That is, each unit increase in ‘forcing physical activity’ was associated with, for example, 17% less LTPA. Interestingly, in
univariable analyses daughters’ reports of their mother’s ‘forcing physical activity’ was positively associated with VPA and total MVPA and daughters’ reports of their father’s ‘forcing physical activity’ was positively associated with walking, VPA and total MVPA. This is somewhat consistent with Chapter 2 of this thesis, which described a positive association between authoritarian parenting (which may be operationalised as forcing physical activity participation) and organised sport among adolescent girls. The disconnect between daughters’ and parents’ reports regarding forcing participation is interesting, and is an area which may warrant further investigation.

While this study aimed to develop items reflective of physical activity-specific parenting styles as well as practices, it was apparent that differences between parenting styles and practices are difficult to differentiate or articulate in relation to physical activity. This perhaps suggests that measures of parenting styles should remain broad and reflective of the overall emotional context of the parent-child relationship, while practices may be specific to the actual behavior under investigation. Further, as suggested in the literature, parenting styles may moderate the relationship between practices and behavior (Loprinzi et al. 2012, Davison et al. 2013, Sleddens et al. 2012), hence further investigating the potential moderating role of styles and other demographic factors is warranted.

This study reported reasonably high correlations between daughters’ reports of their mother’s and father’s parenting for all factors, and significant though lower correlations between daughter-reported and parent-reported physical activity parenting. While it may be a reporting artefact due to the use of self-report measures, there were substantially more associations for daughter-reported parenting than parent self-report; hence girls’ perceptions of parenting appear more important in relation to their self-reported physical activity. This is consistent with the literature, where, for example, child perception of familial support for physical activity was more strongly associated with child physical activity than parent-report (Barr-Anderson et al. 2010). As described previously, however, parents appear to differentially influence girls’ physical activity participation, hence it is important for future research to collect data on girls’ perceptions of both their mother’s and father’s parenting. Further, collecting data from parents is imperative to gain a more comprehensive understanding of the way in which parenting may influence
adolescent girls’ physical activity. This recommendation is consistent with the literature, as the relationship between children and their parents is complex and bi-directional (Power 2013).

There were several limitations to the current study, including the use of a self-report measure of physical activity, a low recruitment rate and the small number of items contained in some of the scales developed. However the inclusion of a test-retest reliability study and sampling from a broad cross-section of the population are methodological strengths. While the inclusion of an objective measure of physical activity, such as accelerometers, would have further strengthened the study design, time and resource restraints precluded this. Adolescent girls are a challenging group to recruit, and including parents in the recruitment procedure was a further challenge. Despite a modest recruitment rate (9.6%), response rates of those who agreed to participate were acceptable with 84% of parents and 70% of girls who agreed to be involved actually completing the survey. A final limitation is that, as identified above, several of the parenting scales created contained very few items, potentially contributing to low Cronbach’s alpha scores, while several individual items had poor reliability. Future research should further refine those items with poor reliability and perhaps develop additional items to contribute to those scales with few items, particularly for those scales which were observed to have numerous associations with physical activity.

7.6 Conclusions

This study contributes to knowledge in the physical activity field by developing and testing a comprehensive range of measures to assess the influence of parenting on physical activity among adolescent girls. In general the items were shown to be reliable, and physical activity parenting, and in particular adolescent girls’ perceptions of their parents’ physical activity-related parenting practices, is clearly important for adolescent girls’ physical activity.

The test-retest reliability of the IPAQ-A has not previously been reported, and the current study demonstrated that this instrument has acceptable to modest reliability, particularly for domain- and intensity-specific physical activity totals. Further, the IPAQ-A was shown to have comparable test-retest reliability to other population-
based physical activity surveys, making the IPAQ-A an appropriate instrument for collection of population level physical activity data from adolescents.

This study described a broader range of physical activity-related parenting practices than those previously reported in the literature, and numerous associations, in particular with different intensities of activity, were observed. Hence, future research should endeavour to include a wide range of practices when examining parenting and physical activity in youth. Further, the moderating role of parenting style has not been clearly established and hence warrants further investigation. Finally, preventing the decline in participation from childhood to adolescence is critical, particularly among girls in this age group. Hence, examining these parenting practices among a younger cohort of children is important to fully inform intervention research.
8.1 Overview of key findings

This thesis sought to explore the relationship between parenting and physical activity among adolescent girls. Specifically, it aimed to determine the associations between parenting style and physical activity, identify physical activity-specific parenting practices, additional to those already cited in the literature, and develop and test measures to assess the relationship between these parenting styles and practices and physical activity. Prior to this research, very few comprehensive measures of physical activity-specific parenting practices were evident in the literature, and those that were available often lacked published psychometric data (Sleddens et al. 2012, Davison et al. 2013). This thesis overcame these limitations by identifying numerous additional strategies that parents implement to encourage their daughters’ physical activity, developing questionnaire items to assess these strategies and assessing the test-retest reliability of these items among a sample of parents and daughters.

Findings from Study 1 (Saunders et al. 2012) suggest that parenting styles are related to adolescent girls’ physical activity, and that these relationships differ by socio-demographic characteristics, highlighting the importance of considering these factors when developing interventions. In particular, parenting style was cross-sectionally associated with active transport and organised sport, and these relationships differed according to family status and parental employment status. Further, this research identified that exploring the relationship between parenting and physical activity using global measures of parenting style may overlook some important relationships between parenting styles, physical activity-specific parenting practices and physical activity. Hence, the need to consider both parenting styles and practices as they relate to physical activity is imperative.

Study 2 identified a range of strategies parents implement to facilitate their daughter’s physical activity. Importantly, rich qualitative data were gathered from parents and daughters, enabling an examination of synergies between parents’ and daughters’ perceptions of parental support for physical activity. Additional strategies
identified included developing an active family culture, scheduling meals around physical activity, ensuring adequate nutrition and hydration and steering girls towards team-based activities from an early age to facilitate the establishment of “active” friendship groups. Further, while the views of parents and daughters were generally consistent, several differences in perceptions were observed, reinforcing the importance of collecting data from parents and daughters to gain a comprehensive understanding of the way in which these relationships manifest.

Study 3 further contributed to this area by testing a comprehensive range of measures to assess physical activity parenting in a sample of adolescent girls and their parents. These measures were based on the physical activity-related parenting practices identified in Study 2, with the test-retest reliability of these measures also determined, thereby overcoming some of the limitations of existing measures. Additionally, the test-retest reliability of the IPAQ-A, which to date has not been reported in the literature, was also assessed. Results indicated the physical activity-specific parenting items were reliable (Sim & Wright 2000, Jago et al. 2009b), with many of the resultant factors created from these items demonstrating positive associations with physical activity. This was particularly true for girls’ reports of their mother’s and father’s parenting in relation to the ‘development of healthy physical activity habits’, the provision of ‘logistic support’, and ‘expectations regarding physical activity’. Fewer associations were observed for parent-reported physical activity parenting, though ‘developing healthy physical activity habits’, the provision of ‘logistic support’, and ‘expectations regarding physical activity’ remained important. Further, there were numerous inverse associations between parent-reported ‘forcing of physical activity’ and girls’ self-reported physical activity.

8.2 The influence of parenting on physical activity

Physical inactivity is clearly a significant public health problem (Stephenson et al. 2000), particularly among adolescent girls (Cavill et al. 2001). In order to realise the health benefits associated with physical activity, it is crucial to understand the influences on physical activity among this important target group. Physical activity is a complex behaviour, and, consistent with an ecological model (Perry et al. 2012), needs to be addressed from a behavioural, educational, policy and environmental
perspective. Further, the complexity of family environments (Kimiecik et al. 1996) suggest that while there is much to be gained from intervening in this context, there is also much more to be learned in order to fully inform interventions. The well-established benefits of physical activity and the potential for parenting to influence such behaviour makes further research in this area critical.

This thesis has expanded the current evidence base regarding the complex range of family-based influences on physical activity, by generating original data on the associations between parenting styles and practices and physical activity among adolescent girls. Indeed, as they do with numerous other health outcomes (Grigorenko & Sternberg 2001, Baumrind 1991), parenting styles and practices both appear to influence physical activity among adolescent girls. This thesis has provided evidence of how this influence might manifest, and how these relationships are impacted by other socio-demographic factors.

Specifically, parenting appears to influence physical activity across all domains and intensities. Despite parenting practices being implemented primarily in the home environment, the influence of parenting on physical activity clearly extends beyond this, including in the school environment. This suggests that the strategies parents employ to facilitate physical activity are pervasive, and not limited to those environments or contexts in which parents have direct contact with their children. This is consistent with the view that parenting, and parenting style in particular, is a global construct which sets the tone for the overall parent-child interaction (Rhee et al. 2006), irrespective of environment or context. Hence, interventions targeting parenting styles and practices have the potential to influence physical activity across all domains.

However, some confusion exists within the literature regarding the conceptualisation of parenting styles and practices (Hughes et al. 2013). While parenting style is typically considered to be a broad construct relating to the approach taken to parenting across domains (Power et al. 2013) and parenting practices the specific acts that parents employ in relation to their child’s behaviour (such as reward and punishment) (Power et al. 2013), these definitions are not standardised or commonly operationalised across studies, making comparisons between studies challenging.
Despite this, it appears that both parenting styles and practices have an important influence on child behaviour.

As described previously, associations, though few in number, were observed in Study 1 between global measures of parenting style and selected physical activity outcomes. In Study 3, however, numerous associations between physical activity-specific parenting practices and physical activity were observed. Further, while it was attempted to develop physical activity-specific measures of parenting style in the current research, this proved challenging as the actual constructs being measured, as they related to physical activity, were similar. For example, the item ‘my mum/dad encourages me to do my best at physical activity’ was developed to reflect an authoritative parenting style, that is, relatively high in demandingness and responsiveness. However, during factor analyses, this particular item grouped with items more reflective of specific parenting practices, such as ‘my mum/dad pays for my fees and uniform’ to form the logistic support factor. Consistent with the view in recent literature, it may be that parenting style has a moderating (Hennessy et al. 2010, Davison et al. 2013, Patrick et al. 2013) and parenting practices a mediating (Loprinzi et al. 2012) effect on physical activity. Therefore, future studies should consider including global parenting style measures in addition to measures of physical activity-specific parenting practices.

A novel finding to emanate from this research is around the development of an active family culture, which was typified by well-established strategies such as role modelling and co-participation, as well as lesser-known strategies including encouraging children to try a range of activities, exposure to physically active options from a young age, and even facilitating physically active part-time employment. Further, parents showed themselves to be strategic in developing this active family culture by, for example, steering their daughters towards team-based activities to facilitate the development of ‘active’ friendship groups. Strategies such as these would benefit from being tested in a larger, longitudinal sample and may provide a focus for future interventions.

Further notable findings to emerge from this research included the interactions between socio-demographic characteristics and physical activity parenting, and also
the relationship between authoritarian parenting and physical activity. These issues are clearly complex and warrant further consideration and investigation.

8.2.1 Authoritarian parenting and physical activity

This thesis observed inconsistent findings around authoritarian parenting and physical activity, and in particular the concept of parents forcing their daughters to participate in physical activity. Specifically, Study 1 found that frequency of organised sport participation was positively associated with authoritarian parenting (a parenting style typified by enforcing strict rules around behaviour), while authoritarian parents in Study 2 reported difficulties in getting their daughter active, and Study 3 demonstrated inverse associations between forcing physical activity and girls’ self-reported participation. As described previously, the literature generally shows positive associations between authoritative parenting and optimal health outcomes (Steinberg 2001, Patrick et al. 2013), while less than optimal outcomes such as risk of overweight (Rhee et al. 2006) and unhealthy eating (Arredondo et al. 2006) are associated with authoritarian parenting. Yet, as evidenced in the current study and the published literature (Newman et al. 2008), the relationship between parenting style and physical activity is less clear. Indeed, results from Study 3 are somewhat consistent with the literature on other health outcomes, with inverse associations between forcing physical activity (a practice typical of authoritarian parents) and girls’ physical activity evident. However, this was only true for parents’ self-reported physical activity parenting. In contrast, for daughters’ report of their mother’s and father’s parenting, the associations observed between forcing physical activity and participation were generally positive. Similarly, results from Study 1, showing an increased frequency of organised sport with an authoritarian parenting style, are inconsistent with the literature on authoritarian parenting and other health outcomes.

While there is very little literature with which to directly compare, the findings from Study 2 regarding authoritarian parents experiencing difficulties in facilitating their daughters’ physical activity may be consistent with the previously described negative outcomes of authoritarian parenting. However, it may be that parents who experience difficulties in getting their daughters active may attempt to overcome this by establishing and enforcing strict rules around physical activity. Investigating the
temporal nature of this relationship may be a focus for future research. Indeed, as Kremers and colleagues (2013) note in their work around parenting and nutrition, the interplay between parenting practices and styles adds complexity to our understanding of these relationships, yet it is an integral and dynamic component which must be considered. As described previously, while Study 3 attempted to develop items reflective of physical activity parenting styles, this was particularly challenging and suggests that parenting style is a higher order construct and should be assessed using global measures.

8.2.2 Authoritative parenting and physical activity

Despite the documented positive outcomes of authoritative parenting across health behaviours (Patrick et al. 2013), the relationship between authoritative parenting and physical activity appears less clear. The current research observed negative cross-sectional associations between an authoritative parenting style and active transport in Study 1, perhaps indicating that the increased support typical of authoritative parenting manifests in the provision of motorised transport options. Conversely, in Study 3 parental expectations around physical activity and provision of logistic support (practices typical of authoritative parents) were positively associated with a range of physical activity outcomes. Similarly, in Study 2, more authoritative parents frequently reported practices such as encouraging their daughter to be active outside during the after-school period and on weekends, and reported fewer difficulties in getting their daughter active. These latter findings are consistent with the literature on authoritative parenting and other health behaviours (Patrick et al. 2013).

8.2.3 Indulgent parenting and physical activity

As described previously, the negative cross-sectional association observed in Study 1 between an indulgent parenting style and active transport may be reflective of indulgent parents’ increased propensity to drive their children to neighbourhood destinations. In the qualitative study, more indulgent parents cited concerns around injury as a result of participation and the importance of not forcing their daughter to participate, while less indulgent parents reported setting limits around the number and types of activities their daughters were permitted to participate in. In Study 3, however, few associations were observed between indulgent parenting practices and
any of the physical activity outcomes. While the results of the first two studies are consistent with what might be expected of indulgent parents, the few associations observed in the third study suggest that further research is needed to fully understand the relationship between indulgent parenting and physical activity. In the interim, it may be that indulgent parents may benefit from ideas or assistance around incorporating active transport into their daughter’s daily routine, such as engaging in active transport together with their daughter.

8.2.4 Neglectful parenting and physical activity

Similarly, few associations between neglectful parenting and physical activity were observed in the current research. The only findings specific to neglectful parenting were in the qualitative study, where parents who were more neglectful reported a less diverse range of support strategies and fewer rules around physical activity. Few associations between neglectful parenting and health outcomes are reported in the literature, possibly due to a focus on other parenting styles, in particular authoritative and authoritarian parenting. Further, much of the research in this domain has been conducted among American and European middle-class populations (Patrick et al. 2013), hence conducting studies in more diverse population samples may be required to explore the relationship between neglectful parenting and health outcomes, including physical activity.

8.3 Policy and practice implications

There are preliminary policy and practical implications as a consequence of the current research. For example, existing parenting programs such as the Triple P (an Australia-wide parenting program) (Sanders et al. 2003), or Lifestyle Triple P (a parent-focused, group program for parents of overweight and obese children) (Child and Adolescent Community Health Service 2011) could be modified to include additional components on, and specific measures of, physical activity parenting. Similarly, national physical activity guidelines for children and adolescents (Australian Government Department of Health 2013) may be supported with additional materials for parents to assist them in incorporating physical activity-specific parenting practices into their daily routines.
It is apparent that socio-demographic characteristics interact with the relationship between parenting and physical activity. This was evident in Study 1, with numerous interactions observed between socio-demographic characteristics, such as family status and employment status, parenting and physical activity, while in Study 2 parents residing in lower SEIFA areas more frequently cited financial limitations as a barrier to their daughters’ physical activity than did those residing in higher SEIFA areas. Further research around the impact of specific socio-demographic characteristics on physical activity would enable tailoring of family-based interventions to socio-economic circumstances, such as parental employment status or family status. Similarly, future government policy should consider further supporting families in challenging socio-economic circumstances to facilitate their children’s physical activity. For example, government subsidies such as the current Western Australian Government Kidsport initiative (Government of Western Australia 2013) could be extended to other jurisdictions and activities other than organised sport to further support these parents.

In relation to implications for interventions, the current thesis provides evidence for the inclusion of strategies to support the development of an active family culture and healthy physical activity habits, and support or ideas for parents around the provision of logistic support. Further, it appears necessary to tailor interventions to specific socio-demographic circumstances.

Given the apparent potential of parenting to influence physical activity across all domains, it appears that comprehensive interventions which include a family-based component are warranted. Indeed, while the evidence around the effectiveness of interventions targeting young people’s physical activity levels is mixed (Jago & Baranowski 2004, Kriemler et al. 2011), multi-component interventions which include a family-based component appear to be most effective (van Sluijs et al. 2007, Kriemler et al. 2011). Further, research suggests that parental involvement is important for school-based interventions (Lubans et al. 2009), hence the need to identify ways of involving parents in increasing youth, and particularly girls’, physical activity in family (van Sluijs et al. 2011) and school (Lubans et al. 2009) settings is imperative.
8.4 Implications for future research

While the current research provides preliminary evidence of the importance of physical activity parenting practices, including newly identified practices such as the development of healthy physical activity habits, expectations around physical activity and provision of logistic support, these findings need to be replicated in larger studies using objective measures of physical activity. Further, a longitudinal design would allow the examination of temporal relationships, and enable an understanding of how parenting practices may evolve over time, which is necessary to inform the development of family-based interventions.

Numerous additional recommendations for future research have emerged from this research. Primarily, studies examining the influence of parenting styles and practices on physical activity would benefit from the inclusion of a comprehensive range of physical activity parenting measures, as was the case in Study 3. Further, the use of reliable measures is essential to ensure the consistent assessment of physical activity parenting. These recommendations are supported by recent calls for the development of comprehensive and reliable measures of physical activity parenting (Davison et al. 2013, Sleddens et al. 2012). It would also be beneficial to test the measures developed in this thesis among more diverse samples, particularly boys and younger girls, to determine their utility across different population sub-groups.

In addition, it appears the inclusion of both parent- and daughter-report measures of physical activity parenting is warranted, as the current thesis has demonstrated that physical activity-specific parenting practices may be perceived differently by girls and their parents. Further, given the differences in associations between daughters’ reports of their mother’s and father’s parenting, it seems appropriate to include measures of both mothers’ and fathers’ physical activity parenting in future research.

As described previously, and consistent with the literature (Power et al. 2013, Patrick et al. 2013), the inclusion of global measures of parenting style and physical activity-specific parenting practices appears necessary in future research. Indeed, further exploring the potential moderating (Hennessy et al. 2010, Davison et al. 2013) and
mediating (Loprinzi et al. 2012) roles of parenting styles and practices, respectively, is warranted.

8.5 Limitations and strengths of the current research

As identified previously (see Chapters 2, 3, 6 and 7), the current research is not without limitations. Study 1 had a small sample size and relied on global measures of parenting, while the sample in Study 2 was relatively homogenous. Study 3 was cross-sectional in design, relied on self-report measures of physical activity, had a low response rate and included the development of some scales that contained very few items. While a longitudinal design using objective measures of physical activity (such as accelerometers) would have overcome some of the limitations of this third study, resource and time constraints precluded this approach.

However, the current research has numerous methodological strengths, including the longitudinal design and inclusion of objective measures of physical activity in Study 1, the breadth of results from both parents and daughters and new insights derived from the in-depth interviews in Study 2. The inclusion of a test-retest reliability study, sampling from a broad cross-section of the population and the collection of data from parents and daughters using reliable measures of parenting practices in Study 3 are key strengths. Further, this research provides a unique and valuable contribution to the literature in this area, and overcomes some of the existing limitations described in Chapter 1.

8.6 Conclusions

The promotion of physical activity at a population level is challenging, however, this thesis has demonstrated that the family environment has potential and is clearly an important context in which to establish lifelong behaviours. As articulated by this mother of an 11 year old, encouraging and supporting physical activity during youth is:

“all about setting them up for a healthy adulthood”. 
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APPENDICES

Appendix 1: Australasian Society for Behavioural Health and Medicine Annual Scientific Meeting 2006 (Auckland): Poster abstract

Appendix 2: International Society for Behavioral Nutrition and Physical Activity Annual Scientific Meeting 2012 (Austin): Oral presentation abstract


Appendix 4: National Physical Activity Conference 2009 (Brisbane): Oral presentation abstract

Appendix 5: International Society for Behavioral Nutrition and Physical Activity Annual Scientific Meeting 2011 (Melbourne): Oral presentation abstract

Appendix 6: Australian Conference of Science and Medicine in Sport 2011 (Fremantle): Oral presentation

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APPENDIX 1:

AUSTRALASIAN SOCIETY FOR BEHAVIOURAL HEALTH AND MEDICINE
ANNUAL SCIENTIFIC MEETING 2006 (AUCKLAND): POSTER ABSTRACT
Associations between family function and parenting style and adolescents’ organised sport participation

Saunders J, Timperio A, Hume C, Ball K, Crawford D & Salmon J

The Centre for Physical Activity and Nutrition Research, Deakin University

Introduction: Family function and parenting style are related to general health outcomes among children and adolescents, however there is a paucity of data examining the influence of these factors on health behaviours such as physical activity or organised sport participation. This study examines associations between family function and parenting style and adolescents’ participation in organised sport, and differences in these relationships between boys and girls.

Methods: This cross-sectional analysis is based on follow-up data collected from 351 adolescents aged 13-15 years and their parents in the Children Living in Active Neighbourhoods study. Measures included adolescents’ self-reported organised sport participation and perceptions of family function, and parents’ self-reported parenting style. Multivariable linear regressions were performed to determine the associations between organised sport participation and family function and parenting style variables.

Results: There were no significant differences in frequency or duration of organised sport participation or in family function between boys and girls. Among boys, positive associations were found between an authoritative parenting style and both frequency (β=.140, p<.10) and duration (β=.133, p<.10) of organised sport participation. Among girls, positive associations were found between an authoritarian parenting style and frequency (β=.157, p<.05) and duration (β=.126, p<.10) of organised sport participation. There were no associations between family function and duration or frequency of organised sport participation.

Conclusion: Different types of parenting style were positively associated with organised sport participation among boys and girls. An authoritative parenting style has been shown to be protective against adolescent drug use and this study suggests positive associations with organised sport among boys. In contrast, among girls an authoritarian parenting style was positively associated with organised sport. Future research should examine other physical activity outcomes, such as overall physical activity participation, rather than organised sport participation alone. In addition, given the limitations of self-reported physical activity, future research should also consider using objective measures of physical activity.
APPENDIX 2:

INTERNATIONAL SOCIETY FOR BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY ANNUAL SCIENTIFIC MEETING 2012 (AUSTIN): ORAL PRESENTATION ABSTRACT
Cross-sectional and longitudinal associations between parenting style and adolescent girls’ walking and cycling trips

Saunders J, Timperio A, Hume C & Salmon J

The Centre for Physical Activity and Nutrition Research, Deakin University

Purpose: Parenting style is related to general health outcomes among adolescents; however there is a paucity of data examining the influence of parenting style on active transport. This study examines associations between parenting style and adolescent girls’ walking and cycling trips.

Methods: This analysis is based on data collected from 222 adolescent girls aged 13-15 years at baseline and their parents in the Children Living in Active Neighbourhoods study. Data were collected in 2004 and 2006. Measures included adolescents’ self-reported walking/cycling trips to neighbourhood destinations, and parents’ self-reported parenting style. Bivariate linear regressions were performed to determine the associations between parenting style and walking/cycling trips at baseline and follow up.

Results: Cross-sectionally, walking/cycling trips were negatively associated with authoritative (p<0.05) and indulgent (p<0.01) parenting, with each unit increase in authoritative parenting resulting in 2.0 fewer walking/cycling trips per week and each unit increase in indulgent parenting resulting in 2.9 fewer walking/cycling trips per week. In multiple regression analyses, an indulgent parenting style was negatively associated with walking/cycling trips (B= -2.83; 95% CI: -4.80, -0.86; p<0.05). There were no significant longitudinal associations between parenting style and walking/cycling trips.

Conclusion: Adolescent girls whose parents display authoritative and indulgent parenting styles may be less likely to walk/cycle, perhaps because they are being driven by car. In contrast to the current findings, evidence suggests positive associations between authoritative parenting and health outcomes. Future research should examine physical activity specific measures of parenting and consider other physical activity outcomes.
APPENDIX 3:

INTERNATIONAL JOURNAL OF BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY 2012 PAPER
AUTHORSHIP STATEMENT

1. Details of publication and executive author

<table>
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<tr>
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<th>Publication details</th>
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<tr>
<th>Name of executive author</th>
<th>School/Institute/Division if based at Deakin; Organisation and address if non-Deakin</th>
<th>Email or phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Julie Saunders</td>
<td>School of Exercise and Nutrition Sciences, Deakin University</td>
<td>0438 058 537</td>
</tr>
</tbody>
</table>

2. Inclusion of publication in a thesis

| Is it intended to include this publication in a higher degree by research (HDR) thesis? | Yes | If Yes, please complete Section 3 if No, go straight to Section 4. |

3. HDR thesis author’s declaration

<table>
<thead>
<tr>
<th>Name of HDR thesis author if different from above. (If the same, write “as above”)</th>
<th>School/Institute/Division if based at Deakin</th>
<th>Thesis title</th>
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<tbody>
<tr>
<td>As above</td>
<td>School of Exercise and Nutrition Sciences, Deakin University</td>
<td>Family Environmental Influences on Girls’ Physical Activity</td>
</tr>
</tbody>
</table>

If there are multiple authors, give a full description of HDR thesis author’s contribution to the publication (for example, how much did you contribute to the conception of the project, the design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)

This was a secondary analysis of an existing dataset. The HDR student conceived the project and conducted all the analyses under the guidance of her supervisors. The manuscript was drafted by the HDR student, commented on by her supervisors (several drafts), and edited and submitted by the HDR student.

I declare that the above is an accurate description of my contribution to this paper, and the contributions of other authors are as described below.

Signature and date: 10th April 2014

Signature Redacted by Library

4. Description of all author contributions

<table>
<thead>
<tr>
<th>Name and affiliation of author</th>
<th>Contribution(s) (for example, conception of the project, design of methodology or experimental protocol, data collection, analysis, drafting the manuscript, revising it critically for important intellectual content, etc.)</th>
</tr>
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<tbody>
<tr>
<td>Ms Julie Saunders, Deakin University</td>
<td>Contribution as above.</td>
</tr>
<tr>
<td>Dr Clare Hume, Deakin University</td>
<td>Conception of initial study on which secondary analyses were based, providing guidance on analyses and commenting on manuscript drafts.</td>
</tr>
<tr>
<td>Associate Professor Anna Timperio, Deakin University</td>
<td>Conception of initial study on which secondary analyses were based, providing guidance on analyses and commenting on manuscript drafts.</td>
</tr>
<tr>
<td>Professor Jo Salmon, Deakin University</td>
<td>Conception of initial study on which secondary analyses were based, providing guidance on analyses and commenting on manuscript drafts.</td>
</tr>
</tbody>
</table>

5. Author Declarations

I agree to be named as one of the authors of this work, and confirm:

i. that I have met the authorship criteria set out in the Deakin University Research Conduct Policy,

ii. that there are no other authors according to these criteria,

iii. that the description in Section 4 of my contribution(s) to this publication is accurate,

iv. that the data on which these findings are based are stored as set out in Section 7 below.
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<table>
<thead>
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<th>Name of author</th>
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<td>Clare Hume</td>
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<td>Anna Timperio</td>
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<tr>
<td>Jo Salmon</td>
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I agree to be named as a non-author contributor to this work.

<table>
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* If an author or contributor is unavailable or otherwise unable to sign the statement of authorship, the Head of Academic Unit may sign on their behalf, noting the reason for their unavailability, provided there is no evidence to suggest that the person would object to being named as author.

7. Data storage

The original data for this project are stored in the following locations. (The locations must be within an appropriate institutional setting. If the executive author is a Deakin staff member and data are stored outside Deakin University, permission for this must be given by the Head of Academic Unit within which the executive author is based.)

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<thead>
<tr>
<th>Data format</th>
<th>Storage Location</th>
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<th>Name of custodian if other than the executive author</th>
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<td>Hard copy questionnaires</td>
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<td>Prof Jo Salmon</td>
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<tr>
<td>Original electronic datasets are stored on a secure drive at Deakin University</td>
<td></td>
<td></td>
<td>Prof Jo Salmon</td>
</tr>
<tr>
<td>Electronic data set containing only variables used in secondary analyses described above is stored at UWA where HDR student is a staff member</td>
<td>University of Western Australia</td>
<td></td>
<td>Assistant Professor Julie Saunders</td>
</tr>
</tbody>
</table>

This form must be retained by the executive author, within the school or institute in which they are based.

If the publication is to be included as part of an HDR thesis, a copy of this form must be included in the thesis with the publication.
Cross-sectional and longitudinal associations between parenting style and adolescent girls’ physical activity

Julie Saunders1,2*, Clare Hume3, Anna Timperio3 and Jo Salmon1

Abstract

Background: Understanding the influences on physical activity is crucial, particularly among important target groups such as adolescent girls. This study describes cross-sectional and longitudinal associations between parenting style and girls’ participation in organized sport, walking/cycling trips and objectively assessed moderate to vigorous physical activity (MVPA).

Methods: Data were collected from adolescent girls (n=222) and their parents in 2004 and again in 2006. Parents self-reported their demographic characteristics and parenting style. Girls self-reported their organized sport participation and weekly walking/cycling trips, while MVPA was assessed using accelerometers. Linear regression and interaction analyses were performed. Interactions between socio-demographic factors and parenting style with organized sport, walking/cycling trips and MVPA are presented.

Results: There were cross-sectional associations between authoritative (β=-0.45, p=0.042) and indulgent (β=0.56, p=0.002) parenting and the number of walking/cycling trips, and authoritarian (β=0.27, p=0.033) parenting and frequency of organized sport. Significant interactions included those between family status, authoritative parenting and daily (β=0.048) and week day (β=0.013) MVPA; education, indulgent parenting and MVPA on weekend days (β=0.006); and, employment, authoritarian parenting and duration and frequency of organized sport (p=0.004), highlighting the complexity of these relationships. Longitudinal analyses revealed significant decreases in organized sport and MVPA, significant increases in walking/cycling trips and no significant associations between parenting and physical activity.

Conclusion: Parenting styles appear to influence walking and cycling trips among adolescent girls, though not physical activity within other domains. Socio-demographic characteristics interact with the relationships between parenting and physical activity. While these findings can inform the development of family-based interventions to improve child and adolescent health, the direction of the observed associations and the number of associations approaching significance suggest the need to further explore this area.

Keywords: Parental influences, Family environment, Adolescents’ Physical activity

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Background

Among adults, the association between regular physical activity and reductions in morbidity and mortality is well established [1]. Whilst the body of research into the benefits of physical activity among children is not as extensive, there is growing support for the role of physical activity in bone health and emotional well-being [2], reduction in coronary heart disease (CHD) risk factors [3] and social and moral development and self esteem [4].

The transition from childhood to adolescence has been identified as a period of marked decline in physical activity [5-7], particularly amongst girls [4]. Indeed, girls appear to be less physically active than boys across all age groups [8]. Sex differences in the types and intensities of physical activity engaged in also appear to have been reported, with boys undertaking more vigorous-intensity physical activity (VPA) [9], moderate- to vigorous-intensity physical activity (MVPA) [10], organized sport [11] and walking and cycling in the local neighbourhood [12] than girls. Understanding the influences on participation among girls is necessary to increase physical activity among this important target group.

It is useful to consider potential influences on behaviour under the guidance of theory. The Family Influence Model (FIM) [13,14] purports that the home environment (consisting of parent/sibling beliefs, parent/sibling behaviour, and family functioning and interaction) influences a child's perception of the home environment. This perception then leads to the development of specific beliefs which in turn is a primary influence on behaviour [14]. In a physical activity context, the FIM has been used to explain the influence of the family environment on children's MVPA [13], and posits that parents' beliefs about their children's MVPA is the basis for understanding family influence on children's MVPA.

Constructs within the FIM, including factors within the proximal family environment, such as parent support, support from significant others, sibling physical activity and direct help from parents, have been consistently associated with adolescents' physical activity [8]. Parents' provision of logistic support and explicit modelling has been associated with girls' physical activity [15,16], while among female adolescents, exercise knowledge and mothers' modelling/support [17] have been identified as correlates of physical activity participation. Similarly, among inactive adolescent girls, support for physical activity from parents was strong and consistent correlate of physical activity participation [18]. Other constructs within the FIM, such as parents' behaviour and family processes, have not been fully tested and family characteristics such as parenting style could be examined within this framework. Further, this model acknowledges the influence of socio-demographic factors on physical activity and the home environment [14], making it a useful tool for examining potential interactions between socio-demographic factors, parenting and physical activity.

Parenting style is a stable characteristic within the family environment [19], which has been associated with various health outcomes among adolescents [20,21]. The literature identifies four main parenting styles, which are reflective of various degrees of demandingness (control) and responsiveness (support) [20-22]. Authoritative parents are considered responsive, nurturing, set clear expectations and explain the reasons behind these expectations [23]. Authoritarian parents are firm and directive, relatively unresponsive, value obedience and exclude the child from decision making [20,23]. Indulgent parents place few demands on the child and are child-oriented, responsive and nurturing, while neglectful parents provide relatively low support and control [20,23]. Recent research suggests that authoritative feeding practices are associated with child consumption of fruit and vegetables [24,25] and authoritarian parenting with risk of overweight among young children [19], although a recent review notes the lack of causal evidence [26]. While preliminary data demonstrate an association between authoritative parenting and girls' physical activity [27], few studies have comprehensively examined how parenting style influences physical activity, despite such studies being recognised as imperative [28]. Further, the need for more longitudinal research in the area, employing a combination of self-report and objective measures, has been identified [16].

Given the important influence of parenting style on child and adolescent health behaviours and health, and the known associations between other aspects of the family environment (such as provision of support and direct help from parents) and physical activity, it is plausible that parenting style may influence adolescent physical activity. Further, socio-demographic characteristics previously associated with physical activity, such as educational attainment, may interact with parenting style to influence physical activity. The present study describes cross-sectional and longitudinal associations between parenting style and adolescent girls' participation in organized sport, walking/cycling trips and objectively assessed MVPA and explores potential interaction with socio-demographic factors.

Methods

These analyses are based on a sub-sample (adolescent girls) from the Children Living in Active Neighbourhoods (CLAN) cohort study. The study combined questionnaire and accelerometry data to examine contextual influences on physical activity. Ethics approval was obtained from Deakin University Ethics Committee and permissions were received from the Department of
Education and Training Victoria and the Catholic Education Office. Informed written consent was received from parents and written assent from adolescents.

Sample
In 2001, 919 10–12 year old children (n=495 girls) and their parents were recruited through 19 primary schools in high and low SES areas in Melbourne, Victoria. Details on baseline recruitment and sample selection are described elsewhere [29]. In 2004, 222 adolescent girls and their parents participated in a 3-year follow-up. Data were collected between July and December 2004. In 2006, 166 adolescent girls and/or their parents participated in a second follow up during the same months. Measures of parenting style were only collected in 2004, thus data from 2004 are considered baseline and 2006 considered follow-up for the purposes of this paper. Physical activity and socio-demographic data were collected in both 2004 and 2006. Although boys and younger children also participated in the CLAN study, this paper includes only adolescent girls as they are at particular high risk for physical inactivity.

Measures
Survey measures
Parents or carers completed survey items regarding socio-demographics and parenting style and adolescents completed survey items relating to organized sport participation and walking and cycling to school.

Socio-demographic items
Parents/carers reported their relationship to the child in the study and their age, educational attainment (collapsed into some secondary school or less (low); completed secondary school, technical college or apprenticeship (mid); university/tertiary qualification (high)) and employment status (collapsed into employed full-time; employed part-time; home duties full-time/other). Family status was recorded as dual carer if the responding parent/carer also answered the above questions about their co-carer who lives with them, and those parents who did not record responses to these questions were identified as single carer. Although marital status was also assessed, the number of carers present in the home was considered to be more likely to influence parenting style and was used in all analyses.

Weight status
Children's height and weight were measured at school in a private room using digital scales and a portable stadiometer. Weight status was calculated and children defined as normal weight, overweight or obese based on international age and gender-specific cutpoints [30].

Parenting style
Twenty-two items assessed parenting style, for example "I make decisions in consultation with my child", "I am clear about my parental role" and "I have the final say with my child". Response options on a five-point scale were never (1); rarely (2); sometimes (3); often (4); and always (5). These items were adapted from those developed by Baumrind [31]. Adaptations included simplifying the wording and developing additional items based on the constructs assessed by Baumrind. Factor analyses were used to reduce items into categories of parenting style. With the exception of three items that were reflective of specific parenting practices rather than overall parenting styles (I become annoyed/impatient when my child disobeys me; I become irritated/annoyed when my child dawdles or is annoying; I avoid open confrontation with my child), all remaining items loaded onto one of four factors/categories with Eigenvalues >1 (Table 1). These factors reflected the indulgent, authoritarian, authoritative and neglectful parenting styles identified in the literature [20-22]. The internal reliability (Cronbach's alpha) of the parenting styles ranged from 0.62 for a neglectful parenting style to 0.77 for an authoritarian parenting style. Responses to each item within each category were summed then averaged, and the average scores dichotomised at the mean.

Organized sport participation
Participation in organized sport was self-reported using an adaptation of the Adolescent Physical Activity Recall Questionnaire (APARQ) [32], which asked the adolescent to list each organized physical activity they were involved in during summer and winter respectively, the average number of times per week they participated, and the average duration each time they participated. Responses were cleaned and truncated consistent with procedures used by Booth and colleagues [32]. Total frequency and duration of organized sport participation in summer and winter were computed for each participant, and the average frequency and duration of organized sport across the whole year was calculated. The reliability and validity of the APARQ has previously been reported as acceptable [32].

Walking and cycling trips
Girls were asked to report how frequently they walked or cycled to each of 15 common destinations (e.g. friends' houses, sport venues, school and parks) in a usual week [33]. Response options (and assigned scores) were it's not within walking/riding distance (0); never/rarely (0); less than once/week (0); 1–2 times/week (1); 3–4 times/week (3); 5–6 times/week (5); and daily (7). Responses were summed to compute weekly frequency of walking/cycling trips. The measure has acceptable reliability [33].
Table 1 Description of factors arising from factor analysis

<table>
<thead>
<tr>
<th>Factors</th>
<th>Indulgent</th>
<th>Authoritative</th>
<th>Authoritarian</th>
<th>Neglectful</th>
</tr>
</thead>
<tbody>
<tr>
<td>I let my child express feelings about being punished or restricted</td>
<td>.735</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I listen to reasons why my child might not want to do something that I ask him/her to do</td>
<td>.731</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I encourage my child to tell me what he/she is thinking</td>
<td>.692</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I make decisions in consultation with my child</td>
<td>.611</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I tell my child how happy he/she makes me</td>
<td>.491</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am consistent with my discipline techniques</td>
<td></td>
<td>.753</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I make clear rules for my child to follow</td>
<td></td>
<td>.706</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I give my child reasons for my directions</td>
<td></td>
<td>.641</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am clear about my parental role</td>
<td></td>
<td>.537</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I use a gentle manner with my child</td>
<td></td>
<td>.441</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I confront my child when he/she does not do as I say</td>
<td></td>
<td></td>
<td>.738</td>
<td></td>
</tr>
<tr>
<td>I punish my child for disobedience</td>
<td></td>
<td></td>
<td>.728</td>
<td></td>
</tr>
<tr>
<td>I am firm with my child</td>
<td></td>
<td></td>
<td>.703</td>
<td></td>
</tr>
<tr>
<td>I have the final say with my child</td>
<td></td>
<td></td>
<td>.691</td>
<td></td>
</tr>
<tr>
<td>I see to it that my child does what he/she is told</td>
<td></td>
<td></td>
<td>.542</td>
<td></td>
</tr>
<tr>
<td>I let myself be talked out of things by my child</td>
<td></td>
<td></td>
<td>.763</td>
<td></td>
</tr>
<tr>
<td>I ignore my child's misbehaviour</td>
<td></td>
<td></td>
<td>.644</td>
<td></td>
</tr>
<tr>
<td>My child nags me into changing my mind</td>
<td></td>
<td></td>
<td>.625</td>
<td></td>
</tr>
<tr>
<td>My child wins arguments with me</td>
<td></td>
<td></td>
<td>.606</td>
<td></td>
</tr>
</tbody>
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Eigenvalue

| | 4.66 | 3.06 | 1.84 | 1.22 |

% variance

| | 21.2 | 13.9 | 8.4 | 5.5 |

Mean score for each parenting style (SD)^

| | 3.98 (0.55) | 4.08 (0.46) | 3.58 (0.57) | 2.39 (0.53) |

^ Range is from 1-5, with higher values representing greater presentation of these characteristics.

Accelerometry

Moderate-to vigorous-physical activity (MVPA) was assessed using accelerometers (Actigraph Model GT1M) [34]. The accelerometers were initialised to collect data in one minute epochs and participants were requested to wear their accelerometer on their right hip for eight consecutive days, only removing it for aquatic activities, bathing and sleeping.

Due to fitting of the accelerometer, data from day 1 was removed as it represented incomplete data. Wear-time was calculated as 24 hours minus all periods with >20 minutes of consecutive zeros. Days where wear-time was >= 8 hours and <300 minutes of vigorous activity was recorded were included as valid days. Total counts per minute were converted into duration of movement at various intensities according to the age-specific cut-points utilised by Freedson and colleagues [25], using a custom-designed data reduction program. Moderate-intensity activity was defined as 4.0-5.9 METs and vigorous-intensity as 6.0 METs and above [34]. Minutes per day in MVPA were calculated by summing the minutes spent in moderate activity and the minutes spent in vigorous activity. Average duration of MVPA on weekdays, weekend days, and across the week was calculated. MVPA recorded during the 'critical window' or after school period from 3pm to 6pm, was also calculated.

Participants were required to have 4 or more valid days (including 1 or more weekend day) of data for inclusion in weekly MVPA analyses, 3 or more valid weekdays for inclusion in weekday analyses, 1 or more valid weekend day for inclusion in weekend analyses and 3 or more valid days for inclusion in critical window analyses.

Data transformation

In both 2001 and 2006, organized sport, walking/cycling trips and MVPA data were all positively skewed and were therefore transformed, with the square root transformation best approximating a normal distribution for all physical activity variables. Transformed data were used for all statistical analyses and generation of p-values. Unless specified otherwise, transformed data have been reported in tables, with corresponding raw values described in text.

Statistical analyses

Data were managed and analysed using IBM SPSS Statistics Version 19 (2010). Descriptive statistics were used to
describe demographic characteristics. Regressions were performed to determine associations between socio-demographics and physical activity at baseline. Separate bivariate linear regression models were generated to assess associations between independent (parenting style) and dependent (organized sport, MVPA and walking/cycling trips respectively) variables. General Linear Modelling (GLM) was employed to examine interactions between 1) specific socio-demographic variables (parental employment, parental education and family status) and parenting style and organized sport; 2) specific socio-demographic variables and parenting style and walking/cycling trips; and 3) specific socio-demographic variables and parenting style and MVPA.

Paired t-tests were used to describe changes in physical activity from 2004 to 2006 and bivariate linear regressions were performed to examine associations between parenting style in 2004 and physical activity in 2006, controlling for baseline physical activity and, where appropriate, socio-demographics.

Results
Demographic characteristics
In 2004, the mean age of the girls (n=222) in the sample was 14.5 (SD 0.6) years. Most were not overweight or obese, with 74% of girls classified as within the normal weight range. The mean age of the responding parent was 43.9 (SD 5.1) years and the majority were mothers (87%), employed either full time or part time (77%) and were part of a dual carer family (80%). Almost half (44%) had completed a university or tertiary qualification. In 2006 (follow-up), the mean age of girls (n=166) was 16.3 (SD 0.6) years and most (73%) were within the normal weight range. The mean age of the responding parent was 46.2 years (SD 4.8) and again most were mothers (86%), employed either full time or part time (82%), part of a dual carer family (80%) and university or tertiary educated (48%).

There were no significant differences in any of the variables examined between the 166 girls who were retained in the sample from 2004 to 2006 and those who were lost to follow up (n=56). Therefore, to maximise the baseline sample size, cross-sectional analyses were performed using all available data rather than restricting the sample to only those who also participated in 2006.

Physical activity participation
Participation in organized sport, number of walking/cycling trips/week and duration of MVPA in 2004 and 2006 is presented in Table 2. Significant decreases in all organized sport and MVPA variables were observed, while the number of weekly walking/cycling trips increased significantly.

Associations between socio-demographics and physical activity
There were no associations between parent employment status or parental education, and any of the organized sport, walking/cycling trips or MVPA variables in 2004. Family status was associated with walking/cycling trips (p=0.002), but not with organized sport or MVPA. Where applicable, these variables were controlled for in cross-sectional and longitudinal analyses.

Cross-sectional associations between parenting style and physical activity
Cross-sectionally, an authoritarian parenting style was positively associated with frequency of organized sport participation (p=0.033), with each unit increase in authoritarian parenting resulting in 1.1 additional instances of organized sport participation per week. The number of walking/cycling trips per week was negatively associated with authoritative (p=0.042) and indulgent (p=0.002) parenting, with each unit increase in authoritative parenting resulting in 2.0 fewer walking/cycling trips per week and each unit increase in indulgent parenting resulting in 2.9 fewer walking/cycling trips per week.

<table>
<thead>
<tr>
<th>Organized sport</th>
<th>2004 Mean (SD)</th>
<th>2006 Mean (SD)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency (times/week)</td>
<td>4.2 (4.1)</td>
<td>4.4 (3.8)</td>
<td>160 3.3 (5.8)</td>
</tr>
<tr>
<td>Duration (hrs &amp; mins/week)</td>
<td>51.06m (4.930m)</td>
<td>51.01m (4.893m)</td>
<td>165 31.55m (5.153m)</td>
</tr>
<tr>
<td>Walking/cycling trips</td>
<td>6.8 (7.2)</td>
<td>7.3 (7.6)</td>
<td>166 10.6 (7.9)</td>
</tr>
<tr>
<td>MVPA (mins/period)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average day</td>
<td>39.3 (8.5)</td>
<td>39.4 (8.2)</td>
<td>85 23.8 (15.8)</td>
</tr>
<tr>
<td>Weekdays</td>
<td>42.2 (22.1)</td>
<td>44.8 (22.6)</td>
<td>97 27.4 (16.5)</td>
</tr>
<tr>
<td>Weekend days</td>
<td>26.1 (24.0)</td>
<td>24.7 (29.5)</td>
<td>68 15.8 (22.7)</td>
</tr>
<tr>
<td>Critical window (3-6pm)</td>
<td>13.1 (9.9)</td>
<td>14.1 (10.7)</td>
<td>96 9.0 (8.8)</td>
</tr>
</tbody>
</table>

*Paired samples t-tests (based on transformed data); untransformed data reported in table.
### Table 3: Bivariate associations between parenting style and organized sport, walking/cycling trips and MVPA in 2004

<table>
<thead>
<tr>
<th>Parenting style</th>
<th>Org sport frequency/week</th>
<th>Org sport duration/week</th>
<th>Number of walking/cycling trips/week</th>
<th>Min MVPA average day</th>
<th>Min MVPA weekday</th>
<th>Min MVPA weekend days</th>
<th>Min MVPA after school period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authoritative</td>
<td>0.27 (0.02, 0.52)**</td>
<td>0.10 (0.03, 0.36)</td>
<td>0.04 (0.02, 0.20)</td>
<td>0.09 (0.05, 0.14)</td>
<td>0.01 (0.00, 0.02)</td>
<td>0.00 (0.00, 0.00)</td>
<td>0.01 (0.00, 0.01)</td>
</tr>
<tr>
<td>Authoritative</td>
<td>0.08 (0.03, 0.25)</td>
<td>0.04 (0.01, 0.13)</td>
<td>0.00 (0.00, 0.00)</td>
<td>0.01 (0.00, 0.01)</td>
<td>0.00 (0.00, 0.00)</td>
<td>0.00 (0.00, 0.00)</td>
<td>0.00 (0.00, 0.00)</td>
</tr>
<tr>
<td>Neglectful</td>
<td>-0.21 (-0.42, 0.00)</td>
<td>-0.15 (-0.34, 0.04)</td>
<td>-0.06 (-0.26, 0.14)</td>
<td>-0.15 (-0.30, 0.02)</td>
<td>-0.04 (-0.18, 0.02)</td>
<td>-0.00 (-0.00, 0.00)</td>
<td>-0.00 (-0.00, 0.00)</td>
</tr>
</tbody>
</table>

**p < 0.05, **p < 0.01. MVPA analyses adjusted for year time; *p < 0.05, **p < 0.01. Multivariate analyses reported in table.
per week. There was a trend towards an increased duration of organized sport with authoritarian parenting, although this finding was not statistically significant. There were no statistically significant associations between MVPA on average days, weekdays, weekend days or the after school period and parenting style.

In multivariable regression analyses, an indulgent parenting style was significantly inversely associated with walking/cycling trips (B= -2.83; 95% CI: -4.80, -0.86, p=0.005) (Table 3).

Interactions between parenting style, socio-demographics and physical activity
A number of significant interactions were found between socio-demographics, parenting styles and physical activity in 2004 (Figures 1,2,3,4,5,6). A significant interaction was found between family status and an authoritarian parenting style with walking/cycling trips (F=4.378, p=0.038), with children of single carers who were less authoritarian participating in more walking/cycling trips per week than other children (Figure 1). Children of single carers who were more authoritative participated in more daily MVPA (F=3.988, p=0.048) (Figure 2a) and weekday MVPA (F=6.265, p=0.013) (Figure 2b) than other children, while children of single carers who were less neglectful participated in more daily MVPA (F=5.059, p=0.026) (Figure 3a), more weekday MVPA (F=5.236, p=0.024) (Figure 3b) and more MVPA in the after school period (F=5.196, p=0.024) (Figure 3c) than other children. Children of single carers who were more indulgent participated in less daily MVPA than their counterparts (F=5.009, p=0.027) (Figure 4).

Children of responding carers who had completed some secondary school and were more indulgent participated in more MVPA on weekend days than other children (F=5.427, p=0.006) (Figure 5), while children of responding carers who were at home full time and were less authoritarian participated in a shorter duration (F=4.606, p=0.011) (Figure 6a) and lower frequency (F=5.664, p=0.004) (Figure 6b) of organized sport each week and less weekend PA than their counterparts (F=4.061, p=0.020) (Figure 6c).

Longitudinal associations between parenting style and physical activity
There were no significant longitudinal associations between parenting style in 2004 and physical activity variables in 2006, although a number of associations approached significance. These included an authoritative parenting style and walking/cycling trips (p=0.097) and MVPA in the after school period (p=0.071), and a neglectful parenting style and frequency (p=0.051) and duration (p=0.054) of organized sport.

Discussion
This study aimed to explore cross-sectional and longitudinal associations between parenting style and adolescent girls’ participation in organized sport, walking/ cycling trips and objectively assessed MVPA, with several associations identified as well as interactions with

![Figure 1 Interaction between family status, authoritarian parenting and walking/cycling trips.](image-url)
socio-demographic factors. Cross-sectional analyses showed associations between authoritative and indulgent parenting and walking/cycling trips, and authoritarian parenting and frequency of organized sport. Significant interactions included those between family status, authoritative parenting and daily and week day MVPA; education, indulgent parenting and MVPA on weekend days; and, employment, authoritarian parenting and duration and frequency of organized sport, highlighting the importance of tailoring public health interventions to specific socio-demographic groups. Longitudinal analyses revealed significant decreases in organized sport and MVPA and significant increases in walking/cycling between 2004 and 2006. There were no significant longitudinal associations between parenting and physical activity. This study is one of the first to examine how parenting styles influence physical activity in a longitudinal sample.

There is very little parenting research specific to physical activity with which to compare the results of the current study, although authoritative parenting has previously been positively associated with a number of child and adolescent health outcomes [20]. The current study found a negative cross-sectional association between authoritative parenting and walking/cycling trips. This negative association may reflect authoritative parents’ provision of higher levels of support for their child, which may manifest itself in non-active transport options. Alternatively, children of authoritative parents may avail themselves of parental support by requesting parents drive them by car to neighborhood destinations. Further exploring the reasons for this finding may provide an interesting focus for future research.

The negative cross-sectional association between indulgent parenting and weekly walking/cycling trips may be explained by indulgent parents’ provision of higher levels of support for their child in the form of motorized transport, thereby reducing the need for their child to use more active transport options. In this study, each unit increase in indulgent parenting resulted in almost three fewer walking/cycling trips per week for adolescent girls, which may represent a substantial amount of activity [36]. Investigating the nuances of this relationship may therefore be important.

A positive cross-sectional association between authoritarian parenting and organized sport frequency was
observed in the current study, while the positive association between authoritarian parenting and organized sport duration approached significance. It is possible this finding may be related to authoritarian parents' placement of demands on their child, strict enforcement of rules and monitoring of behavior [20], which may be applied to their daughter's participation in organized sport. Again, exploring this notion qualitatively may be appropriate.

The observed interactions between socio-demographics, parenting style and physical activity suggest a complex relationship between these variables and provide direction for further research and intervention, in particular for the identification of practices which are supportive of physical activity within parenting styles and in light of personal socio-demographic circumstances. For example, single parents who exhibit low levels of authoritarian parenting may provide useful insights into encouraging walking/cycling trips, while more authoritarian parents who work part-time may benefit from guidance or strategies to include organized sport in their children's routine. Further exploration of the specific physical activity related parenting practices employed within each of the parenting styles and socio-demographic sub-groups is required.

The decrease in physical activity over the two years of this study, particularly in organized sport and MVPA, is consistent with previous studies [37-39]. The consistent
of declines among girls provides substantial justification for the need to address physical activity among this target group. The observed increase in active transport over the two years is also consistent with the literature [40], however further longitudinal studies are required [41]. Given the contribution that active transport appears to make to achievement of physical activity guidelines [36], it is important to ensure that parents are supportive of active transport behaviours.

There are a number of limitations to this study, including the use of global measures of parenting style that were not specific to physical activity, the relatively small sample size and the narrow age range of participants. Physical activity specific measures of parenting styles and practices should be developed and tested within larger, more representative samples. Although parenting style is a stable characteristic established early in life [19], the practices implemented within these parenting styles may evolve as children age. Investigating the influence of physical activity-related parenting practices in other age groups may be warranted. Further, a number of participants (n=56) were lost to follow-up (although there were no significant differences between those who were and were not retained in the sample on any of the key variables). The inclusion of cross-sectional and longitudinal data, providing a more comprehensive picture of the temporal relationship between parenting and physical activity, and the use of objective measures of physical activity are methodological strengths.

Conclusions
This study provides unique data on the influence of parenting styles on physical activity, and the interactions socio-demographics characteristics have with these relationships. While few associations between parenting style and physical activity were observed, the direction of the associations and the number of associations approaching significance (data not shown) suggests the need to further explore this area. In order to better understand the potential influence of parenting on girls’ physical activity, the development of measures of parenting styles and practices specific to physical activity is required. Further, given the significant decline in physical activity participation during the transition from childhood to adolescence, investigating these associations in girls before they reach adolescence is critical.

Competing interests
The authors declare they have no competing interests.

Author’s contributions
All authors contributed equally to this manuscript and read and approved the final manuscript.

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APPENDIX 4:

NATIONAL PHYSICAL ACTIVITY CONFERENCE 2009 (BRISBANE): ORAL PRESENTATION ABSTRACT
How parents support their daughters’ physical activity: Perspectives from parent/daughter dyads

Saunders J, Timperio A, Hume C & Salmon J

The Centre for Physical Activity and Nutrition Research, Deakin University

Introduction: This research explored perceptions of parents and their daughters regarding strategies and practices employed by parents to support their daughter’s physical activity.

Methodology: In-depth interviews were conducted with girls aged between 11 and 15 years (N=34) and one or both of their parents (N=36) from high and low socio-economic areas in Melbourne. Interviews were audio-recorded and later transcribed. Data were content analysed using QSR NVivo 8 and emerging themes were identified.

Results: All girls provided a number of examples of ways in which their parents supported them to be physically active. The majority cited transport and the provision of verbal encouragement and emotional support as the main ways their parents supported their activity. Several indicated their parents participated with them, mainly by going for walks, and a number indicated their parents practiced skills with them to help them improve. Enforcing rules around time spent outside and committing to team sports were also identified as a means of supporting participation. Some individuals commented their parents implemented strategies such as taking care of their injuries, ensuring adequate rest and talking with them about the benefits of activity.

Parents cited a diverse range of ways in which they support their daughter’s activity. Examples included encouraging children towards appropriate activities, emphasising the social aspect of activities, providing equipment around the home, providing incentives, discussing team commitment, encouraging incidental activity and ensuring adequate nutrition. The majority of parents also identified transport and encouragement as ways of supporting their daughters.

A synergy among parent/daughter dyads in relation to practices parents employ to support their daughter’s physical activity was identified. The provision of transport and encouragement was the most common theme to emerge from both parent and daughter interviews, while parents additionally identified a very diverse range of mechanisms by which they support their daughters to be active.

Conclusions: Given their traditionally low activity levels, adolescent girls are an important target group for physical activity interventions. Family-based interventions have been shown to have potential among this group; however the exact mechanisms by which parents can encourage their daughter’s participation are largely unknown. While previous research has identified strategies such as modeling and logistic support as means by which parents support their daughters’ activity, this research has comprehensively explored and identified a number of practices previously not discussed in the literature. This provides an important basis for future intervention research to determine how parents can best encourage participation among their daughters.
APPENDIX 5:

INTERNATIONAL SOCIETY FOR BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY ANNUAL SCIENTIFIC MEETING 2011 (MELBOURNE): ORAL PRESENTATION ABSTRACT
How can parents best encourage their daughters to be physically active?

Saunders J, Hume C, Timperio A & Salmon J

The Centre for Physical Activity and Nutrition Research, Deakin University

Introduction: This research explored parents’ perceptions regarding how they might best encourage their daughters’ physical activity.

Methods: In-depth semi-structured interviews were conducted with parents (N=34 mothers and N=4 fathers) of girls aged between 11 and 15 years from high and low socio-economic areas in Melbourne, Australia. Questions were informed by the Family Influence Model (Kimiecik & Horn 1988) and included items relating to provision of support for and attitudes toward physical activity. Interviews were audio-recorded and later transcribed. Emerging themes were identified using NVivo 8.

Results: Most parents stressed the importance of active modelling (e.g. being active themselves and being active with their daughters) as a means of encouraging their daughter’s physical activity. Other frequently discussed strategies included getting girls involved in physical activity at a young age, provision of transport and other logistic support, actively encouraging a range of activities, showing enthusiasm for chosen activities and being able to identify when their daughters were ‘overloaded’.

Parents also noted that strategies such as enforcing strict rules around physical activity were unlikely to encourage participation. Further, parents believed that other parents who were loud and aggressive while their daughters were participating were a deterrent to participation.

Conclusions: Many adolescent girls exhibit low physical activity levels, thus identifying strategies to encourage participation is paramount. Parents in this study had clear ideas about strategies that would encourage activity amongst their daughters and also about strategies unlikely to be effective. These data provide important information for the development of family-based interventions to encourage physical activity among adolescent girls.
APPENDIX 6:

AUSTRALIAN CONFERENCE OF SCIENCE AND MEDICINE IN SPORT, 2011 (FREMANTLE): ORAL PRESENTATION
Parental attitudes towards their daughter’s physical activity

Ms Julie Saunders

Background
- Physical activity (PA) declines among adolescent girls
- Social & family environment influences girls’ PA
- Parental attitudes and practices important for development of health behaviours, but little known about PA
- PA-specific parental attitudes and parenting practices need to be identified

Aim:
- To identify parents’ perceptions and attitudes towards their daughter’s PA

Methods
- In depth interviews with parents (N=36) of girls aged 11-15 years
- Recruited from high & low SES areas in Melbourne
  - Multiple recruitment methods
- Recorded & transcribed

Results: parental attitudes towards their own PA as a child
- Polarized respondents
- Very favourable
  - ‘fun’, ‘very important’, ‘part of life’
- Very unfavourable
  - ‘boring’, ‘not important’, ‘horrible’
- Despite many negative attitudes, all had positive attitudes towards daughter’s PA
Results: parental attitudes towards their daughter’s PA

• Overwhelmingly positive
  – ‘very important’, ‘an essential part of a balanced lifestyle’, ‘great way to channel energy’
• Social aspects important
• Positive impact on self-esteem
  – “…academically she’s not up there but this is something she is good at… and it gives them a lot of self-esteem” (father of 14yo girl)

Results: parental attitudes towards their daughter’s PA

• Important as a means of preventing weight gain
  – “she’s had a weight problem most of her life… so I used to try and get her out at least 3 times a week… and even then she still stacked it on” (mother of 14yo girl)
• Concept of competition polarized respondents
• Not ‘forcing’ participation considered important

Results: parental concerns regarding their daughter’s PA

• None
• Injuries
• Amount
  • Limits due to time and financial constraints
  • Level of encouragement required

Conclusions

• Parents had positive attitudes towards their daughter’s participation
• PA considered important for many reasons:
  • Part of a balanced lifestyle
  • Development of social skills and friendship networks
  • Weight gain prevention
  • Self-esteem development
• Parental concerns regarding PA mainly related to injuries and logistics

Acknowledgements

• Professor Jo Salmon
• Dr Clare Hume
• Dr Anna Timperio
• Ms Sanee Roberts
• Centre for Physical Activity and Nutrition Research at Deakin University
APPENDIX 7:

INTERNATIONAL SOCIETY FOR BEHAVIORAL NUTRITION AND PHYSICAL
ACTIVITY ANNUAL SCIENTIFIC MEETING PRE-CONFERENCE PARENTING
WORKSHOP 2012 (HOUSTON): POSTER PRESENTATION ABSTRACT
Beyond modelling and support: which physical activity related parenting practices need to be captured?

Saunders J, Timperio A, Hume C & Salmon J

The Centre for Physical Activity and Nutrition Research, Deakin University

Purpose: Parenting styles and practices are related to general health outcomes among children and adolescents. Research on physical activity related parenting practices is largely limited to the assessment of parental modelling and provision of logistic support. The current study seeks to inform the development of survey items that measure the myriad of physical activity related parenting practices.

Methods: In-depth interviews were conducted with girls aged between 11 and 15 years (N=34) and one or both of their parents (N=36) from high and low socio-economic areas in Melbourne, Australia. Questions were informed by the Family Influence Model (Kimiecik & Horn 1988) and included items relating to strategies implemented by parents to facilitate physical activity. Interviews were audio-recorded and later transcribed, with data managed using NVivo 9.

Results: Parents cited a diverse range of practices they employ to facilitate their daughter’s activity. Examples included encouraging children towards appropriate activities, emphasising the social aspect of activities, providing equipment around the home, providing incentives, discussing team commitment, encouraging incidental activity and ensuring adequate nutrition. The majority of parents also identified transport and encouragement as ways of supporting their daughters. Parents noted the strategies they employed differed depending on the particular situation and the child herself.

Conclusion: This study identified parenting practices for which measures don’t currently exist; hence items need to be developed to encapsulate these practices. Further, it is important that these measures are context specific, as it is likely that the practices employed by parents differ depending on the situation and the child.
APPENDIX 8:

STUDY 2 PLAIN LANGUAGE STATEMENTS
Dear Principal,

We are currently recruiting female students in years 6 and 8 and their parents to participate in a research project which aims to investigate family and parental influences on girls’ physical activity. This study aims to understand parents’ perceptions of their daughters’ physical activity, as well as girls’ attitudes towards physical activity. We are hoping to speak with a wide range of girls, including girls who are inactive and those who are active.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and include Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio. Our team has a strong track record in research into the health behaviours of young people, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders.

We are seeking your consent to recruit participants through your school. Families who consent to participate will be asked to take part in two interviews – one with the female student and one with her parents. The interview will involve some brief questions about physical activity participation, attitudes to physical activity and ways in which females may be supported to be physically active. The two interviews will take approximately one hour in total, and will be conducted outside of school hours. Where convenient, interviews can be conducted in the home, in a mutually convenient location for the family, or at Deakin University. Interviews will be audio-taped for transcribing at a later date. To compensate for their time donated to this important research, each participant will receive a movie ticket.

Please be assured that all information provided by participants will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at Deakin University in a locked filing cabinet in accordance with Deakin University guidelines, and will be retained for six years after the study finishes. The information gathered during this study may be published in scientific literature or presented at conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual or school.

This is an important research study, however your school is under no obligation to participate, and if you consent to do so you are free to withdraw at any time, and any information provided by your school will be destroyed. If you wish, you will be provided with a summary of the overall results.

If you consent for your school to participate in this study, please sign and return the attached consent form in the enclosed reply-paid envelope.

If you have any questions about this study, please feel free to contact Ms Julie Saunders (9244 6910) or Associate Professor Jo Salmon (9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Ms Julie Saunders

Should you have any concerns about the conduct of this research project, please contact the Secretary, Deakin University Human Research Ethics Committee, Research Services, Deakin University, 221 Burwood Highway, Burwood VIC 3125. Tel: (03) 9251 7123 (International +61 3 9251 7123) E-mail: research-ethics@deakin.edu.au

Please quote project no. [EC 72-2007]
Dear Parent/Guardian,

Your school Principal has approved the recruitment of female students and their parents to participate in a research project which aims to investigate family and parental influences on the physical activity of girls. This study aims to understand how parents feel about their daughters’ physical activity and what types of support they provide, as well as girls’ attitudes towards physical activity. We are hoping to recruit parents of a wide range of girls, including those girls who are inactive and those who are active.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and include Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio. Our team has a strong track record in research into the health behaviours of young people, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders.

Your family, including yourself and your daughter, plus other carers, are invited to participate in this research project. Participation involves taking part in two interviews – one with yourself and your partner (where available), and one with your daughter. The interview will involve some brief questions about your own and your daughter’s physical activity, attitudes to physical activity and ways in which you may support your daughters’ physical activity. The two interviews will take approximately one hour in total, and can be conducted at a time to suit you. Where convenient, interviews can be conducted in your home, otherwise a location that is convenient to you can be organised (eg. Deakin University). With your permission, interviews will be audio-taped for transcribing at a later date.

Please be assured that all information provided by you and members of your family will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at Deakin University in a locked filing cabinet in accordance with Deakin University guidelines, and will be retained for six years after the study finishes. The information gathered during this study may be published in scientific literature or presented at conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual.

This is an important research study, however your family is under no obligation to participate, and if you consent to do so you are free to withdraw at any time with any information you have provided being confidentially disposed of. If you wish, you will be provided with a copy of the results of the study.

If you consent to participate in this study, please sign and return the attached consent form (along with your daughter’s signed consent form) in the enclosed reply-paid envelope. To compensate for the time donated to this important research, each participant will receive a movie ticket.

If you have any questions about this study, please feel free to contact Ms Julie Saunders (9244 6910) or Associate Professor Jo Salmon (9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Ms Julie Saunders

Should you have any concerns about the conduct of this research project, please contact the Secretary, Deakin University Human Research Ethics Committee, Research Services, Deakin University, 221 Burwood Highway, Burwood VIC 3125. Tel: (03) 9251 7123 (International +61 3 9251 7123) E-mail: research-ethics@deakin.edu.au Please quote project no. [EC 72-2007]
Dear Student,

Your school Principal has approved the recruitment of girls and their parents to participate in a research project investigating family and parental influences on girls’ physical activity. This study aims to understand how parents feel about their daughters’ physical activity, as well as girls’ attitudes towards physical activity. We are hoping to speak with a wide range of girls, from those who are inactive to those who are active.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and include Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio. Our team has extensive experience in this type of research, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders.

Your family, including yourself and your parents, are invited to participate in this research project. Participation involves taking part in two interviews – one with you and one with your parents. The interview will involve some brief questions about physical activity participation, attitudes to physical activity and ways in which you may be supported to be physically active. The two interviews will take approximately one hour in total, and can be conducted at a time to suit you. Where convenient, interviews can be conducted in your home, otherwise a location that is convenient to you can be organised (eg. Deakin University). With your permission, interviews will be audio-taped for transcribing at a later date.

Please be assured that all information provided by you and members of your family will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at Deakin University in a locked filing cabinet in accordance with Deakin University guidelines, and will be retained for six years after the study finishes. The information gathered during this study may be published in scientific literature or presented at conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual.

This is an important research study, however you are under no obligation to participate, and if you consent to do so you are free to withdraw at any time with any information you have provided being confidentially disposed of. If you wish, you will be provided with a copy of the results of the study.

If you consent to participate in this study, please sign and return the attached consent form (along with your parents’ signed consent form) in the enclosed reply-paid envelope. To compensate for the time donated to this important research, each participant will receive a movie ticket.

If you have any questions about this study, please feel free to contact Ms Julie Saunders (9244 6910) or Associate Professor Jo Salmon (9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Ms Julie Saunders

Should you have any concerns about the conduct of this research project, please contact the Secretary, Deakin University Human Research Ethics Committee, Research Services, Deakin University, 221 Burwood Highway, Burwood VIC 3125. Tel: (03) 9251 7123 (International +61 3 9251 7123) E-mail: research-ethics@deakin.edu.au
Please quote project no. [EC 72-2007]
APPENDIX 9:

STUDY 2 CONSENT FORMS
I, of

**Hereby consent** to allow the recruitment of subjects through my school for a human research study to be undertaken

By Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio

and I understand that the purpose of the research is to investigate family and parental influences on the physical activity of girls.

**I acknowledge**

1. That the aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2. That I voluntarily and freely give my consent to my school’s participation in such research study.

3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

4. Individual results **will not** be released to any person except at my request and on my authorisation.

5. Interviews will be audio-taped and later transcribed, with all data de-identified and stored in a locked filing cabinet.

6. That I am free to withdraw my consent at any time during the study, in which event my school’s participation in the research study will immediately cease and any information obtained from me will not be used.

Signature: Date:
DEAKIN UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE
PARENT/GUARDIAN CONSENT FORM

FAMILY AND PARENTAL INFLUENCES ON GIRLS’ PHYSICAL ACTIVITY

I, of

Hereby consent to be a subject of a human research study to be undertaken

By Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio

and I understand that the purpose of the research is to investigate family and parental influences on the physical activity of girls.

I acknowledge

1. That the aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2. That I voluntarily and freely give my consent to my participation in such research study.

3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

4. Individual results will not be released to any person except at my request and on my authorisation.

5. Interviews will be audio-taped and later transcribed, with all data de-identified and stored in a locked filing cabinet.

6. That I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Signature: Date:
I, of

**Hereby consent** to be a subject of a human research study to be undertaken

By Ms Julie Saunders, Associate Professor Jo Salmon, Dr Clare Hume and Dr Anna Timperio

and I understand that the purpose of the research is to investigate family and parental influences on the physical activity of girls.

**I acknowledge**

1. That the aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2. That I voluntarily and freely give my consent to my participation in such research study.

3. I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

4. Individual results **will not** be released to any person except at my request and on my authorisation.

5. Interviews will be audio-taped and later transcribed, with all data de-identified and stored in a locked filing cabinet.

6. That I am free to withdraw my consent at any time during the study, in which event my participation in the research study will immediately cease and any information obtained from me will not be used.

Signature: Date:
APPENDIX 10:

STUDY 2 PARENT INTERVIEW SCHEDULE
I’d like to start by thanking you very much for making time to take part in this study. I’m Julie Saunders, and this study forms part of my PhD research, and this is [name of research assistant], who is going to observe the interview and take notes of anything I may miss. If it’s ok with you, I’d also like to tape record the interview so I can go back later to listen to answers to questions etc. Any identifying information such as your name will be stored separately to the tape and any transcripts. Are you happy for me to proceed?

Great, I’d like to stress that your participation in this is completely voluntary, and you are able to withdraw at any time without prejudice.

Ok, I’d like to start off with some generic top of mind associations about physical activity. By physical activity I mean both structured activities (such as organised sport and games) and non-structured activities such as walking to school, free play and bike riding for fun. I’m going to start a sentence, and I’d like you to finish it with whatever pops into your mind first. For example, I may say, “Exercise is...” , and you may say “Something I don’t do very often” or “Something I love to do”. Does that make sense?

1. When I was a child, sport was...
2. As a parent I think it is important that my child...
3. Physical activity is...

Thank you for that – now I’ll ask some questions specifically regarding your daughter’s physical activity.

1. How do you feel about your daughter participating in physical activity?
2. Do you have concerns about your daughter being physically active? (Prompts: what are these? Why not?)
3. How do you think your daughter feels about being physically active?
4. What are some of the things you do to support your daughter to be physically active? (Prompts: can you tell me more about these things?)
5. In what ways do you encourage your daughter to be physically active? Has this changed over time?
6. Do you have any rules regarding your daughter’s physical activity?
7. What types of activities do you prefer your daughter to do after school? (Prompts: why?) On the weekend? (Prompts: why?) What do you do to ensure she takes part in these activities?
8. Do you ever have any problems getting your daughter to participate in physical activity? (Prompts: what sorts of problems and why?, what sorts of strategies do you employ to overcome these problems?)
9. Do you and your partner (if applicable) share similar views about your daughter’s physical activity? (Prompts: why/why not? how does this impact on your daughter’s activity levels?)
10. Do you feel any differently about your daughter participating in physical activity compared to her siblings (where appropriate)?
11. How can parents best encourage their daughters to be physically active?
(Prompts: have you seen any really good examples of things parents can do to encourage their daughter’s physical activity?)

Thanks very much for that. As described in the Plain Language Statement, I am interested in exploring how your relationship with your daughter affects her participation in physical activity. I would like to ask you a series of standard questions that have been developed to identify what sort of strategies and interactions parents have with their children. Please indicate how often the following statements apply to you and your daughter by pointing to the correct option on this card (options are ‘never’, ‘rarely’, ‘sometimes’, ‘often’, ‘always’).

1. I tell my daughter how happy she makes me.
2. I listen to reasons why my daughter might not want to do something I ask her to do.
3. I become annoyed and impatient when my daughter disobeys me.
4. I become irritated and impatient when my daughter dawdles or is annoying.
5. I am clear about my parental role.
6. I make decisions in consultation with my daughter.
7. I encourage my daughter to tell me what she is thinking and feeling.
8. I let my daughter express feelings about being punished or restricted.
9. I am firm with my daughter.
10. I have the final say with my daughter.
11. I confront my daughter when she does not do as I say.
12. I give my daughter reasons for my directions.
13. I see to it that my daughter does what she is told.
15. I make clear rules for my daughter to follow.
16. I use a gentle manner with my daughter.
17. I am consistent with my discipline techniques.
18. My daughter wins arguments with me.
19. My daughter nags me into changing my mind.
20. I ignore my daughter’s misbehaviour.
21. I let myself be talked out of things by my daughter.

Ok, we’re finished with the formal part of the interview - is there anything else you’d like to add before we finish? I wonder if I could leave this short demographic and physical activity questionnaire for you to complete – it will take approximately 10 minutes and I will collect it after I’ve finished speaking with your daughter. Thank you again for making the time to speak with me, it is much appreciated.
This short questionnaire will take approximately 10 minutes to complete and I will collect it after I’ve finished speaking with your daughter. Please place the completed questionnaire in the attached envelope.

This first group of questions asks about your own physical activity levels:

1. IN THE LAST WEEK how many times have you walked continuously, for at least 10 minutes, for recreation/exercise or to get to or from places?
   ______ times

2. What do you estimate was the total time that you spent walking in this way IN THE LAST WEEK?
   ______ hours / ______ minutes

3. IN THE LAST WEEK how many times did you do any vigorous gardening or heavy work around the yard which made you breathe harder or puff and pant?
   ______ times

4. What do you estimate was the total time that you spent doing vigorous gardening or heavy work around the yard IN THE LAST WEEK?
   ______ hours / ______ minutes

The next question excludes household chores or gardening or yardwork

5. IN THE LAST WEEK, how many times did you do any vigorous physical activity which made you breathe harder or puff and pant? (e.g. jogging, cycling, aerobics, competitive tennis, etc)
   ______ times

6. What do you estimate was the total time that you spent doing this vigorous physical activity IN THE LAST WEEK?
   ______ hours / ______ minutes

PLEASE TURN THE PAGE
The next question excludes household chores or gardening or yardwork

7. IN THE LAST WEEK how many times did you do any other more moderate physical activity that you haven't already mentioned? (e.g. gentle swimming, social tennis, golf etc)
   ______ times

8. What do you estimate was the total time that you spent doing these activities IN THE LAST WEEK?
   ______ hours / ______ minutes

These final questions ask information about you and your family:

1. How old are you? ______ years

2. What is your relationship to the child? ________________

3. What is your highest level of schooling? (please tick one box)
   - never attended school
   - primary school
   - some high school
   - completed high school
   - technical or trade school certificate/apprenticeship
   - university or tertiary qualification

4. Which one of the following best describes your employment status? (please tick one box)
   - employed full time
   - employed part time
   - home-duties full time
   - student
   - retired
   - unemployed
   - other ________________

5. What is your current marital status? (please tick one box)
   - married
   - defacto/living together
   - separated
   - divorced
   - widowed
   - never married

6. How many children do you have? ________________

Thank you again for your participation – please place this questionnaire in the envelope provided.
APPENDIX 11:

STUDY 2 ADOLESCENT INTERVIEW SCHEDULE
Thank you again for agreeing to participate in this interview – your participation is very valuable to this study. I’m Julie Saunders, and this study forms part of my PhD research, and this is [name of research assistant], who is going to observe the interview and take notes of anything I may miss. If it’s ok with you, I’d also like to tape record the interview so I can go back later to listen to answers to questions etc. Any identifying information such as your name will be stored separately to the tape and any transcripts. Are you happy for me to proceed?

If you don’t mind, I’d like ‘name of subject’ to answer each question first, then ‘name of sibling’ can have their say afterward. Does that sound ok?

I’d like to start off with some generic top of mind associations about physical activity. By physical activity I mean both structured activities (such as organised sport and games) and non-structured activities such as walking to school, free play and bike riding for fun. I’m going to start a sentence, and I’d like you to finish it with whatever pops into your mind first. For example, I may say, “Exercise is...”, and you may say “Something I don’t do very often” or “Something I love to do”. Does that make sense?

1. To me, sport is...
2. Physical activity makes me feel...
3. My friends think physical activity is...
4. My parents think physical activity is...

Thank you for that. Now I’m going to ask some questions about your feelings about physical activity and what your parents think about physical activity (subject to answer first, then sibling).

1. What do you like about physical activity?
2. What do you dislike about physical activity?
3. In what way do your parents help you to be physically active?
4. Who decides what physical activity you can do?
5. What sort of rules do your parents have about what you can do after school and on weekends?
6. Are there any things that your parents do that stop you from being physically active?
7. How could your parents make it easier for you to be active?
8. How does having a brother/sister affect your participation in physical activity? (Prompt: in what way?)
9. How has your physical activity changed as you have got older? (If so, why?)
10. Has the way your parents support your physical activity changed as you get older? (If so, how? Have their rules about physical activity changed?)
Thanks very much for that. I would now like to ask you a few questions that have been developed to identify what sort of interactions kids have with their parents. Please indicate how often the following statements apply to you and your parents by pointing to the correct option on this card (options are ‘never’, ‘rarely’, ‘sometimes’, ‘often’, ‘always’).

11. My parents make decisions in consultation with me.
12. My parents encourage me to tell them what I am thinking and feeling.
13. My parents become annoyed and impatient if I disobey them.
14. My parents make clear rules for me to follow.
15. My parents ignore my misbehaviour.
16. I can talk my parents out of things.
17. My parents give me reasons for their directions.
18. My parents confront me when I do not do as they say.

Thank you very much – we’re almost finished now. One last question - I’d just like to get an indication of how much physical activity you do. (question asked of girl, then sibling if present)

1. On how many of the past 7 days did you participate in sport, physical activity, or active play for a total of at least 60 minutes per day? This includes netball, basketball, football, swimming, dancing or gymnastics, tennis, walking or riding to school, skipping, or rollerblading.

Ok, we’re pretty much done now. Is there anything else you’d like to add before we finish? Thank you again for making the time to speak with me, it is much appreciated.
APPENDIX 12:

STUDY 3 PLAIN LANGUAGE STATEMENTS
Dear Principal,

We are currently recruiting female students in years 8, 9 and 10 and their parents to participate in a research project which aims to investigate parental influences on girls’ physical activity. This study aims to assess measures of strategies parents employ to support their daughters’ physical activity, as well as girls’ perceptions of these strategies. We are hoping to recruit girls who are active and those who are inactive.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and the School of Population Health at the University of Western Australia, and include Assistant Professor Julie Saunders, Professor Jo Salmon and Dr Anna Timperio. Our team has a strong track record in research into the health behaviours of young people, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders, an Assistant Professor in the School of Population Health at the University of Western Australia.

We are seeking your consent to recruit participants through your school. Families who consent to participate will be asked to complete an online questionnaire. The questionnaire will involve some brief questions about physical activity participation and ways in which their daughter is supported to be physically active. The questionnaire will take approximately 10 minutes to complete and will be completed after school hours in the home. To compensate for their time donated to this important research, each participating adolescent will go into the draw to receive one of 10 $50 iTunes vouchers and each participating parent will receive a tea or coffee bag.

Please be assured that all information provided by participants will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at the University of Western Australia in a locked filing cabinet, and will be retained for at least five years after the study finishes. The information gathered during this study may be published in scientific literature or presented at
conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual or school.

This is an important research study, however your school is under no obligation to participate, and if you consent to do so you are free to withdraw at any time, and any information provided by your school will be destroyed. If you wish, you will be provided with a summary of the overall results. As compensation for your participation, Assistant Professor Julie Saunders would be willing to give a talk at your school assembly or similar on physical activity or population health.

If you consent for your school to participate in this study, please sign and return the attached consent form via email.

If you have any questions about this study, please feel free to contact Julie Saunders (0438 058 537) or Professor Jo Salmon (03 9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Julie Saunders
Assistant Professor
School of Population Health
University of Western Australia
Ph: 6488 1305
E: julie.saunders@uwa.edu.au

Complaints
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 03 9251 7129, Facsimile: 03 9244 6581; research-ethics@deakin.edu.au

Please quote project number: HEAG-H 148_2011
PLAIN LANGUAGE STATEMENT

To: The Parent/Guardian

Date: October 2012

Full Project Title: Parental facilitation of adolescent girls’ physical activity

Principal Researcher: Professor Jo Salmon

Student Researcher: Ms Julie Saunders

Associate Researcher(s): Dr Anna Timperio

Dear Parent/Guardian,

Your school Principal has approved the recruitment of female students and their parents to participate in a research project which aims to investigate parental influences on girls’ physical activity. This study aims to assess measures of strategies parents employ to support their daughters’ physical activity, as well as girls’ perceptions of these strategies. We are hoping to recruit girls who are active and those who are inactive.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and the School of Population Health at the University of Western Australia, and include Ms Julie Saunders, Professor Jo Salmon and Dr Anna Timperio. Our team has a strong track record in research into the health behaviours of young people, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders, who is also an Assistant Professor in the School of Population Health at the University of Western Australia.

Your family, including yourself and your daughter, plus other carers, are invited to participate in this research project. Participation involves completing an online questionnaire. The questionnaire will involve some brief questions about physical activity participation and ways in which girls are supported to be physically active and will take approximately 10 minutes to complete.

Please be assured that all information provided by you and members of your family will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at the University of Western Australia in a locked filing cabinet, and will be retained for at least five years after the study finishes. The information gathered during this study may be published in scientific literature or presented at conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual or school.

This is an important research study, however you are under no obligation to participate, and if you consent to do so you are free to withdraw at any time, and any information
provided by you will be destroyed. If you wish, you will be provided with a summary of the overall results.

If you consent to participate in this study, please sign and return the attached consent form (along with your daughter’s signed consent form) in the enclosed reply-paid envelope. To compensate for the time donated to this important research, each adolescent participant will go into the draw to receive one of 10 $50 iTunes vouchers.

If you have any questions about this study, please feel free to contact Julie Saunders (0438 058 537) or Professor Jo Salmon (03 9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Ms Julie Saunders
Assistant Professor
School of Population Health
University of Western Australia
Ph: 6488 1305
E: julie.saunders@uwa.edu.au

Complaints
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Research Integrity, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au

Please quote project number: HEAG-H 148_2011
PLAIN LANGUAGE STATEMENT

To: The Student

Date: October 2012

Full Project Title: Parental facilitation of adolescent girls’ physical activity

Principal Researcher: Professor Jo Salmon

Student Researcher: Ms Julie Saunders

Associate Researcher(s): Dr Anna Timperio

Dear Student,

Your school Principal has agreed to help recruit female students and their parents to participate in a research project which aims to investigate parental influences on girls’ physical activity. This study aims to assess measures of strategies parents employ to support their daughters’ physical activity, as well as girls’ perceptions of these strategies. We are hoping to recruit girls who are active and those who are inactive.

The research team are from the Centre for Physical Activity and Nutrition Research, at Deakin University in Melbourne, and the School of Population Health at the University of Western Australia, and include Ms Julie Saunders, Professor Jo Salmon and Dr Anna Timperio. Our team has a strong track record in research into the health behaviours of young people, particularly in physical activity. This study forms part of the PhD studies of Julie Saunders, who is also an Assistant Professor in the School of Population Health at the University of Western Australia.

Your family, including yourself and your parent/s, are invited to participate in this research project. Participation involves completing an online questionnaire. The questionnaire will involve some brief questions about physical activity participation and ways in which girls are supported to be physically active and will take approximately 10 minutes to complete.

Please be assured that all information provided by you and members of your family will remain strictly confidential. All identifying information, such as names and addresses, will be kept separately from the written copy of results, and will be identified only by a number. All information will be stored at the University of Western Australia in a locked filing cabinet, and will be retained for at least five years after the study finishes. The information gathered during this study may be published in scientific literature or presented at conferences. Only summary information will be presented however, with no information included that would allow the identification of any individual or school.

This is an important research study, however you are under no obligation to participate, and if you consent to do so you are free to withdraw at any time, and any information
provided by you will be destroyed. If you wish, you will be provided with a summary of the overall results.

**If you consent to participate in this study, please sign and return the attached consent form (along with your parents’ signed consent form) in the enclosed reply-paid envelope. To compensate for your time donated to this important research, you will go into the draw to receive one of 10 $50 iTunes vouchers.**

If you have any questions about this study, please feel free to contact Julie Saunders (0438 058 537) or Professor Jo Salmon (03 9251 7254) between 9am and 5pm weekdays.

Yours sincerely

Ms Julie Saunders  
Assistant Professor  
School of Population Health  
University of Western Australia  
Ph: 6488 1305  
E: julie.saunders@uwa.edu.au

**Complaints**  
If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Manager, Research Integrity, Deakin University, 221 Burwood Highway, Burwood  
Victoria 3125, Telephone: 9251 7129, Facsimile: 9244 6581; research-ethics@deakin.edu.au

Please quote project number: HEAG-H 148_2011
APPENDIX 13:

STUDY 3 CONSENT FORMS
CONSENT FORM

TO: The Principal

Date: July 2012
Full Project Title: Parental facilitation of adolescent girls' physical activity
Reference Number: HEAG-H 148_2011/RA/4/1/5178

I have read and I understand the attached Plain Language Statement.
I give my permission for ...........................................................(name of school) to participate in this project according to the conditions in the Plain Language Statement.
I have been given a copy of Plain Language Statement and Consent Form to keep.
The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Principal’s Name (printed) ..........................................................
Name of School (printed) ..........................................................
Contact person for future correspondence ...........................................

Signature .......................................................... Date ..........................

Please return via email to: julie.saunders@uwa.edu.au OR via mail to: Assistant Professor Julie Saunders, The University of Western Australia, School of Population Health, M431, 35 Stirling Highway, Crawley, WA, 6009
CONSENT FORM

To: The Parent/Guardian
Date: October 2012
Full Project Title: Parental facilitation of adolescent girls' physical activity
Reference Number: HEAG-H 148_2011/RA/4/1/5178

I have read, and I understand the attached Plain Language Statement.
I freely agree to participate in this project according to the conditions in the Plain Language Statement.
I have been given a copy of the Plain Language Statement and Consent Form to keep.
The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Participant’s Name (printed) ...........................................................................................................

Email address (printed) ..................................................................................................................

Phone number (printed) ..................................................................................................................

Signature ................................................................. Date ..........................................

Please return in the reply-paid envelope to: Assistant Professor Julie Saunders,
The University of Western Australia, School of Population Health, M431, 35 Stirling Highway, Crawley, WA, 6009
CONSENT FORM

To: The Student
Date: October 2012

Full Project Title: Parental facilitation of adolescent girls' physical activity
Reference Number: HEAG-H 148_2011/RA/4/1/5178

I have read, and I understand the attached Plain Language Statement.

I freely agree to participate in this project according to the conditions in the Plain Language Statement.

I have been given a copy of the Plain Language Statement and Consent Form to keep.

The researcher has agreed not to reveal my identity and personal details, including where information about this project is published, or presented in any public form.

Participant’s Name (printed) ..............................................................................................................................................

Email address (printed) ...........................................................................................................................................................

Phone number (printed) ...........................................................................................................................................................

Signature .......................................................... Date ..........................................................

Please return in the reply-paid envelope to: Assistant Professor Julie Saunders,
The University of Western Australia, School of Population Health, M431, 35 Stirling Highway, Crawley, WA, 6009
APPENDIX 14:

STUDY 3 PARENT QUESTIONNAIRE (HARD COPY VERSION OF ONLINE QUESTIONNAIRE)
Parent Questionnaire

Thank you very much for agreeing to complete this questionnaire – the information you provide will be very helpful. There are three main sets of questions in this questionnaire – the first asks about your own physical activity, the second asks about what you do to help your daughter be physically active, and the third asks about you. It should take you about 10-15 minutes to complete the questionnaire. If you have any problems answering any of the questions, please contact me by email on julie.saunders@uwa.edu.au

Thank you again for your assistance 😊

Section 1

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

☐ Yes

☐ No ➔ Skip to PART 2: TRANSPORTATION

The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

______ days per week

☐ No vigorous job-related physical activity ➔ Skip to question 4
3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

___ hours per day
___ minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads as part of your work? Please do not include walking.

___ days per week

☐ No moderate job-related physical activity ⟹ **Skip to question 6**

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

___ hours per day
___ minutes per day

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work.

___ days per week

☐ No job-related walking ⟹ **Skip to PART 2: TRANSPORTATION**

7. How much time did you usually spend on one of those days **walking** as part of your work?

___ hours per day
___ minutes per day

---

**PART 2: TRANSPORTATION PHYSICAL ACTIVITY**

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

___ days per week

☐ No traveling in a motor vehicle ⟹ **Skip to question 10**

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

___ hours per day
___ minutes per day

300
Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the last 7 days, on how many days did you **bicycle** for at least 10 minutes at a time to go from place to place?

    ____ days per week

    [ ] No bicycling from place to place  ➞  **Skip to question 12**

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

    ____ hours per day
    ____ minutes per day

12. During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time to go from place to place?

    ____ days per week

    [ ] No walking from place to place  ➞  **Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY**

13. How much time did you usually spend on one of those days **walking** from place to place?

    ____ hours per day
    ____ minutes per day

**PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY**

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, or digging **in the garden or yard**?

    ____ days per week

    [ ] No vigorous activity in garden or yard  ➞  **Skip to question 16**
15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

   _____ hours per day
   _____ minutes per day

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard?

   _____ days per week
   [ ] No moderate activity in garden or yard
   → **Skip to question 18**

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

   _____ hours per day
   _____ minutes per day

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home?

   _____ days per week
   [ ] No moderate activity inside home
   → **Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY**

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

   _____ hours per day
   _____ minutes per day

**PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY**

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time in your leisure time?

   _____ days per week
   [ ] No walking in leisure time
   → **Skip to question 22**
21. How much time did you usually spend on one of those days **walking** in your leisure time?

   _____ hours per day
   _____ minutes per day

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

   _____ days per week
   
   [ ] No vigorous activity in leisure time  
   [ ] Skip to question 24

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

   _____ hours per day
   _____ minutes per day

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

   _____ days per week
   
   [ ] No moderate activity in leisure time  
   [ ] Skip to PART 5: TIME SPENT SITTING

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

   _____ hours per day
   _____ minutes per day
Section 2

The following questions relate to what you do to help your daughter be physically active. In these questions, physical activity relates to organised activities such as sport, and also unorganised activities such as walking the dog and jumping on the trampoline. Please indicate how frequently, if ever, you do the following things in relation to your daughter’s physical activity (to be answered on a scale of ‘never’, ‘rarely’, ‘sometimes’, ‘often’, ‘always’). Please mark the ‘N/A’ box if the question is not applicable.

<table>
<thead>
<tr>
<th></th>
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<th>A</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>I suggest physical activities my daughter might enjoy</td>
<td></td>
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<tr>
<td>I provide transport to help my daughter get to and from physical activities</td>
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<tr>
<td>I encouraged my daughter to be physically active when she was really young</td>
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<tr>
<td>My daughter sees me being physically active myself</td>
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<tr>
<td>I make sure my daughter eats healthy food after being physically active</td>
<td></td>
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<tr>
<td>I make sure my daughter drinks plenty of water during physical activity</td>
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<tr>
<td>I help my daughter improve her physical activity skills</td>
<td></td>
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<tr>
<td>I help out at my daughter’s physical activity by doing things such as scoring, coaching, timing</td>
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<tr>
<td>I pay for my daughter’s physical activity fees and uniform</td>
<td></td>
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</tr>
<tr>
<td>I make my daughter do physical activity when she doesn’t really want to</td>
<td></td>
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</tr>
<tr>
<td>I participate in physical activity with my daughter</td>
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<tr>
<td>I talk to my daughter about the health benefits of physical activity</td>
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<tr>
<td>I talk to my daughter about the social benefits of physical activity</td>
<td></td>
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<tr>
<td>I make sure my daughter gets enough rest after she’s been physically active</td>
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</tr>
<tr>
<td>I let my daughter try lots of physical activities to see which ones she enjoys</td>
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<tr>
<td>I think physical activity is important for our whole family</td>
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<tr>
<td>I have to nag my daughter to do physical activity</td>
<td></td>
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</tr>
<tr>
<td>I provide equipment for my daughter to be physically active at home</td>
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<tr>
<td>I watch my daughter participate in physical activity</td>
<td></td>
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<tr>
<td>I encourage my daughter to go outside</td>
<td></td>
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</tr>
<tr>
<td>I insist my daughter participates in physical activity</td>
<td></td>
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<tr>
<td>I complain about my daughter being physically active</td>
<td></td>
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<tr>
<td>I enforce strict rules around my daughter’s physical activity</td>
<td></td>
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<tr>
<td>I encourage my daughter to do her best at physical activity</td>
<td></td>
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</tr>
<tr>
<td>I don’t really mind if my daughter doesn’t do any physical activity</td>
<td></td>
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<tr>
<td>I don’t really care what physical activity my daughter does</td>
<td></td>
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</tr>
<tr>
<td>I get frustrated if my daughter doesn’t do any physical activity</td>
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<tr>
<td>I expect my daughter to do well at physical activity</td>
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<tr>
<td>I don’t encourage my daughter to do any physical activity</td>
<td></td>
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</tr>
<tr>
<td>I let my daughter do whatever she wants in regard to physical activity</td>
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</tbody>
</table>

**Section 3**

These final questions ask information about you and your family:

1. How old are you? _______ years

2. What relation are you to the child involved in this study?

- mother
- female carer
- father
- male carer
- grandparent
- guardian
- other _______
3. What is your highest level of schooling? (please tick one box)
   - never attended school
   - primary school
   - some high school
   - completed high school
   - technical or trade school certificate/apprenticeship
   - university or tertiary qualification

4. Which one of the following best describes your employment status? (please tick one box)
   - employed full time
   - employed part time
   - home-duties full time
   - student
   - retired
   - unemployed
   - other __________

5. What is your current marital status? (please tick one box)
   - married
   - defacto/living together
   - separated
   - divorced
   - widowed
   - never married

6. How many children do you have? __________

7. What is the postcode of your home address?

This is the end of the questionnaire – thank you again for your help 😊
APPENDIX 15:

STUDY 3 DAUGHTER QUESTIONNAIRE (HARD COPY VERSION OF ONLINE QUESTIONNAIRE)
Student Questionnaire

Thank you very much for agreeing to complete this questionnaire – the information you provide will be very helpful. There are three main sets of questions – the first asks about how much physical activity you do, the second asks about what your mum and dad do to help you be physically active, and the third asks about you. It should take you about 15 minutes to complete the questionnaire. If you have any problems answering any of the questions, please contact me by email on julie.saunders@uwa.edu.au

Thank you again for your assistance 😊

Section 1 – YOUR PHYSICAL ACTIVITY

The following questions are about all the walking, vigorous and moderate physical activities that you did for at least 10 uninterrupted minutes in the last 7 days.

Please do not include those activities that took less than 10 minutes per occasion. By the last 7 days we mean 5 school days and 2 weekend days.

The questions are divided into four groups and ask questions about

- physical activities you did during school time,
- physical activities you did in and around your home like housework and gardening
- physical activities you did to get to and from places,
- physical activities you did during leisure time (physical activities during play, sports, dancing, exercises and competition).

Part 1: SCHOOL-RELATED PHYSICAL ACTIVITY

Part 1 is about the physical activities that you have been doing the last 7 days during school hours (during the lessons and during breaks). Transportation to and from school are NOT included.

A. During physical activity classes

| How many lessons (school hours) of physical education did you have during the last seven days? |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| ô none                          | ô 1 lesson                       | ô 2 lessons                     | ô 3 lessons                     | ô 4 lessons                     | ô other, namely .... lessons     |
How much time did you spend in **TOTAL** during these physical education lessons on **physical activities** such as sport, running, playing, dancing etc? Add the total for the whole week, but count only the occasions that you were active for at least 10 uninterrupted minutes.

___ hours ___ minutes physical activity during the last 7 days

---

**B. During breaks**

During the last 7 days, on how many days did you do the following, during **breaks** at school, **for at least 10 uninterrupted minutes**....

Don’t include activities that took less than 10 uninterrupted minutes.

---

**... WALK**

<table>
<thead>
<tr>
<th>none</th>
<th>1 day</th>
<th>2 days</th>
<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
</tr>
</thead>
</table>

How much time did you usually spend during breaks at school on **one** of those days **walking**?

___ hours ___ minutes per day

---

**... VIGOROUS physical activity, that involves hard physical effort and makes you breathe much harder than normal**, like running...

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<thead>
<tr>
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<th>1 day</th>
<th>2 days</th>
<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
</tr>
</thead>
</table>

How much time did you usually spend during breaks at school on **one** of those days **doing vigorous physical activities**?

___ hours ___ minutes per day

---

**... MODERATE physical activity, that involves moderate physical effort and makes you breathe somewhat harder than normal**, like dancing, ...

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<th>1 day</th>
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<th>4 days</th>
<th>5 days</th>
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</table>

How much time did you usually spend during breaks at school on **one** of those days **doing moderate physical activities**?

___ hours ___ minutes per day
Part 2: HOUSEWORK AND GARDENING

This second part is about physical activity that you might have been doing during the last 7 days in and around the house.

During the last 7 days, on how many days did you do, for at least 10 uninterrupted minutes, physical activities in the garden or in home that took at least moderate physical effort and made you breathe somewhat or much harder than normal like carrying heavy loads, scrubbing floors, sweeping... Don’t include activities that took less than 10 uninterrupted minutes.

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<tr>
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<th>1 day</th>
<th>2 days</th>
<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
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</thead>
</table>

How much time did you usually spend on those activities in the home and yard on one of those days?

___ hours ___ minutes per day

Part 3: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like school, shops, movies, and so on during the last 7 days.

During the last 7 days, on how many days did you travel for at least 10 uninterrupted minutes ... Don’t include activities that took less than 10 uninterrupted minutes.

... in a motor vehicle like a train, bus or car?

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<tr>
<th>none</th>
<th>1 day</th>
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<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
</tr>
</thead>
</table>

How much time did you usually spend on one of those days travelling by motor vehicle?

___ hours ___ minutes per day
... on a bicycle?

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<th>1 day</th>
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<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
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</thead>
</table>

How much time did you usually spend on one of those days bicycling from place to place?

__hours __minutes per day

... by walking?

<table>
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<tr>
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<th>1 day</th>
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<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
</tr>
</thead>
</table>

How much time did you usually spend on one of those days walking from place to place?

__hours __minutes per day

Part 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned!!!

During the last 7 days on how many days did you do one of the following for at least 10 uninterrupted minutes in your leisure time? Don’t include activities that took less than 10 uninterrupted minutes!

... walk

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<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
</tr>
</thead>
</table>

How much time did you usually spend on one of those days walking in your leisure time?

__hours __minutes per day
... vigorous physical activities, that involve hard physical effort and make you breathe much harder than normal, like aerobics, running, fast bicycling, or fast swimming ...

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<tr>
<th>none</th>
<th>1 day</th>
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<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
</tr>
</thead>
</table>

How much time did you usually spend on one of those days on vigorous physical activity in your leisure time?

___ hours ___ minutes per day

... moderate physical activities, that involve moderate physical effort and make you breathe somewhat harder than normal, like dancing, swimming at a regular pace, and doubles tennis ...

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<tr>
<th>none</th>
<th>1 day</th>
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<th>3 days</th>
<th>4 days</th>
<th>5 days</th>
<th>6 days</th>
<th>7 days</th>
</tr>
</thead>
</table>

How much time did you usually spend on one of those days on moderate physical activity in your leisure time?

___ hours ___ minutes per day

How much do you agree or disagree with the following statements? (Please circle one answer per statement)

<table>
<thead>
<tr>
<th>I do a lot of physical activity</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>I look funny when I am physically active</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly disagree</td>
<td>Don't know</td>
</tr>
<tr>
<td>I don't have enough time for physical activity</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly disagree</td>
<td>Don't know</td>
</tr>
<tr>
<td>I prefer to watch TV or play electronic games</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly disagree</td>
<td>Don't know</td>
</tr>
<tr>
<td>I don't have anyone to be physically active with</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly disagree</td>
<td>Don't know</td>
</tr>
<tr>
<td>I don't like physical activity</td>
<td>Strongly agree</td>
<td>Agree</td>
<td>Neither</td>
<td>Disagree</td>
<td>Strongly disagree</td>
<td>Don't know</td>
</tr>
</tbody>
</table>
Other kids make fun of me when I am physically active

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I don't think I am very good at physical activity

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I have a health problem that prevents me from being physically active

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I have an injury that prevents me from being physically active

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I am scared that I might get hurt if I played sport (eg. football, netball)

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I don't have the proper clothing or shoes to play sport

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

I don't like how being active physically makes me feel (eg. hot, sweaty, out of breath)

<table>
<thead>
<tr>
<th>Strongly agree 1</th>
<th>Agree 2</th>
<th>Neither 3</th>
<th>Disagree 4</th>
<th>Strongly disagree 5</th>
<th>Don't know 6</th>
</tr>
</thead>
</table>

How confident (sure) are you that you could be active in the following situations? (Please circle one answer for each statement)

I could be active even......

If others make fun of me

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If there is no-one to be active with

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If I don't have the energy to be active

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If I am not good at it

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If I had no one to take me to training

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If my friends don't take part

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If the weather is bad

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If I had a lot of homework to do

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>

If I were busy going out with my friends

<table>
<thead>
<tr>
<th>Not at all sure 1</th>
<th>A bit sure 2</th>
<th>Fairly sure 3</th>
<th>Quite sure 4</th>
<th>Very sure 5</th>
</tr>
</thead>
</table>
How much do you agree or disagree with the following statements? (Please circle one answer for each statement)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither</th>
<th>Disagree</th>
<th>Strongly disagree</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most of my friends don’t do a lot of physical activity or sport</td>
<td></td>
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<tr>
<td>Most of my friends prefer to watch TV or play electronic or computer games than be active</td>
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<tr>
<td>Most of my friends discourage me from being physically active</td>
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<tr>
<td>Most of my friends don’t like physical activity or sport</td>
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<tr>
<td>Most of my friends aren’t sporty types</td>
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<tr>
<td>Most of my friends are too shy or embarrassed to be physically active</td>
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<tr>
<td>Most of my friends are too lazy to be physically active</td>
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<tr>
<td>Most of my friends encourage me to be physically active</td>
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</table>

Section 2 —PARENTAL SUPPORT FOR PHYSICAL ACTIVITY

The following questions relate to what your parents do to help you be physically active. In these questions, physical activity relates to organised activities such as sport, and also unorganised activities such as walking the dog and jumping on the trampoline. Please indicate how frequently, if ever, your Mum and your Dad do the following things in relation to your physical activity (to be answered on a scale of ‘never’, ‘rarely’, ‘sometimes’, ‘often’, ‘always’). Please mark the ‘N/A’ box if the question is not applicable.

Questions to be answered separately for mum and dad eg:

<table>
<thead>
<tr>
<th></th>
<th>Mum</th>
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<tr>
<td></td>
<td>N</td>
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<td>S</td>
<td>O</td>
<td>A</td>
<td>N/A</td>
<td>N</td>
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<tr>
<td>My mum/dad suggests physical activities I might enjoy</td>
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<tr>
<td>My mum/dad provides transport to help me to get to physical activities</td>
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<tr>
<td>Mum</td>
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<td><strong>N</strong> <strong>R</strong> <strong>S</strong> <strong>O</strong> <strong>A</strong> <strong>N/A</strong></td>
<td><strong>N</strong> <strong>R</strong> <strong>S</strong> <strong>O</strong> <strong>A</strong> <strong>N/A</strong></td>
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<tr>
<td>My mum/dad encouraged me to be physically active when I was really young</td>
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<tr>
<td>I see my mum/dad being physically active</td>
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<tr>
<td>My mum/dad makes sure I eat healthy foods after I have been physically active</td>
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<td>My mum/dad makes sure I drink lots of water during physical activity</td>
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<tr>
<td>My mum/dad tries to help me improve my physical activity skills</td>
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<tr>
<td>My mum/dad helps out at my physical activity by doing things such as scoring, coaching, timing</td>
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<tr>
<td>My mum/dad pays for my physical activity fees and uniform</td>
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<tr>
<td>My mum/dad makes me do physical activity when I don’t really want to</td>
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<tr>
<td>My mum/dad participates in physical activities with me</td>
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<tr>
<td>My mum/dad talks to me about why physical activity is good for my health</td>
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<tr>
<td>My mum/dad talks to me about the social aspects of physical activity</td>
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<td>My mum/dad makes sure I get enough rest after I do physical activity</td>
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<tr>
<td>My mum/dad lets me try lots of physical activities to see which ones I enjoy</td>
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<td>My mum/dad thinks physical activity is important for our whole family</td>
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<tr>
<td>My mum/dad nags me to do physical activity</td>
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<tr>
<td>My mum/dad provides equipment for me to be physically active at home</td>
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<tr>
<td>My mum/dad watches me participate in physical activity</td>
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<td>Mum</td>
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<td>N/A</td>
<td>N</td>
<td>R</td>
</tr>
<tr>
<td>My mum/dad encourages me to go outside</td>
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<tr>
<td>My mum/dad insists that I do physical activity</td>
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<tr>
<td>My mum/dad complains about me being physically active</td>
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<tr>
<td>My mum/dad has really strict rules around physical activity</td>
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<tr>
<td>My mum/dad encourages me to do my best at physical activity</td>
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<tr>
<td>My mum/dad doesn’t really mind if I don’t do any physical activity</td>
<td></td>
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<tr>
<td>My mum/dad doesn’t really care what physical activity I do</td>
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<tr>
<td>My mum/dad gets frustrated if I don’t do any physical activity</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>My mum/dad expects me to do well at physical activity</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>My mum/dad doesn’t encourage me to do any physical activity</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>My mum/dad lets me do whatever I want in regard to physical activity</td>
<td></td>
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</tr>
</tbody>
</table>

**Section 3 – QUESTIONS ABOUT YOU**

1. What is your date of birth? DD/MM/YYYY

2. What is the postcode of your home address?

3. What school do you go to?

Please turn the page – you’re nearly finished! 😊
4. Please place a tick next to all the adults who live with you at home:
   Mother
   Father
   Stepmother (or father’s girlfriend)
   Stepfather (or mother’s boyfriend)
   Grandmother
   Grandfather
   I live in a foster home or children’s home
   With someone or somewhere else: Please write it down:

   ________________________________

5. Please write down how many children live in your home (including half, step or foster brothers/sisters). Please write 0 if there are none
   a. Number of brothers? ______________
   b. Number of sisters? ______________

6. Do you stay in this home...... (Please tick one)
   All the time
   Most of the time
   Half the time

This is the end of the questionnaire – you will be entered into the draw to win one of ten $50 iTunes vouchers. Thank you again for your help 😊
APPENDIX 16:

TEST-RETEST RELIABILITY OF IPAQ-A INDIVIDUAL ITEMS
### A16.1 Test-retest reliability of IPAQ-A individual items

As described in Chapter 7, ICCs were determined for individual IPAQ-A frequency and duration items, as well as domain- and intensity-specific weekly totals. ICCs for individual items are presented in Table A16.1.

#### Table A16.1: Test-retest reliability of IPAQ-A individual items

<table>
<thead>
<tr>
<th>IPAQ-A individual item</th>
<th>ICC</th>
<th>IPAQ-A individual item</th>
<th>ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td>School physical education</td>
<td></td>
<td>Cycling for transport</td>
<td></td>
</tr>
<tr>
<td># of days</td>
<td>0.80</td>
<td># of days</td>
<td>0.85</td>
</tr>
<tr>
<td>duration</td>
<td>0.00</td>
<td>duration</td>
<td>0.46</td>
</tr>
<tr>
<td>School walking during breaks</td>
<td></td>
<td>Walking for transport</td>
<td></td>
</tr>
<tr>
<td># of days</td>
<td>0.46</td>
<td># of days</td>
<td>0.51</td>
</tr>
<tr>
<td>duration</td>
<td>0.00</td>
<td>duration</td>
<td>0.03</td>
</tr>
<tr>
<td>School vigorous PA during breaks</td>
<td></td>
<td>Leisure-time walking</td>
<td></td>
</tr>
<tr>
<td># of days</td>
<td>0.61</td>
<td># of days</td>
<td>0.48</td>
</tr>
<tr>
<td>duration</td>
<td>0.59</td>
<td># of hours</td>
<td>0.56</td>
</tr>
<tr>
<td># of minutes</td>
<td></td>
<td># of minutes</td>
<td></td>
</tr>
<tr>
<td>School moderate PA during breaks</td>
<td></td>
<td>Leisure-time vigorous PA</td>
<td></td>
</tr>
<tr>
<td># of days</td>
<td>0.42</td>
<td># of days</td>
<td>0.60</td>
</tr>
<tr>
<td>duration</td>
<td>0.07</td>
<td>duration</td>
<td>0.16</td>
</tr>
<tr>
<td>Household MVPA</td>
<td></td>
<td>Leisure-time moderate PA</td>
<td></td>
</tr>
<tr>
<td># of days</td>
<td>0.37</td>
<td># of days</td>
<td>0.44</td>
</tr>
<tr>
<td>duration</td>
<td>0.00</td>
<td>duration</td>
<td>0.28</td>
</tr>
</tbody>
</table>

# number
APPENDIX 17:

ADDITIONAL ASSOCIATIONS BETWEEN PARENTING AND PHYSICAL ACTIVITY
A17.1 Additional associations between parenting and physical activity

In Study 3: Associations between measures of physical activity-specific parenting styles and practices and physical activity among adolescent girls, numerous univariable and multivariable associations between parenting and physical activity were observed. Multivariable associations have previously been described in Chapter 7, while back-transformed univariable associations are described below. Back-transformed data for significant univariable and multivariable associations are presented in Tables A17.1 and A17.2.

Daughters’ reports of their mother’s physical activity parenting

For daughters’ reports of their mother’s parenting, in univariable analyses, ‘developing healthy physical activity habits’ was significantly positively associated with leisure-time physical activity (LTPA), moderate-intensity physical activity (MPA), vigorous-intensity physical activity (VPA) and total MVPA. Each unit increase in the ‘developing healthy physical activity habits’ scale was associated with 53% greater LTPA (1.53; 95% CI 1.27-1.84), 16% greater MPA (1.16; 95% CI 1.06-1.27), 86% greater VPA (1.86; 95% CI 1.46-2.38) and 21% greater MVPA (1.21; 95% CI 1.12-1.31).

Similarly, mothers’ provision of ‘logistic support’ was positively associated with LTPA, MPA, VPA and MVPA. Each unit increase in ‘logistic support’ resulted in 64% greater LTPA (1.64; 95% CI 1.36-1.97), 13% greater MPA (1.13; 95% CI 1.03-1.24), 65% greater VPA (1.65; 95% CI 1.29-2.12) and 16% greater MVPA (1.16; 95% CI 1.07-1.25).

Daughters’ reports of their mother’s ‘forcing physical activity’ participation was positively associated with VPA and MVPA, with each unit increase resulting in 35% and 10% greater VPA (1.35; 95% CI 1.08-1.68) and MVPA (1.10; 95% CI 1.03-1.18) respectively.
Mothers’ ‘modelling of physical activity and co-participation’ was significantly positively associated with VPA, with each unit increase in modelling resulting in 23% greater VPA (1.23; 95% CI 1.01-1.52).

Finally, girls’ perceptions of their mother’s ‘expectations regarding physical activity’ were significantly positively associated with school physical activity, LTPA, MPA, VPA and MVPA. Each unit increase in ‘physical activity expectations’ resulted in 13% greater school physical activity (1.13; 95% CI 1.01-1.27), 27% greater LTPA (1.27; 95% CI 1.02-1.57), 17% greater MPA (1.17; 95% CI 1.06-1.30), 62% greater VPA (1.62; 95% CI 1.22-2.16) and 18% greater MVPA (1.18; 95% CI 1.08-1.29).

**Daughters’ reports of their father’s physical activity parenting**

In univariable analyses for daughters’ reports of their father’s parenting, ‘developing healthy physical activity habits’ was significantly positively associated with LTPA, MPA, VPA and MVPA. Each unit increase in the ‘developing healthy physical activity habits’ scale was associated with 59% greater LTPA (1.59; 95% CI 1.32-1.91), 16% greater MPA (1.16; 95% CI 1.06-1.26), 91% greater VPA (1.91; 95% CI 1.50-2.43) and 20% greater MVPA (1.20; 95% CI 1.11-1.29).

Fathers’ provision of ‘logistic support’ was significantly positively associated with LTPA, MPA, VPA and MVPA. Each unit increase in provision of ‘logistic support’ was associated with 82%, 17%, 111%, and 23% greater LTPA (1.82; 95% CI 1.50-2.20), MPA (1.17; 95% CI 1.07-1.29), VPA (2.11; 95% CI 1.63-2.73) and MVPA (1.23; 95% CI 1.14-1.33) respectively.

‘Forcing physical activity’ participation was positively associated with walking, VPA and MVPA, with each unit increase in this scale resulting in 18% greater walking (1.18; 95% CI 1.00-1.38), 48% greater VPA (1.48; 95% CI 1.17-1.86) and 10% greater MVPA (1.10; 95% CI 1.02-1.18).
Daughters’ reports of their father’s physical activity ‘modelling and co-participation’ was positively associated with LTPA, MPA, VPA and MVPA. Each unit increase in modelling was associated with 42% greater LTPA (1.42; 95% CI 1.21-1.65), 15% greater MPA (1.15; 95% CI 1.07-1.23), 73% greater VPA (1.73; 95% CI 1.41-2.12) and 14% greater MVPA (1.14; 95% CI 1.07-1.22).

Finally, fathers’ ‘expectations regarding their daughter’s physical activity’ was positively associated with all physical activity outcome variables except walking and transport physical activity. Each unit increase in physical activity expectations was associated with 20% greater school physical activity (1.20; 95% CI 1.07-1.34), 45% greater home physical activity (1.45; 95% CI 1.07-1.97), 27% greater LTPA (1.27; 95% CI 1.02-1.59), 21% greater MPA (1.21; 95% CI 1.09-1.34), 42% greater VPA (1.42; 95% CI 1.05-1.92) and 20% greater MVPA (1.20; 95% CI 1.10-1.32).

*Parent self-report of physical activity parenting*

Fewer univariable associations between parents’ self-reported physical activity parenting and girls’ physical activity were observed. The ‘developing healthy physical activity habits’ scale was positively associated with MPA, VPA and MVPA. Each unit increase in this scale was associated with 17% greater MPA (1.17; 95% CI 1.03, 1.33), 64% greater VPA (1.64; 95% CI 1.16-1.33) and 21% greater MVPA (1.21; 95% CI 1.08-1.36). Provision of ‘logistic support’ was positively associated with LTPA, MPA, VPA and MVPA, with each unit increase resulting in 98% greater LTPA (1.98; 95% CI 1.60-2.44), 24% greater MPA (1.24; 95% CI 1.11-1.38), 119% greater VPA (2.19; 95% CI 1.63-2.95) and 23% greater MVPA (1.23; 95% CI 1.12-1.36).

‘Forcing physical activity participation’ was inversely associated with LTPA, with each unit increase in ‘forcing physical activity’ associated with 17% less LTPA (0.83: 95% CI 0.70-0.91), while ‘physical activity expectations’ were positively associated with MPA (1.18; 95% CI 1.04-1.33) and MVPA (1.14; 95% CI 1.02-1.28). Finally, ‘physical activity nurturing’ was positively associated with VPA, with each unit increase resulting in 44% greater VPA (1.44; 95% CI 1.02-2.02).
Table A17.1: Significant back-transformed univariable and multivariable associations between parenting practices and weekly physical activity within domains

<table>
<thead>
<tr>
<th>PA parenting scale</th>
<th>School PA</th>
<th>Home PA</th>
<th>Transport PA</th>
<th>LTPA</th>
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<tbody>
<tr>
<td></td>
<td>Estimate</td>
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<tr>
<td></td>
<td>(95% CI)</td>
<td>(95% CI)</td>
<td>(95% CI)</td>
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<td>Healthy PA habits</td>
<td>1.17*</td>
<td></td>
<td>1.53***</td>
<td>1.31*</td>
</tr>
<tr>
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<td>1.52**</td>
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<td>1.26*</td>
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<td></td>
<td>(0.83, 0.99)</td>
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<td>(1.00, 1.58)</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>PA expectations</td>
<td>1.13*</td>
<td>1.14*</td>
<td>1.27*</td>
<td>1.33*</td>
</tr>
<tr>
<td></td>
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<td>(1.02, 1.29)</td>
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<td>(1.06, 1.65)</td>
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<td><strong>Daughter/father</strong></td>
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<td></td>
<td>1.59***</td>
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<td>(1.32, 1.91)</td>
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<td>1.82***</td>
<td>1.66***</td>
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<td></td>
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<td>(1.50, 2.20)</td>
<td>(1.26, 2.20)</td>
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<td>Forcing participation</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Modelling</td>
<td>1.44*</td>
<td></td>
<td>1.42***</td>
<td></td>
</tr>
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<td></td>
<td>(1.07, 1.94)</td>
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<td>(1.21, 1.65)</td>
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<tr>
<td>PA expectations</td>
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<td>1.21**</td>
<td>1.45*</td>
<td>1.27*</td>
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<td>(1.08, 1.36)</td>
<td>(1.07, 1.97)</td>
<td>(1.02, 1.59)</td>
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<td>1.26*</td>
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<td></td>
<td></td>
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<td>(1.01, 1.58)</td>
</tr>
<tr>
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<td>School PA&lt;sup&gt;‡&lt;/sup&gt;</td>
<td>Home PA</td>
<td>Transport PA&lt;sup&gt;§&lt;/sup&gt;</td>
<td>LTPA&lt;sup&gt;§&lt;/sup&gt;</td>
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<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
<td>Estimate (95% CI)</td>
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<td><strong>Parent report</strong></td>
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<td>Healthy PA habits</td>
<td>1.80* (1.10, 2.95)</td>
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<tr>
<td>Logistic support</td>
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<td>1.98*** (1.60, 2.44)</td>
<td>2.33*** (1.79, 3.04)</td>
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<tr>
<td>Forcing participation</td>
<td>0.83* (0.70, 0.98)</td>
<td>.080* (0.66, 0.96)</td>
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</tr>
<tr>
<td>Modelling</td>
<td></td>
<td></td>
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<tr>
<td>Indulgent/neglectful</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>PA expectations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA nurturing</td>
<td></td>
<td></td>
<td></td>
<td>0.74* (0.56, 0.98)</td>
</tr>
</tbody>
</table>

Back transformed data presented in table; ‡controlling for parental education; §linear mixed models *p<0.05; **p<0.01; ***p<0.001: Simple linear regression models (univariable) and multivariable linear regression models.
Table A17.2: Significant back-transformed univariable and multivariable associations between parenting practices and weekly physical activity intensities

<table>
<thead>
<tr>
<th>PA parenting scale</th>
<th>Walking</th>
<th>Moderate PA</th>
<th>Vigorous PA</th>
<th>Total MVPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable</td>
<td>Univariable</td>
<td>Multivariable</td>
</tr>
<tr>
<td><strong>Healthy PA habits</strong></td>
<td>1.16** (1.06, 1.27)</td>
<td>1.17* (1.03, 1.34)</td>
<td>1.86*** (1.46, 2.38)</td>
<td>1.79** (1.23, 2.59)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>1.13** (1.03, 1.24)</td>
<td>1.65*** (1.29, 2.12)</td>
<td>1.10** (1.08, 1.68)</td>
<td>1.15* (1.01, 1.52)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>1.35** (1.08, 1.68)</td>
<td>1.10* (1.02, 1.18)</td>
<td>1.48** (1.17, 1.86)</td>
<td>1.10* (1.02, 1.18)</td>
</tr>
<tr>
<td>Modelling</td>
<td>1.23* (1.01, 1.52)</td>
<td>1.10* (1.02, 1.18)</td>
<td>1.48** (1.17, 1.86)</td>
<td>1.10* (1.02, 1.18)</td>
</tr>
<tr>
<td><strong>Indulgent/neglectful</strong></td>
<td>1.20* (1.01, 1.43)</td>
<td>1.19*** (1.06, 1.32)</td>
<td>1.60** (1.18, 2.15)</td>
<td>1.18*** (1.08, 1.29)</td>
</tr>
<tr>
<td><strong>PA expectations</strong></td>
<td>1.17*** (1.06, 1.30)</td>
<td>1.19*** (1.06, 1.32)</td>
<td>1.60** (1.18, 2.15)</td>
<td>1.18*** (1.08, 1.30)</td>
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</table>

<table>
<thead>
<tr>
<th><strong>Daughter/ father</strong></th>
<th>Walking</th>
<th>Moderate PA</th>
<th>Vigorous PA</th>
<th>Total MVPA</th>
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<tr>
<td></td>
<td>Univariable</td>
<td>Multivariable</td>
<td>Univariable</td>
<td>Multivariable</td>
</tr>
<tr>
<td><strong>Healthy PA habits</strong></td>
<td>1.16** (1.06, 1.26)</td>
<td>1.91*** (1.50, 2.43)</td>
<td>1.20*** (1.11, 1.29)</td>
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</tr>
<tr>
<td>Logistic support</td>
<td>1.17*** (1.07, 1.29)</td>
<td>2.11*** (1.63, 2.73)</td>
<td>1.54* (1.05, 2.26)</td>
<td>1.15* (1.03, 1.30)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>1.18* (1.00, 1.38)</td>
<td>1.48** (1.17, 1.86)</td>
<td>1.10* (1.02, 1.18)</td>
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<tr>
<td>Modelling</td>
<td>1.15*** (1.07, 1.23)</td>
<td>1.73*** (1.41, 2.12)</td>
<td>1.14*** (1.07, 1.22)</td>
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<tr>
<td><strong>Indulgent/neglectful</strong></td>
<td>1.21*** (1.09, 1.34)</td>
<td>1.20*** (1.08, 1.34)</td>
<td>1.42* (1.05, 1.92)</td>
<td>1.19*** (1.09, 1.31)</td>
</tr>
<tr>
<td>PA parenting scale</td>
<td>Walking Estimate (95% CI)</td>
<td>Moderate PA Estimate (95% CI)</td>
<td>Vigorous PA Estimate (95% CI)</td>
<td>Total MVPA Estimate (95% CI)</td>
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<td>Multivariable</td>
<td>Univariable</td>
<td>Multivariable</td>
</tr>
<tr>
<td>Healthy PA habits</td>
<td>1.49* (1.03, 2.16)</td>
<td>1.17* (1.03, 1.33)</td>
<td>1.64** (1.16, 1.33)</td>
<td>1.21** (1.08, 1.36)</td>
</tr>
<tr>
<td>Logistic support</td>
<td>1.24*** (1.11, 1.38)</td>
<td>1.24** (1.07, 1.43)</td>
<td>2.19*** (1.63, 2.95)</td>
<td>1.23*** (1.12, 1.36)</td>
</tr>
<tr>
<td>Forcing participation</td>
<td>0.89* (0.81, 0.99)</td>
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<td>0.65** (0.49, 0.85)</td>
<td>0.90* (0.82, 0.99)</td>
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<tr>
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</tr>
<tr>
<td>Indulgent/neglectful</td>
<td>1.26* (1.04, 1.53)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PA expectations</td>
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<td>1.22** (1.07, 1.39)</td>
<td>1.14* (1.02, 1.28)</td>
<td>1.17** (1.05, 1.31)</td>
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<tr>
<td>PA nurturing</td>
<td>1.44* (1.02, 2.02)</td>
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</tr>
</tbody>
</table>

Back transformed data presented in table; controlling for parental education; *p<0.05; **p<0.01; ***p<0.001: Simple linear regression models (univariable) and multivariable linear regression models
APPENDIX 18:

INTERNATIONAL SOCIETY FOR BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY ANNUAL SCIENTIFIC MEETING 2014 (SAN DIEGO): POSTER PRESENTATION ABSTRACT
Associations between parenting practices and adolescent girls’ leisure-time physical activity

Saunders J1,2, Salmon J1, Hume C1, Bremner A2 & Timperio A1

1 The Centre for Physical Activity and Nutrition Research, Deakin University
2 School of Population Health, The University of Western Australia

Purpose: Parenting styles and practices are related to health outcomes among adolescents; however, few studies have comprehensively examined the influence of parenting on physical activity (PA). This study examines associations between parenting and adolescent girls’ leisure-time physical activity (LTPA).

Methods: Analyses are based on data collected in 2012 from 414 girls aged 12-16 years, residing in the Perth metropolitan area. Girls completed the International Physical Activity Questionnaire Adolescent version (IPAQ-A) and reported their mother’s and father’s PA parenting practices. Linear mixed models were used to estimate univariable associations between parenting practices and LTPA. Multivariable models were run for all factors relating to firstly, mothers, and secondly, fathers.

Results: Univariable analyses indicated mothers’ provision of logistic support (p<0.001), fostering healthy PA habits (p<0.001) and expectations regarding PA (p=0.03) were positively associated with LTPA. Fathers’ provision of logistic support (p<0.001), fostering healthy PA habits (p<0.001), PA modelling (p<0.001) and expectations regarding PA (p=0.034) were positively associated with LTPA.

In the mothers’ multivariable model, provision of logistic support (p=0.001), fostering healthy PA habits (p=0.05) and expectations regarding PA (p=0.01) remained significant, while forcing PA (p=0.04) was negatively associated with LTPA. In the fathers’ multivariable model, provision of logistic support (p<0.001) and expectations regarding PA (p=0.04) remained significant.

Conclusions: Adolescent girls’ perceptions of their parents’ PA parenting are clearly important for participation in LTPA. Further examination of PA parenting is essential to promote physical activity among this important target group. Future research should examine parental perceptions of PA parenting and consider other PA outcomes.