PHYSICAL ACTIVITY LEISURE-TIME
PARTICIPATION OF BOYS WITH
DEVELOPMENTAL COORDINATION DISORDER

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Thesis submitted for the degree of Doctor of Philosophy in the Division of
Occupational Therapy, School of Health and Rehabilitation Sciences at
The University of Queensland

August 2006
Statement of originality

I declare that the work presented in this thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text. Material has not been submitted, either in whole or part, as part of a degree at this or any other university. Some thesis material has been published or is under consideration for publication. This is in accordance with the regulations of The University of Queensland, which permit publication of thesis material during candidature, prior to its presentation for the Degree of Doctor of Philosophy.

Statement of contribution to jointly published work and contribution by others

I declare that the jointly published work included in this thesis is, to the best of my knowledge original with contribution from the acknowledged co-authors. I made the leading contribution to the work reported at all levels of study, including conceptualisation of the research, subject recruitment, data collection, statistical analyses, and manuscript preparation. Advisors Ziviani and Cuskelly provided guidance and editorial assistance.

Statement of contribution by others

I certify that all co-authors have given their consent for each of the papers presented as part of this thesis, to be included as part of this thesis.

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Acknowledgements

I wish to acknowledge the many individuals whose guidance and support facilitated the completion of this thesis. There is an immense sense of gratitude for the many acts of kindness, comfort and encouragement that ensured the successful completion of this thesis. Kindness, enthusiasm and dedicated mentorship were abundant qualities of my advisors, colleagues, friends and family who helped make this journey meaningful, enriching and worthwhile.

I am indebted to the two dynamic and dedicated researchers who were pivotal driving forces behind the successful accomplishment of this thesis: Drs Jenny Ziviani and Monica Cuskelly. I wish to acknowledge the valuable assistance and commitment of these outstanding advisors, who skilfully guided me through the stormy seas of methodological and statistical challenges with remarkable forbearance, demonstrating high levels of scientific precision and intellectual rigour, and ensuring that I did not sink along the way. Thank you, Jenny, for your wisdom, strength and humour, your exceptional foresight, intelligence and patience, and for your rich blend of advice and encouragement in pursuing an academic journey of discovery. I am also deeply indebted to Monica, whose vast knowledge, judicious counsel; perceptive understanding and thoughtful appraisals during each stage of the thesis have facilitated my development as an independent researcher. I was particularly fortunate to have received superb mentorship from these talented academics.

I wish to express my gratitude to the boys and their families who contributed to the research. Without their enthusiastic participation there would be no story to tell. To the teachers who welcomed me into their classrooms at St Lawrence’s and Nudgee Junior, who bent over backwards to accommodate me and the research program, I thank you for your generosity and assistance.

The journey to completion of the thesis was a memorable and enjoyable one. The challenges were daunting but stimulating, with peaks to be scaled and valleys to be crossed. The journey could never have been completed without the backing of key people in my life, who fuelled my motivation and determination to succeed. My family, and in particular, my life companion, best friend, and love of my life, Michael, lifted my spirits during those seemingly dire moments, motivated me to reach for the stars, and was my steady rock. In you I have a wonderful example of how to live a balanced life, to enjoy hard work and yet relax at the end of the day, to value family and connectedness to others, to be optimistic and treasure each and every day.
My children, Kate, Emma and Rob, provided inspiration, practical and emotional sustenance: Kate - for her meticulous graphics, sensitive understanding and study companionship; Emma – for her enthusiastic help with the minutiae, scoring and entering data while offering calm, sensible and valued insights along the way; Rob – for endlessly trialing data collection tools and sharing his wealth of personal knowledge about the lived experience of being an early adolescent boy – I can never thank each of you enough.

To my parents, Jean and Don Armstrong, who encouraged my dreams and who never faltered in their lifelong support and unquestioning belief that yet another of my projects would be successful, thank you for tactfully avoiding the question, “When will the thesis be completed?” To you I will be eternally grateful, not just for your deep love, friendship and support, but also for modelling excellence, perseverance and optimism in all endeavours.

My talented sisters, Louise Arvier and Suzy Wilson and their families, John, Tim, Beck and Matt Arvier, Ralph, Hannah, Charlotte and Harry Wilson – who helped trial the data collection tools, provided regular encouragement, and who gave heart-warming advice and thoughtful observations on a regular basis, I also am deeply indebted.

Amongst your ranks have many wonderful examples of hard work, extraordinary brilliance, and steadfast faith.

To my wider family circle, especially to Diana and Geoff Poulsen, thank you for quietly caring and providing wonderful lessons about what really counts in life. Your greatest contribution was in providing examples of how to live the “good life”, devoted to each other and to family, and always ready to jump in to assist at any moment. “Write it down!” was a great inspirational catch-phrase.

From the professional ranks, there are so many to acknowledge:

Michele Haynes, Ross Darnell and Travis Gee – who ably assisted with the data analysis; Sandra Warren, Rachel Smith, Judy Jones, Kay Smith, and Kathy Ahern – for cheerful, practical assistance with data collection and coding;

Julie Henderson and Vonny Castrisos my amazing OT colleagues - for mentorship and for being the best travel buddies; Sylvia Rodger – for stimulating professional advice, and Jane McNamara, Shirleen Heyman and Rose Kelso – for ensuring a balance between work, rest and play;

The University of Queensland – for financial assistance with scholarship support,
Riverbend Books, Bulimba – for generous contributions towards the libraries of the participating schools, and CRS (Commonwealth Rehabilitation Services), for providing mouse pads for the classrooms.

In addition, I wish to acknowledge the Canadian Journal of Occupational Therapy, Human Movement Science and the Australian Journal of Occupational Therapy for granting permission to reproduce the published and “in press” articles reproduced in this thesis.

To name the cast of thousands who contributed would mean another chapter itself. The astuteness, compassion, humour and patient forbearance of my close family and friends, all of whom were a never-ending source of strength, is interwoven behind the ultimate completion of the thesis. At any given time throughout the candidature, moments when someone would miraculously emerge to offer guidance and unexpected generosity of skill and expertise were frequent. To each and every one of you, Thank you.
Publications by the candidate relevant to the thesis


Publications by the candidate relevant to the thesis, but not forming part of it


Conference presentations


Abstract

Background: Boys with DCD have lower rates of participation in leisure-time physical activities, which are important developmental contexts for males, than boys without DCD. There is evidence that variable developmental trajectories exist although factors contributing to an optimal child-activity-environment fit are poorly understood. Therefore, identifying the processes influencing leisure-time physical activity participation patterns, and the impact that low participation has on subjective quality of life is a clinical and research priority. Identifying factors and circumstances that promote or inhibit successful adaptation to physical coordination difficulties has potential to contribute to the mental and physical health of boys with DCD. In this thesis psychological mechanisms influencing leisure-time participation and subjective quality of life were explored with a view to informing an ecological open systems model called SCOPE-IT (Synthesis of Child-, Occupation-, and Environment- in Time), developed to conceptualise the multiple inputs from child-, activity- and environment-level factors that contribute to health and well-being.

Objectives: The first research priority was to identify mediation processes influencing relationships between physical coordination ability and leisure-time participation. Three psychological process variables were investigated; perceptions of freedom in leisure, self-concept perceptions and dispositional goal motivations. Three quality of life-related outcomes related to subjective quality of life were also explored; global life satisfaction, general self-concept and loneliness. Differences between these variables for boys with and without DCD were compared before mediation processes were investigated as the key research initiative of the thesis.

Method: Sixty boys with DCD and 113 boys without DCD completed self-report measures of the psychosocial variables under consideration. Parents completed a retrospective recall of leisure-time behaviour over the previous 12-months and a 7-day diary for the out-of-school hours. The 7-day diary recorded intensity, duration, content, social and physical context of leisure-time activities.

Results of Descriptive Analyses: Boys with DCD had lower mean scores than boys without DCD for perceived freedom in leisure and self-concept appraisals for physical ability, physical appearance, peer and parent relations, general self-concept and global life satisfaction. Higher loneliness was reported by boys with severe and moderate DCD than boys without DCD who had medium to high levels of physical coordination.
Lower participation in team sports and informal group physical activities, but higher participation in structured groups, such as choir, that involved low levels of physical activity energy expenditure, were found for boys with DCD compared to boys without DCD. These leisure-time social-physical activity patterns of boys with DCD contributed to significantly lower physical activity energy expenditure rates for the previous week’s out-of-school hours when compared to energy expenditure of boys without DCD. Correlation analyses showed that more time spent in social-physical activities was positively associated with global life satisfaction, general self-concept and perceived freedom in leisure, and was negatively associated with loneliness for all boys. Therefore, the relationships between these variables were further investigated for mediation effects.

**Results of Mediation Analyses:** Team sports were identified as the only significant activity participation context that mediated relationships between physical coordination ability and two outcomes: global life satisfaction and loneliness. Psychological processes contributing to team sport participation were also investigated. Perceived freedom in leisure was identified as a significant psychological mechanism mediating the relationship between physical coordination ability and team sport participation. When the relationships between physical coordination and different levels of energy expenditure were investigated it was found that self-perceptions of peer relations changed the negative relationship between level of physical coordination ability and participation in low energy expenditure activities.

Mediation analyses for relationships between boys’ physical coordination ability and self-perceptions of life satisfaction and general self-concept were undertaken. Significant mediators of these relationships included: self-concept appraisals of physical ability and appearance, peer and parent relations, and adoption of task-oriented goals. Perceived freedom in leisure partially mediated the relationship between physical coordination ability and global life satisfaction.

**Conclusions:** Team sports participation was positively associated with life satisfaction, perceived freedom in leisure, social satisfaction, general self-concept and moderate to vigorous energy expenditure for boys aged 10 to 13 years. From a physical and mental health perspective the finding that boys with DCD spent significantly less time in team sports and in all social-physical contexts than boys without DCD was of concern because these leisure-time contexts provide developmentally important sources of enjoyment and friendship-building for young males. When descriptive analyses were conducted it was found that boys with DCD had lower general self-concept, global life satisfaction, task goal orientations and perceived freedom in leisure than boys without
DCD, and also reported more loneliness than their well coordinated counterparts. These results provide convincing evidence that parents, teachers and practitioners must be vigilant and address potential physical and mental health-related concerns for boys with DCD.

The finding that a small number of boys with DCD participated in both team sports and informal group physical activities was encouraging and consistent with previous research describing ongoing and active participation in social-physical activities for a few determined adolescents with DCD. This prompted the investigation of psychological mechanisms that might support participation in social-physical activity contexts and protect against negative outcomes, such as loneliness, or promote positive outcomes, such as life satisfaction. Perceived freedom in leisure was identified as one mechanism that contributed to the positive relationships between physical coordination ability and both team sport participation and global life satisfaction. Participation in team sports, itself, was found to be a process variable changing the negative relationship between physical coordination ability and loneliness, and positively contributing to life satisfaction for all boys irrespective of physical coordination ability. Further investigation of the features of team sport environments that protect against loneliness and which promote life satisfaction is warranted.

Researchers and practitioners are challenged to consider the four components of perceived freedom in leisure as psychological factors that potentially underpin decisions about choice, effort and time spent in team sport settings. Perceived freedom in leisure was regarded as having potential to inform models such as SCOPE-IT model which guided these investigations. However, further research with more representative populations is required to verify these preliminary findings. In addition, in keeping with the premise of the SCOPE-IT model, investigations of environment-level variables are required to fully understand the fit between child, activity and environment factors.

This study moved beyond a descriptive analysis of the psychosocial features and leisure-time activity participation patterns of boys with DCD. The identification of mechanisms influencing leisure-time participation in team sports, life satisfaction and loneliness was regarded as having potential to inform clinical practice, theory development and lead to future research initiatives aimed at promoting and maintaining health, contributing to the formulation of policies and preventive health strategies for these children.
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Chapter 1: Introduction

Boys with developmental coordination disorder (DCD) have significant difficulties performing everyday motor tasks and are frequently referred to occupational therapists for intervention (Missiuna, Moll, King, Law, & King, 2006; Sutton Hamilton, 2002). The physical coordination difficulties experienced by boys with DCD are substantially below that expected for chronological age and intellectual ability, and are not related to a general medical condition (American Psychiatric Association, 2000). Parents and teachers are more likely than paediatricians to identify the functional performance impairments that are associated with having motor coordination difficulties (Kirby, Davies, & Bryant, 2005). This is because parents and teachers, who observe on a daily basis, the continual frustration and distress associated with public performance impairments of slower and less skilled physical coordination ability by boys with DCD, are more likely to recognise that help is needed for children in their care (Rose, Larkin, & Berger, 1997).

Health care providers may underestimate the impact of the condition on children, based on the belief that the physical coordination difficulties are insignificant, and that the majority of children with DCD will outgrow their difficulties (Missiuna, Moll, Law, King, & King, 2006). However, there is persuasive evidence that resolution of early motor coordination difficulties is not always the case (Cantell, Smyth, & Ahonen, 2003; Geuze & Borger, 1993; Losse, Henderson, Elliman, Hall, Knight & Jongmans, 1991; Rasmussen & Gillberg, 2000). Persistent physical coordination difficulties may be associated with educational under-achievement and low participation in all social leisure-time pursuits during middle adolescence (Cantell et al., 2003). Social functioning difficulties and psychological disorders have been identified in early adulthood (Rasmussen & Gillberg, 2000; Sigurdsson, van Os, & Fombonne, 2002). Adults with movement difficulties have poignantly recollected indignities experienced during physical education classes at school although the buffering effect of participation in an areas of talent or personally valued pursuits has suggested positive pathways involving leisure-time activity participation (Fitzpatrick & Watkinson, 2003).

Low general self-concept (Skinner & Piek, 2001), stigmatisation (Segal, Mandich, Polatajko, & Valiant Cook, 2002) and internalising problems (Francis & Piek, 2003; Sigurdsson et al., 2002) are psychosocial problems that have been associated with DCD. Physical health problems have also been reported, including obesity (Cairney, Hay, Faught, & Hawes, 2005) and poor aerobic fitness (Cairney, Hay, Wade, Faught, &
This evidence suggests broad and possibly long-term physical and mental health problems for many individuals with DCD.

Thus, DCD is not an inconsequential condition but one that can have immediate and long-term psychological and physical morbidity. The incidence of DCD has been estimated as six per cent of the childhood population (American Psychiatric Association, 2000). Despite the fact that there is widespread, informal knowledge in the community about individuals whose poor coordination has caused suffering in physical education classes, on the playground and sports fields, DCD is not widely recognised as a potentially serious and pervasive disorder that can impact on physical and mental health (Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001; Rasmussen & Gillberg, 2000). This may be because individuals with DCD frequently attempt to disguise their discrediting physical coordination difficulties, by avoiding public displays of physical incompetence in physical activity settings (Segal et al., 2002).

The ongoing interruption in performance of daily activities means that for those with DCD, participation in many of the physical pursuits of childhood that can give such joy and pleasure may become an ordeal. According to Missiuna, Moll and King (2006), what starts out as a physically-based problem may develop into other more complex issues, including social and emotional difficulties. The processes by which this occurs, or by which this can be prevented, are not clear.

**Significance of the study**

This research was prompted by concern about adverse developmental trajectories for some individuals with DCD (Rasmussen & Gillberg, 2000), tempered with the knowledge of positive developmental pathways for others (Cantell et al., 2003). Heterogeneity in terms of outcomes has been a source of hope, confusion and at times, frustration, for researchers, practitioners and families who struggle to identify pathways leading to positive outcomes for these children (Ahern, 2000; Geuze, Jongmans, Schoemaker, & Smits-Engelsman, 2001; Mandich, Polatajko, & Rodger, 2003).

Boys with DCD are more likely to be noticed and referred by teachers for evaluation and intervention than girls (Cairney, Hay, Faught, Mandigo, & Flouris, 2005; Henderson & Hall, 1982). Increased prevalence in males over females with DCD may also be related to neural, biomechanical, maturational and experiential factors (for review see Kirby & Drew, 2003). Boys were also the focus of this study of leisure-time physical activity participation, as lower rates of engagement in recreational sports for boys with DCD (Cairney, Hay, Faught, Mandigo et al., 2005) may have more impact on perceived quality.
of life for males than females, particularly in cultures where physical prowess is highly valued.

Although a significant proportion of boys with DCD have low participation in leisure-time physical activities, there is evidence that a few individuals diagnosed in early life as having DCD are physically active, determined sports participants during adolescence (Cantell, Smyth, & Ahonen, 1994). This suggests positive developmental trajectories in terms of physical activity participation, for a small number of individuals with motor difficulties (Cantell et al., 2003). Understanding the mechanisms contributing to participation in leisure pursuits, such as large group physical activities that are highly valued by many pre- and early-adolescent boys (Swain, 2003), and the psychosocial factors that enable participation is critical in understanding the processes that support an optimal child-activity-environment fit.

The longitudinal studies of Cantell and colleagues (1994; 2003) suggest mechanisms that may impact on social-physical activity participation. In these studies descriptions of athletes with DCD who were not regarded as successful by normative standards but who displayed tenacity and deep involvement in team sports were described. The psychological mechanisms and motivations behind social-physical activity engagement for determined sportsmen with DCD are consistent with adoption of task- over ego-oriented goals (Nicholls, 1989), and with self-perceptions of competence and control, deep involvement and leisure needs satisfaction, consistent with high perceived freedom in leisure (Ellis & Witt, 1984). These variables were explored in the thesis as potential mechanisms promoting positive participation in leisure-time physical activities.

Adopting task-oriented goals is positively associated with effort, persistence, perceptions of competence, task choice and intensity/degree of effort exerted in performance situations (Duda, 1988; Kavussanu & Harnisch, 2000). Therefore adoption of task-oriented dispositional goal orientations may be one mechanism contributing not only to high participation in leisure-time physical activities for boys with DCD, but also to effective and cognitive appraisals associated with perceived life satisfaction.

Achievement goal theory (Nicholls, 1989) predicts that adoption of task- over ego-oriented goals will be associated with more adaptive outcomes, such as subjective well-being (Duda, 1987; Kaplan & Maehr, 1999). Task goals, which are also known as learning, mastery or improvement goals, are associated with increased persistence, positive affect, optimistic orientations and intrinsic motivation (Brunel, 1999; Duda, 1989). Previous research has identified a relationship between dispositional task orientation goals and perceptions of a mastery-oriented physical education climate, which influences
perceived competence in physical education for children with movement difficulties (Causgrove Dunn, 2000).

Understanding the dispositional goal orientations of boys with DCD may help explain the varying patterns of leisure-time participation and the associated well-being outcomes for this group. The combination of low task- and high ego-goal orientations is associated with low general self-concept (Gibbons, Lynn, & Stiles, 1997), and giving up or withdrawing from an activity (White & Duda, 1993). Conversely, high task- and low ego-orientations are associated with high general self-concept, even when children have low perceived ability (Gibbons et al., 1997; Kaplan & Maehr, 1999), and persistence (Brunel, 1999).

Perceived freedom in leisure (PFL) is proposed as another psychological process, not previously investigated for children with DCD, which might impact on leisure-time physical activity patterns, as well as influencing global appraisals of life satisfaction, general self-concept and feelings of loneliness. Children who have high PFL have high self-perceptions of leisure competence and internal control over leisure experiences, as well as reporting deep involvement and satisfaction of leisure needs (Ellis & Witt, 1994).

The central tenet of leisure is that freedom to participate in intrinsically motivating activities provides enjoyment and leads to development of full potential as well as contributing to overall life satisfaction (Kelly, 1996). Perceived freedom in leisure to participate in activities that are interesting and personally valued may have more impact on quality of life than any other experience, and is associated with positive affect and persistence in that activity (Witt & Ellis, 1989). However, low perceived choice and internal control over leisure outcomes, dissatisfaction with social relations in leisure settings, and low perceived competence are associated with low intrinsic motivation and low leisure needs satisfaction, described as helplessness in leisure (Ellis & Witt, 1994).

Based on attribution theory (Weiner, 1974), PFL describes a state of mind where intrinsic motivation and self-perceptions of internal control underpin voluntary action. Attributions about success or failure in leisure pursuits are based on self-evaluations about internal/external causes that influence decisions about leisure-time participation. The attributions about whether a leisure pursuit is perceived as successful or unsuccessful are dependent on self-appraisals of one’s perceived competence in that activity and sense of control over the process and outcomes, as well as subjective evaluations of whether leisure needs are being satisfied. Depth of involvement or experiences of flow, where the challenge of the activity matches the child’s skills for that activity also contribute to decisions about activity participation (Csikszentmihalyi, 1990). Deep
involvement and positive emotions associated with leisure participation provide the basis for long-term satisfaction (Larson, 2001).

Kelly (1996) proposed that leisure-time activity participation in challenging and interesting pursuits may have more impact on quality of life than any other experience. Contributions from self-determination theory (Deci & Ryan, 2000) broaden the PFL construct by describing how satisfaction of three basic psychological needs can contribute to improved subjective quality of life. Feeling free to pursue leisure activities of one’s own choosing, feeling supported and connected to others, and perceiving that one is competent in leisure leads to enjoyment, satisfaction of leisure needs and continued engagement.

Leisure-time activity participation in social/non-social, structured/unstructured and physical/non-physical contexts is potentially an outcome variable and a mediator mechanism influencing loneliness, global life satisfaction, general self-concept and energy expenditure. Adverse mental health outcomes potentially linked with poor physical coordination may be linked with low participation in social-physical activities during leisure. For boys with DCD, identifying the processes that contribute to improved quality of life is a baseline step in developing effective intervention strategies to inform clinical practice and guide future experimental and longitudinal research.

Low participation in physical activities has potential physical and mental health consequences (Sallis, Prochaska, & Taylor, 2000). It is therefore important to establish the processes contributing to positive psychosocial and physical activity participation outcomes for boys with DCD in order to provide direction for those developing intervention and prevention programs for these children. The work described in this thesis is undertaken in order to identify the dynamic (and therefore alterable) processes that operate between physical coordination ability, leisure participation and subjective quality of life. This is a broad aim which moves beyond a narrow focus on the descriptive characteristics of boys with and without DCD.

**Background Information**

Boys with DCD have been reported to outnumber girls with DCD in ratios varying from 3:1 (Miller et al., 2001) to 7:1 (Kadesjo & Gillberg, 1999). It has been debated whether DCD is actually more prevalent in boys than girls, or whether it is a social condition, where boys who do not perform well in culturally expected patterns of physical activity engagement, are more often recognised by referral sources – parents and teachers (Cairney, Hay, Faught, Mandigo et al., 2005; Kirby, 2005).
Global life satisfaction, also known as perceived quality of life, may be lower for boys with DCD, particularly when there is low participation in social-physical activities that afford boys high social status (Chase & Dummer, 1992; Gilman & Huebner, 2003). Both general self-concept and global life satisfaction, two complementary constructs measuring cognitions related to subjective well-being, can act as an index of emotional adjustment (Huebner, Suldo, Smith, & McKnight, 2004; Marsh, 1990). While global life satisfaction of boys with DCD has not been previously investigated, general self-concept (or the related construct – global self-worth) has been researched. Lower general self-concept has at times been found for children with DCD (Schoemaker & Kalverboer, 1994; Skinner & Piek, 2001), compared to children without DCD. Non-significant differences between adolescents with and without DCD for global self-worth have also been found (Cantell et al., 1994). Cultural differences may explain different results. The impact of leisure-time activity participation on general self-concept has not been explored.

Self-concept perceptions may also act as mediators of relationships between physical coordination ability and leisure-time activity participation. Self-perceived physical efficacy, including perceptions of physical competence or adequacy in physical activities and enjoyment of these pursuits has been identified as one process contributing to recreational physical activity participation in children with DCD (Cairney, Hay, Faught, Wade, Coma & Flouris, 2005). Boys who have high physical ability self-concept perceptions are more likely to have high general self-concept and to participate in more physical activities during leisure (Gibbons et al., 1997). In Australia, sporting prowess is highly valued in boys, and those with poor athletic ability and physical ability self-concept are more likely to be marginalised than competent athletes (Rose & Larkin, 2002; Rose et al., 1997). This may contribute to low global life satisfaction and general self-concept. Boys themselves are less tolerant than girls of physical coordination impairments exhibited by peers, particularly if low physical coordination ability is perceived to be interfering with group goals or success in competitive sporting environments (Killen, Crystal, & Watanabe, 2002). Those with poor sports ability are therefore more often excluded by their peers, which may contribute to low perceived quality of life.

Physical ability self-concept perceptions have consistently been reported to be lower for children with DCD compared to children without DCD (Barrett, Piek, & Allen, 2003; Cairney, Hay, Faught, Mandigo et al., 2005; Cantell et al., 2003; Cantell et al., 1994; Piek, Dworcan, Barrett, & Coleman, 2000; Pless, Carlsson, Sundelin, & Persson, 2001; Skinner & Piek, 2001). Previous research about other self-concept domains (physical appearance, peer relations and general self-concept) has reported equivocal findings.
and the influence of these variables on leisure-time participation of boys with DCD have not been explored.

**Leisure-time participation**

Leisure-time activity participation is the area of occupational performance selected for investigation in this study. Time allocated to recreational pursuits during the out-of-school hours is potentially more discretionary than other occupational performance domains. However, boys with DCD may experience social and physical activity participation restrictions in these settings either through self-imposed constraints or social-environmental barriers to participation (Fitzpatrick & Watkinson, 2003; Mandich et al., 2003; Missiuna, Moll, Law et al., 2006; Segal & Frank, 1998).

It is known that children with DCD have low rates of participation in all recreational physical activities whether they are structured and adult-organised team sports or informal play activities, such as going to the park and riding bikes or kicking a ball around (Cairney, Hay, Faught, Wade et al., 2005). It is not known whether PFL is lower for boys with DCD compared to boys without DCD. Structured social-physical activities, such as team sports, are a particularly difficult physical activity context for boys with DCD (Kirby, 2004). Low participation in these social-physical activities may be associated with stigmatisation by peers (Segal et al., 2002).

Children who cannot participate or who choose not to participate in social-physical activities may turn to other social contexts for enjoyment and socialisation experiences. Development of strengths in other areas of talent, and participation in other leisure activities that provide socialisation and skill acquisition offer the potential to increase social networks (Larson, 2000). However, there is evidence that adolescents with DCD have low participation in all social recreational pursuits, whether physical or non-physical (Cantell et al., 1994).

The reasons for low participation in social as well as physical leisure-time activity for individuals with DCD are unclear. The impact of low participation in social/physical leisure contexts on perceived quality of life may be negative in cultures where physical prowess in team sports is lauded. For boys, the psychosocial implications of low participation in popular social-physical activities, such as team sports, may be particularly detrimental for peer relation self-concept but there may be broader implications for general self-concept and global life satisfaction (Kirby, 2004). Children with DCD who do not participate in social/physical leisure-time pursuits may experience loneliness. Social dissatisfaction and low engagement in leisure-time activities with peers are key concerns.
Children with DCD who participate in fewer recreational organised and informal physical activities than children without DCD (Cairney, Hay, Faught, Wade et al., 2005) are likely to have lower physical activity energy expenditure than their well-coordinated peers. For boys with DCD, missing out on recreational physical activity engagement experiences, particularly in team sports and informal group play involving moderate to vigorous energy expenditure may also mean missing out on many important socialisation opportunities to make and cement friendships (Evans & Roberts, 1987). This is because boys spend increasing amounts of time every day in physical activities that involve large groups of peers as they move through middle childhood into early adolescence (Pellegrini, 1995). These social-physical activities represent contexts that may be particularly important for males in acquiring social status and in contributing to masculine identity formation (Eder & Kinney, 1995; Gilbert & Gilbert, 1998). From a physical health perspective, low physical activity energy expenditure and the adoption of sedentary lifestyles are
associated with serious health problems in western nations (Sallis et al., 2000). Boys with DCD who participate in fewer team sports may be doubly disadvantaged compared to their well-coordinated peers in terms of physical and mental health.

**The research plan**

While the processes that mediate between leisure-time activity participation and psychosocial outcomes is the major focus of the research reported here, it is necessary to investigate and describe differences between boys with and without DCD with respect to their leisure pursuits, and the psychosocial characteristics of interest. The first priority of the research program is to describe leisure-time activity participation differences between boys with and without DCD in terms of time spent in physical/non-physical and social/non-physical activity contexts, as well as in structured and unstructured contexts. It is also regarded as imperative that the psychosocial characteristics of boys with DCD are evaluated, particularly in relation to previous findings suggesting low perceived subjective quality of life and satisfaction with social relationships for individuals with DCD (Francis & Piek, 2003; Losse et al., 1991; Rose, Larkin, & Berger, 1999; Schoemaker & Kalverboer, 1994).

Obtaining this descriptive information is regarded as a necessary baseline step, particularly as limited research has been done to date, focusing specifically on boys with DCD compared to boys without DCD. Following collation of descriptive information comparing boys with and without DCD, this study then proposes to identify possible mechanisms leading to positive psychosocial outcomes and healthy participation in leisure-time pursuits for boys of this age. It is well known that there are negative outcomes (social, psychological and physical) for many individuals with DCD, and that pathways promoting health must be identified (Mandich et al., 2003; Missiuna, Moll, King et al., 2006; Missiuna, Moll, Law et al., 2006).

In an effort to understand the multiple determinants and pathways leading to different participation and quality of life outcomes a model, called (Synthesis of Child, Occupational Performance and Environment – In Time) is presented in Chapters 2 and 3 of the thesis. Identifying variables that impact on relationships can contribute to theory by informing explanatory models and guiding clinical practice.

Limited understanding of processes contributing to physical and mental health outcomes for individuals with DCD has led to the formation of research aims to guide this study. The first aim was to describe psychosocial self-perceptions, physical activity leisure-time participation and energy expenditure of boys aged 10 to 13 years with and without DCD.
A second aim was to investigate potential mechanisms (processes) that influence relationships between physical coordination ability and five outcomes: leisure-time activity participation and energy expenditure, and self-perceptions of global life satisfaction, general self-concept and loneliness.

**The research questions**

With these aims in mind, a series of research questions was formulated to guide the study. The first two questions were aimed at providing descriptive information about leisure-time physical activity and energy expenditure, and psychological self-perceptions of boys with and without DCD.

1. Are there differences between leisure-time physical activity participation patterns and energy expenditure of boys with and without DCD?

2. Do boys with DCD have different perceptions of global life satisfaction, general self-concept and other non-academic self-concept perceptions, task and ego goal orientations, PFL and self-appraisals of loneliness than boys without DCD?

Mediation analyses were then undertaken to answer research questions about the mechanisms influencing the relationships between boys’ physical coordination levels and leisure-time participation and quality of life outcomes. These questions were formulated with a view towards informing explanatory models, such as SCOPE-IT.

3. Do self-concept perceptions act as mediators of relationships between physical coordination ability and both energy expenditure and leisure-time activity participation?

4. Do goal orientations and self-concept perceptions act as mediators of relationships between physical coordination ability and three outcomes; global life satisfaction, general self-concept and leisure participation?

5. Does PFL mediate between physical coordination ability and both leisure participation and global life satisfaction?

6. Does leisure-time activity participation mediate between physical coordination ability and three outcomes; global life satisfaction, general self-concept and loneliness?

**Format of the thesis**

This thesis will be presented as a series of six papers each of which has been submitted for consideration in peer-reviewed research journals. Three of the papers have been
accepted for publication and the remaining three are currently under review. In the first two papers, which are presented in Chapters 2 and 3, a model developed to understand the multidimensional factors and processes influencing physical activity participation and quality of life is presented. Chapters 2 and 3 set the scene for the detailed research investigations that follow. In Chapters 4 to 7 the findings of descriptive and mediation analyses investigating mechanisms that potentially influence leisure-time activity participation, global life satisfaction and general self-concept, and loneliness of boys with DCD, are described.

Chapters 4 to 7 are organised in a consistent manner, although there is some overlapping of common material, given the fact that each paper was written as a stand-alone article for journal publication. In each of these chapters the data analytic format is similar, with descriptive analyses comparing boys with and without DCD on the variables under investigation presented first, followed by correlation and mediation analyses to investigate proposed relationships between physical coordination ability and quality of life outcomes.

Six research questions guide the investigations undertaken in Chapters 4 to 7. In Chapter 4, between-group differences are explored to answer the first question comparing physical activity participation and energy expenditure levels of boys with and without DCD. The second research question asking whether boys with and without DCD had different perceptions of global life satisfaction, self-concept, goal orientations, PFL and loneliness is investigated in Chapters 4 to 7.

The remaining four questions are sequentially investigated in different research papers presented in Chapters 4 to 7. It must be stressed that the SCOPE-IT model that underpinned the aims of the thesis to understand the complex relationships between variables influencing physical activity participation in health-enhancing leisure-time pursuits is necessarily over-inclusive. The research undertaken in this study must be regarded as a starting point for future research. In this investigation only child-level psychological factors and the social and physical context of leisure-time participation were explored as mediators of relationships between physical coordination ability and a range of outcomes, including global life satisfaction, general self-concept and loneliness. In addition, physical activity energy expenditure and leisure-time participation are explored as outcome variables in Chapters 4, 5, and 6. The ultimate aim of the research is to identify potential avenues for intervention, prevention, education and training of practitioners working towards optimising physical and mental health of boys with DCD.
Introduction to Chapters 2 and 3

In these first two chapters the literature concerning physical activity engagement of children is reviewed. The multidimensional factors and processes contributing to physical activity engagement in occupational performance areas are discussed in terms of physical and mental health outcomes. Occupational therapists are identified as being philosophically well suited to profiling children’s physical activity patterns and exploring variables contributing to an optimal child-, activity-, environment fit. Limited participation in physical activities for children with DCD is then specifically targeted as an area of concern for researchers and clinicians working with preventive and intervention goals in mind. A model, Synthesis of Occupational Performance — in Time (SCOPE-IT), is developed in Chapter 2, to assist practitioners in conceptualising time use, choice and effort expended in physically active pursuits as opposed to more sedentary occupations. This model is then expanded in Chapter 3 to include outcomes of interactive pathways of influence on physical activity participation. The SCOPE-IT model is used as a framework for investigating between-group differences between boys with and without DCD in subsequent chapters of the thesis.
Chapter 2: Paper 1

Health enhancing physical activity: Factors influencing engagement patterns in children

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Physical inactivity and the development of increasingly sedentary lifestyles are recognised as a community health concern, the origins of which can be traced from childhood lifestyle behaviours. Physical activity engagement patterns in children are multidimensional and occupational therapists are philosophically well suited to profiling these activity patterns. To do so requires a broad understanding of the complex, interrelated contextual, interpersonal, intrapersonal and temporal aspects of occupational performance. In this paper, the SCOPE-IT model (Synthesis of Child Occupational Performance and Environment — In Time) is used as a conceptual framework for describing these factors. This is undertaken with the purpose of alerting occupational therapists and others who work with children to key factors that influence the development of healthy lifestyles where there is an optimal balance between physically active and sedentary pursuits. Achieving temporal balance in core areas of occupational performance underpins physical and mental health and has implications for disease prevention.

KEY WORDS children, health promotion, occupational science, time use, well being.

INTRODUCTION

Children's time use is distributed between areas of discretionary and non-discretionary activities including self-care, schoolwork, play, rest and sleep. Physical activity participation is affected by a multitude of environmental, personal, social and cultural factors within the context of each child's individual developmental, biological and chronological time frames (Sallis, Prochaska & Taylor, 2000).

Concerns have been raised about the decreasing amounts of time that children engage in behaviours that can be called physically active (Pratt, Macera & Blanton, 1999; Stucky-Ropp & DiLorenzo, 1993). Physical activity refers to bodily movements produced by skeletal muscles, which results in significantly more energy expenditure than when the child is resting (Bouchard, Shephard & Stephens, 1993). Community concerns about physical inactivity are now on the health agenda and, as such, are of concern to all involved in the health and welfare of children (Queensland Health, 2002).

There remains, however, ongoing debate about the amount and types of physical activity that are optimal for young people. Children tend to engage in repeated short bursts of physical activity of up to 5-min duration at any time rather than extended periods of intense physical activity. Identifying populations at risk of having insufficient physical activity in their daily lives is vital if preventive measures are to be taken.

Gender has been found to impact on continuing engagement in physically active pursuits (Cale & Almond, 1992). Girls aged 12–18 years and older adolescent males and females aged 16–18 years are considered to be in the at-risk category (Cale & Almond; Malina, 1996; Sallis & Owen, 1999). Children from low socioeconomic backgrounds and individuals with obesity, depression, diabetes...
and developmental coordination disorders have also been identified as being at-risk of developing physically inactive lifestyles (Cantell, Ahonen & Smyth, 1994; Cavill, Biddle & Sallis, 2001).

Occupational therapists have an important role to play in the identification of individuals who may not develop optimal or even basic levels of physical activity in their lives. For these individuals, the balance between physically active and inactive occupations may be insufficient for maintaining performance capacity, and overall quality of life, which is an integral goal of occupational therapy practice (Wilcock et al., 1997). Occupational therapists also have a social responsibility to provide information to contribute to the health debate on the basis of their professional and philosophical background.

The importance of balancing time spent in core occupational performance areas of work, rest, play/leisure and self-care has been acknowledged throughout the profession’s history (Meyer, 1952; Kielhofner, 1977; Christiansen, 1996). While the ideal occupational balance has been proposed as an approximately equal involvement between physical, mental, social and rest occupations, this issue has been debated for adult populations and may well be different for children (Bungum, Dowda, Weston, Trost & Pate, 2000; Wilcock et al., 1997). The need to clarify the current occupational therapy knowledge base concerning how children function as developing occupational beings has been identified as a key area of professional concern for therapists working with younger populations (Humphrey, 2002).

Understanding the multitude of factors influencing temporal balance between passive and physically active occupational performance has clear implications for ‘healthfulness’, which leads to optimal quality of life and a sense of well-being and satisfaction in one’s own activities (Yerxa, 1997). Temporal balance can be viewed as optimal engagement in activities that have a positive influence on physical health and psychosocial well-being (Pentland, Harvey & Walker, 1998). Research on children’s actual time use offers empirical information on how time is distributed between different areas of daily life, but the relationships between activity engagement and outcomes such as satisfaction, skill development and other outcomes have proved more difficult to elucidate (Larson & Verma, 1999).

In this paper, the factors influencing engagement in physically active pursuits will be explored, and the currently recommended daily amounts of physical activity for children will be discussed. The SCOPE-IT model (Synthesis of Child Occupational Performance and Environment — In Time) that was first described by Poulsen (2001) as one framework for systematically examining the multitude of factors impacting on occupational performance in children, will be used to explore patterns of physical activity engagement in children and by doing so, will facilitate the identification of those at risk of inactivity.

Explaining a child’s engagement in daily occupations by discussing the multifaceted processes and factors influencing occupational behaviour represents a move away from traditional practice, where a child’s behaviour may be described in terms of normative skill acquisition (Humphrey, 2002). This paper addresses the call for further articulation of the dynamic interplay of elements contributing to the healthy development of children as occupational beings by describing factors impacting on engagement in one area of daily living — physically active pursuits (Humphrey).

The aims of this paper are to: (i) present current opinions on the risks of physical inactivity and what constitutes healthy balance in relation to physical activity requirements for children; (ii) describe the complex interrelated contextual, interpersonal, intrapersonal and temporal influences on physically active patterns of occupational behaviour using the SCOPE-IT model as a means of systematically examining these factors; and (iii) discuss future directions for occupational therapy practice in identifying children at risk of developing physically inactive lifestyles and promoting healthy engagement in optimal levels of physical activity.

**PHYSICAL INACTIVITY: THE RISKS**

The promotion of healthy lifestyle behaviours from childhood to old age is an important preventive health goal for the occupational therapy profession. The health risks of being physically inactive in adulthood include obesity, cardiovascular disease, hypertension, non-insulin dependent diabetes mellitus, osteoporosis, colon cancer and premature mortality (Pate et al., 1995; Haskell, 1996; Katzmarzyk, Malina & Bouchard, 1999).

Encouraging physical activity and the pursuit of physical fitness in children has significant health benefits (Riddoch, Savage, Murphy & Boreham, 1991; Shephard, 1995; Sothern, Loftin, Suskind & BLEcker, 1999). These benefits include reduction of low-density lipoproteins concurrent with an increase in high-density lipoproteins, improvement of glucose metabolism in children with type II diabetes, and an increased interleukin-2 natural killer cell system, which increases immune system responses (Sothern et al.). Improved strength, self-esteem and body image, and other stress-reducing effects are associated with lifestyles where there are optimal levels of physical activity (Sothern et al.).
HEALTHY BALANCE

What is the ideal amount of physical activity?

Activities of a moderate to vigorous intensity that cause children to 'huff and puff' for 30 min, three to four times per week, have been found to enhance overall health and assist in preventing chronic disease in at-risk youth (Sothtern et al., 1999: The Australian Council for Health, 1987). More recently, it has been recommended that all young people should participate in moderate physical activity for up to 60 min per day as the ideal goal. Activities that build muscle strength and flexibility and promote bone growth are recommended at least twice a week (Cavill et al., 2001).

Comparisons of actual amounts of time distributed between activities of differing levels of physical intensity and duration indicate that there are gender, biological, age and socioeconomic status influences in children's abilities to meet these minimal physical health requirements. Perceptions of the ideal balance of time spent in differing physical and sedentary activities need to be considered within the social, physical and psychological framework of the activity. This broader perspective of balance considers not only temporal factors but also social ecological variables impacting on activity choice and ongoing engagement (Christiansen, 1996).

From the child's perspective, optimal balance between activities may be associated with the fulfilment of basic needs for competency, autonomy and relatedness (Deci & Ryan, 2000). Engaging in physical activities that provide optimal amounts of enjoyment, challenge and self-direction, as opposed to stress, boredom and external direction, are important outcomes to measure when evaluating the positive benefits of different physical activity engagement experiences (Larson, 2000). Are there ideal amounts (or minimal amounts of time) that children of different ages and genders should spend in team versus solitary physical activities? How much time should be allocated to adult-controlled versus child-determined physical activity? The American Academy of Pediatrics (2001) has issued national guidelines recommending that young children should spend no more than 15–20 min in an adult-controlled, organised sports activity before having a free play break of at least 30 min.

Cost-benefit analyses of physical activity engagement in different contexts must always consider the child's perceptions of satisfaction and well-being, stress and challenge. An extensive review of many of these factors associated with children's time use has concluded that to date, research has not established the optimal balance of benefits and costs from a satisfaction and well-being perspective (Larson & Verma, 1999).

Thus, although guidelines regarding the recommended amount and type of daily physical activity engagement for positive physical health outcomes for children have been established, similar information regarding the mental health and well-being outcomes of physical activity have not been detailed in a similarly prescriptive form. Meeting needs over time through competent performance in a variety of occupational roles and settings was proposed by Kielhofner and Burke (1985) as being a more important measure of balance (termed occupational role balance), than measuring time spent engaging in different everyday activities alone (Christiansen, 1996). Examining the relationships between how satisfying the occupational engagement experience has been for the individual, how much time has been proportioned or is available to complete the activity and the contextual supports or constraints for activity engagement provides information on adaptive outcomes related to occupational role balance.

To date, the most widely used processes for gathering information about children's occupational performance engagement are client-centred models that focus on the 'doing' component of occupational behaviour and the collation of data about the multitude of environment-level and child-level factors that support or hinder participation in a range of daily tasks (Mew & Fossey, 1996: Coster, 1997). Systematic, ecologically sensitive appraisals of the occupational behaviour of children have only recently been considered as first-line measures to replace or supplement the array of paediatric assessment tools that are based on developmental models that are hierarchical and linear (Coster; Humphrey, 2002).

Understanding the complex relationships between the multitude of dimensions that influence everyday decisions about occupational performance engagement and encouraging positive participation in health-enhancing occupations is a strength of occupational therapy that can be harnessed to prevent ill health related to sedentary behaviour patterns. Informed decisions regarding activity options, however, require an in-depth appreciation of background variables. One way to visualise the myriad of variables involved in the decision to engage in physically active occupational behaviours is to describe these dimensions using a framework such as the SCOPE-IT model (Poulsen, 2001). In this model, integral child-level variables that influence activity engagement are examined concurrently with environmental-level variables. The combination or synthesis of these elements contributes to the complex whole that is occupational behaviour.
THE SCOPE-IT MODEL OF TIME USE

The SCOPE-IT model (Fig. 1) has built on established concepts underlying the occupational frame of reference for children that describe the process of occupational synthesis aimed at maximising the child-environment-occupation fit (Primeau & Ferguson, 1999). Children are viewed through an occupational lens by examining the relationships between the child, their environment and their occupations in a temporal context (Kielhofner, 1977; Primeau & Ferguson; Strong, Rigby, Stewart, Law, Letts & Cooper, 1999). Temporal elements at the child-level include the developmental, chronological and biological background of the individual that may influence psychological and physical functioning. Environment-level temporal variables include seasonal influences, geophysical cycles, sociocultural and physical environmental factors that influence occupational behaviours such as physical activity engagement (Rowland, 1999).

The central focus of the SCOPE-IT model is on the child’s involvement in areas of occupational performance. This model has attempted to reflect Adolf Meyer’s original theoretical encapsulation of occupational therapy, in which the value of the balance in the daily rhythms of life was emphasised. Specifically, Meyer described four principal activities — work and play and rest and sleep, which must be balanced, even in difficult conditions (Meyer, 1952). For children, these core occupational performance areas may be described as self-care, play or leisure, rest or sleep, and work. The collation of information on distribution of time in these key areas and the impact that different environment and child-level variables have on time use can be considered one important part of occupational therapy practice.

Occupational synthesis of the physical and sociocultural circumstances external to the child, and the individual’s developmental structure is a common core concept underlying many different frames of reference and models of practice in occupational therapy (Nelson, 1995). The SCOPE-IT model incorporates occupational synthesis of environmental conditions and performance components that interconnect with each other at different temporal levels.

Using the SCOPE-IT model to understand and promote physical activity engagement in children

The occupational therapist’s role in health promotion through occupation lies not only in understanding dispositional factors such as intrinsic motivation, perceived competence and other psychological and physical factors, but also in recognising the influence of situational factors. The conceptualisation of human health as multifaceted and multidimensional offers a myriad of opportunities for preventive health initiatives.

Health in humans has been defined as having physical, social and psychological dimensions with positive and negative poles along each dimension. Positive health is perceived as a disease-free state associated with adaptive behaviours including the capacity to enjoy life and withstand challenges. Negative health, in contrast, is associated with morbidity, and in the extreme, with premature mortality (Bouchard et al., 1993). An important goal, therefore, is to shift the balance along each dimension towards the positive, and to encourage optimal activity involvement.

The interconnecting links of the SCOPE-IT watchband represent the multitude of factors that influence a
child's activity engagement. Each factor can assume varying levels of influence upon the child's occupational performance patterns of engagement. The focus is not on the underpinning components of performance but on the balance and quality of time spent engaging in daily occupations. This reflects the philosophical background of the Lifestyle Performance model, which is concerned with the identification of lifestyle configurations of activity patterns that optimise individual wellness and quality of life (Fidler, 1995).

The central clock-face of SCOPE-IT represents a means of measuring the quantity and quality of time spent performing different activities. In the area of physical activity, the amount of time children spend in physical activity episodes, as opposed to other areas of daily living, can be mapped out by using the clock face as a pie chart. This is an easily understandable and recognisable concept for all members of the community. The use of a watch as a figurative, temporal symbol of the SCOPE-IT model allows therapists to clearly depict the quantitative aspects of activity involvement, and allows clients and clinicians to perceive the temporal structure of day-to-day activities as well as over long periods of time.

The qualitative aspects of occupational performance are included along with the more readily quantifiable aspects of occupational performance in the SCOPE-IT model. These elements relate to the use of the clock hands to represent choice and effort. ‘Choice’ means the willingness to attempt or select a physical activity over another activity that may be less physically demanding, and ‘effort’ refers to the vigor or energy commitment expended in performing the task. ‘Choice’ empowers individuals to exert control over an activity, thereby allowing for an adaptive response. This has been regarded as the very heart of clinical occupational therapy practice (Wood, 1996). Exploring choices in physical activity options means addressing complex issues at the individual level such as competency perceptions, task values, relative autonomy, actual skills for the task and competing interests (Wigfield & Eccles, 2000). Identifying choices at the environment level means addressing issues relating to support and availability of activities, as well as considering the constraints or barriers to activity participation at the school, family and wider community level (Law, Haight, Milroy, Willsm, Stewart & Rosenbaum, 1999).

‘Effort’ has also been identified as a key construct in occupational performance. A principle theme in occupational therapy, since its inception, has been that the process or effort expended, rather than the product, article or activity accomplished, is the true measure of personal accomplishment (Bing, 1981). Expending effort and being committed to the activity leads to identity building, sense of purpose and meaning in life (Christiansen, 1999). Understanding and promoting physical activity engagement in children therefore requires an in-depth knowledge of the child’s individual and environmental circumstances that will lead to optimal choice and effort being maximally expended in physical occupational behaviour.

**Child-level variables that influence physical activity engagement**

Children’s choice of physical activity participation over other activities is influenced by child-level variables including physical factors related to skill development or physical fitness, psychological correlates including cognitive, emotional and motivational elements, and temporal issues pertaining to developmental and chronological changes. The thrill, excitement and fun of the activity have been rated highly by children as important psychological drives for sport participation (Taylor, Blair, Cummings, Wun & Malina, 1999). The impact of the motivational climate in physical education classes, past experiences and involvement in different physical activities, and access to a range of physical activity experiences can impact on a child’s perceptions of physical self-efficacy and influence life-long motivational patterns (Locke, 1996; Martens, 1996).

Physical characteristics that have been correlated with physical activity patterns include age, gender, motor coordination and physical fitness (Sallis & Saelens, 2000). There are well-documented gender differences in physical activity levels. The tendency for girls to be less physically active than boys is present as early as 8–10 years of age (McMurray, Harrell & Bangdiwala, 1994). Boys tend to be more involved than girls in organised leisure activities that require physical skills, and by middle childhood, peer activities tend to be gender segregated (McHale, Crouter & Tucker, 1999). Boys, who have an interest in sports media, have exercise knowledge, and who are involved in community physical activity organisations are more active than girls (DiLorenzo, Stucky-Ropp, Vander Wal & Gotham, 1998; Trust, Pate, Ward, Saunders & Riner, 1999).

If the necessary fundamental motor skills are lacking, and the physical experience has maladaptive outcomes, then intrinsic interest in physical activity as an ongoing source of pleasure and satisfaction is unlikely to follow. It has been suggested that negative experiences may contribute to lifetime avoidance of physical activities (Locke, 1996). The belief that engagement in physical exercise can be a source of enjoyment rather than a prescribed exercise, needs to be encouraged from an early age if lifelong physically active behaviours are to be realised (Taylor et al., 1999). The repercussions of encounters with unsympathetic or ill-informed coaches whose unrealistic
program demands and ego-orientated goals support the 'win-at-all costs' mentality has a detrimental effect on children with lowered levels of motor competence (Portman, 1995; Wright, 1997).

Choice, effort and persistence are adaptive outcomes of activity engagement that are associated with increased intrinsic motivation and positive physical activity experiences. Allowing children to have a choice encourages the development of self-regulation associated with self-determined motivation to learn, to accomplish and to experience pure enjoyment of 'flow' (Csikszentmihalyi, 2000; Deci & Ryan, 2000). The issue of external versus internal control, in relation to individual choice, is a significant factor to consider when evaluating different perspectives on occupational engagement.

Research suggests that up to 20 per cent of children do not enjoy physical education at school (Carlson, 1995). Considering that during early and middle childhood a significant proportion of a child's time for physical activities is spent at school, the lack of enjoyment and participation of many children in physical education and recess physical activity is a cause for concern. The likelihood of these children continuing to participate in organised physical activities out of school hours when choice is available is unlikely. In contrast, motivated children and parents may find alternative physical activities that meet the child's individual needs.

There is a need to provide opportunities for skill practice for children with motor performance difficulties so that the maximum participation in lifetime health and fitness programs can take place. It has been found that active participation in physical activities at 36 years of age is significantly related to ability in sports at 13 years of age (Kuh & Cooper, 1992). Occupational therapists have an important role in developing appropriate intervention strategies and consulting with relevant community groups about skill development for at-risk children such as youth with developmental coordination disorder, DAMP (i.e. deficits in attention, motor control and perception), obesity, depression and diabetes (Cantell et al., 1994; Cavill et al., 2001; Poulsen & Ziviani, 2004).

ENVIRONMENT-LEVEL VARIABLES

Physical environment

The influence of the physical environment on children's physical activity engagement has been the least studied category of potential determinants of physical activity. Environmental influences such as location and month of the year have, however, been identified as strong predictors of physical activity (Sallis & Owen, 1999). The effect of weather patterns, seasonal changes, physical locations, space and facilities has received less empirical attention than the effect of the child's sociocultural environment or individual characteristics on physical activity participation (Sallis, Johnson, Calfas, Carparosa & Nichols, 1997).

Ecological paradigms examining reciprocity between the individual and environment are increasingly recognised for their pivotal role in conceptualising occupational performance in natural environments (Kellegrew & Kroksmark, 1999). Understanding the constraints or barriers to physically active pursuits in various environments is an occupational therapy concern that implicitly recognises that participation levels will be significantly altered when safe, inclusive facilities are available for children (Law et al., 1999).

Article 31 of the United Nations convention of the 'Right of the Child' imposes on the state an obligation to provide safe and attractive facilities for all children (Alston & Brennan, 1991). The incumbrancy on councils and schools to provide safe equipment for climbing and physical exploration that nevertheless presents a challenge to children is an important, if at times onerous responsibility. Despite these stated intentions for adequate provision of facilities for physical activity, it is contended that insufficient play areas have been set aside, especially in urban areas, for children (Turner, 1995). The increase in sedentary behaviour with age has been speculatively linked to declining levels of free play rather than decreasing levels of participation in organised sports, whether at school or outside school hours (O'Loughlin, Paradis, Kischuk, Barnett & Renaud, 1999).

Confined living spaces, lack of available play areas around the home and the absence of public parks adjacent to the home have been found to influence physical activity engagement (Johns & Ha, 1999). The low activity levels found in early school-aged children playing at home in apartment-block settings, have been found to persist in the school playground, suggesting that inactive behaviour habits established in one environment may flow over to other environments (Johns & Ha).

Social and cultural environment

Constraints or barriers to physical activity participation may vary across cultures and within different community contexts. Environmental press is a term used by ecological psychologists when describing the combined forces that shape and influence the behaviour and development of people in different contexts (Garbarino, 1989). Environmental press in physical activity engagement patterns is evident when insufficient time and space is available for children to participate in physical activities. This is one of many factors that have contributed to the declining fitness
levels and associated health concerns seen in industrialised nations today (Cale & Almond, 1992; Kirk, O’Connor, Carlson, Davis & Glover, 1997; Shropshire & Carroll, 1998). Socioeconomic constraints including purchase of equipment or clothing items, club membership and coaching fees, insurance and sport-hiring costs, have proved to be barriers to children’s participation in sport (Kirk et al., 1997). Conversely, home environments where there is access to exercise equipment and transportation to sporting venues has been shown to increase the probability of children developing physically active lifestyles (Sallis et al., 1997).

The relationship between male gender, socioeconomic status (SES) and levels of physical activity has been examined in several studies, but results have been inconclusive. Pre-adolescent boys with lower SES were reported as being more physically active than boys of higher SES in one study, but the reverse was found in another study of slightly older boys (Aaron et al., 1993; Harrell, Gansky, Bradley & McMurray, 1997). These two studies also differed in their findings of the relationships between physical activity levels and ethnic differences.

Girls’ participation in organised sports outside school has been related to their father’s educational attainment and income sufficiency (O’Loughlin et al., 1999). The relationship between lower SES and decreased participation in physical activities in girls has been demonstrated in several studies, indicating that this is a group particularly at risk of developing sedentary lifestyles (Aaron et al., 1993; Sallis & Owen, 1999). Improving access and quality of school-based physical activity programs may benefit all children regardless of gender, SES or ethnic origin.

In some schools, it has been postulated that participation in physical education is declining because of staff funding issues and inadequate numbers of teachers willing to give up their time to extra-curricular sport (Turner, 1995). Increasing the budget allocation for the training of teachers and access to support personnel such as occupational therapists will improve the provision of quality physical education programs in all schools.

Providing ‘sport for all’ rather than producing winning teams means adapting the curriculum to provide activities that can be played individually or by small groups as well as the more traditional team sports. The policy of placing less emphasis on traditional team games in school has been linked to greater physical activity participation by at-risk groups such as girls and children who have coordination difficulties (Roberts, 1996).

Parents are also significant socialising agents for sports participation in children, with higher social support being associated with increased physical activity (Brustad, 1993; Simons-Morton et al., 1997). Under the age of 11 years, parents may exert the strongest influence on where and how children invest time in physical activities (Jambor & Weekes, 1994). This influence on children’s activity choice declines with age with adolescents becoming increasingly proactive regarding activity selection and commitment to ongoing activity participation (Schmitt-Rodermund & Vondracck, 1999).

Parental beliefs, attitudes, expectations, encouragement and values about sport have been reported as having an effect on childhood sport and physical activity engagement (Brustad, 1996). Parental evaluation about the quality of the physical education program, the transportation arrangements and financial support considerations will affect the participation and enrolment of children in the program (Jambor & Weekes, 1994). Parents may also enrol their child if there is social pressure for doing so and if the registration process is not perceived as too arduous (Atsalakis & Slep, 1996).

Other social influences such as the perceived beliefs of peers, teachers and other family members have been found to significantly correlate with vigorous and moderate physical activity for boys but not for girls (Trost et al., 1999). Boys have been reported as being significantly more confident than girls in overcoming barriers to physical activity such as homework obligations, time constraints, feelings of fatigue and poor weather (Trost et al.). Active boys participate in more community individual and team sports, but have also been found to watch significantly more television than girls (Howell, Sallis, Kolody & McKenzie, 1999).

IDENTIFYING CHILDREN AT RISK OF PHYSICAL INACTIVITY

When studying physical activity levels, the likelihood of under- or over-reporting levels has been linked to differing methodologies in collecting data. Objective measures using observation, heart-rate monitoring, or accelerometers or pedometers have limitations with regard to collecting information over extended time periods, which is necessary if long-term data on physical activity is to be collected. Self- or proxy-reports may be prone to memory lapses where sporadic activity is forgotten. The thresholds of activity to determine sufficient participation and ongoing health benefits need further exploration in the light of these considerations (Shropshire & Carroll, 1998).

It is known that physical activity levels decrease with age, and there is evidence that they track or persist over time, with children who are identified as being less active than their peers becoming sedentary adults (Malina, 1996; Pate, Baranowski, Dowda & Trost, 1996; Vanreusel, Renson, Beunen, Claessens, Lefevre & Van den Eynde, 1997). Gender effects are well documented with evidence
that girls participate in less physical activity at all ages in organised and recreational sports (Duda, 1991; Sallis & Owen, 1999; Trost, Pate, Dowda, Saunders & Felton, 1996).

It has been recognised that it is difficult for adults to change from sedentary to active lifestyles, and to maintain these positive changes on a long-term basis. Therefore, it is recommended that interventions aimed at improving the skills, attitudes and values regarding physical activity be seen as a prime concern of health professionals (Atsalakis & Sleap, 1996). Occupational therapy’s central focus on the balance between occupations of daily living in the areas of work, rest and play is philosophically well suited to the identification of individual and environmental factors that contribute to an at-risk profile of imbalance between physically active and inactive behaviours. Balanced health enhancing time-use promotion and the instigation of interventions to improve health and well-being is a recognised goal of occupational therapy practice (Wood, 1996; Wilcock et al., 1997). Understanding the multitude of factors that influence the child-environment-occupation fit is the first step in identifying individuals at risk of developing an imbalance in daily pursuits that lead to sedentary lifestyles (Primeau & Ferguson, 1999; Yerxa, 1998).

**FUTURE DIRECTIONS**

Future directions for occupational therapy practice include increasing occupational therapy involvement at a broader community level within schools, sporting associations and at a social and health policy level regarding preventive health programs that encourage physically active lifestyles for children. Contributing to policy development in preventive health programs and increasing physical activity in the children’s daily lives means moving beyond traditional educational and health settings, and requires input from informed practitioners about children’s current patterns of engagement in developmentally beneficial activities. The strength of the occupational therapy contribution in this area stems from the profession’s skills and knowledge base in understanding complex occupational performance phenomena and the links that this has with physical and mental health and well-being. From the occupational therapy point of view, physical activity is one of many areas of occupational performance that needs to be considered when understanding the individual’s unique patterns of engagement in a broad range of daily activities. Models such as SCOPE-IT can be used as a pictorial aid with community groups and prospective clients to explain complex occupational phenomena by presenting a conceptual representation of the many input and output variables influencing daily activity patterns. The use of representational models allows for simpler explanations of multifaceted phenomena without losing sight of the multitude of factors influencing occupational performance.

Physical activity was chosen as one area where the existing information on child-level and environment-level variables is readily available. It is recommended that other areas of occupational performance be explored in a similar way to this review of physical activity engagement in children using the SCOPE-IT model.

Further research is necessary to expand the information on the benefits and costs of different levels of engagement in physical activities from a mental health and well-being perspective. Some of the more topical areas of community concern that might be addressed include issues such as burn out of elite athletes, and the factors associated with children being overcommitted in one field of physical pursuit at the cost of imbalance in other areas of daily life. Investigating time use and satisfaction outcomes of engagement in competitive sports, child-determined activity schedules as opposed to adult-determined activity engagement are other areas of popular interest as well as being worthy research topics. Child perspectives versus adult perspectives on what constitutes optimal balance from a time-use viewpoint and from an occupational balance investigation of physical and mental health outcomes have also been mentioned as important avenues for future research. Certainly, there is no doubt that more research is needed in developing and adapting existing methodologies to explore some of these issues for younger populations.

**CONCLUSIONS**

The promotion of physical activity is a priority for all health professionals. In this paper, the SCOPE-IT model was used to describe the complex interpersonal, intrapersonal and temporal influences on physically active patterns of occupational behaviour. The risks of physical inactivity and what constitutes healthy engagement in physical activities was described in relation to the current guidelines for minimal amounts of physical activity for children for promoting optimal physical health. However, it was noted that no such guidelines are available for life satisfaction and well-being outcomes of physical activity engagement in children.

It was recognised that the understanding and promotion of engagement in physical activities from a mental health and well-being perspective requires further analysis of this particular area of children’s occupational performance. The psychosocial outcomes of balanced engagement
in physical versus sedentary activities from a time-use and an occupational-role balance perspective need to be further explored. Holistic, ecological frameworks such as SCOPE-IT, allow for the systematic exploration of multi-dimensional activities such as physical activity engagement, where complex child-environment-occupational interactions are observed. Occupational therapists have the opportunity and responsibility to positively influence the health and well-being of children at an individual and societal level. Consumer-friendly models such as SCOPE-IT that graphically demonstrate the multifaceted influences on children’s occupational performance in physically active pursuits offer a visually attractive means of explaining and exploring these health enhancing goals.

ACKNOWLEDGEMENTS

This study was made possible by financial support from The University of Queensland, Brisbane. Special thanks are extended to Katherine Poulsen (James Cook University, Townsville) for her graphic skills in drawing the diagrammatic representation of the SCOPE-IT model.

REFERENCES


Health enhancing physical activity


Chapter 3: Paper 2

Can I play too? Physical activity engagement of children with developmental coordination disorders

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Key words
- Developmental coordination disorder
- Physical activity
- Paediatric occupational therapy

Abstract

Background. Children with developmental coordination disorders (DCD) are less physically active and have significantly different patterns of social and physical play than their well-coordinated peers. Factors. The impact of motor incoordination on physical activity engagements throughout life is influenced by a multitude of factors. External factors such as the social, cultural and physical environment may act as either supports or barriers to active physical involvement. Individual characteristics including the unique physical and psychological attributes of the child with motor coordination difficulties also impact on engagement in physically active occupations.

Result. A model is proposed that conceptualizes the multiple dimensions which impinge on the decisions to select, engage and persist in physical activities for children with developmental coordination disorders.

Practice Implications. The occupational therapist’s role in promoting a balanced and physically active lifestyle is explored. Interventions to increase physical activity participation for children with DCD are dependent on a full understanding of the complex, multi-dimensional correlates of occupational engagement.

Résumé

Description générale. Les enfants ayant des troubles de l’acquisition de la coordination sont moins actifs physiquement et ont des comportements sociaux et de jeu significativement différents des enfants sains. Facteurs. Les répercussions d’une incoordination motrice sur la participation à des activités physiques tout au long de la vie sont tributaires d’une multitude de facteurs. Des facteurs externes tels que les environnements social, culturel et physique peuvent être favorables ou défavorables à la participation à une activité physique. Des caractéristiques individuelles comme les attributs physiques et psychologiques de l’enfant atteint de troubles de coordination motrice ont également un effet sur la participation à des occupations physiques actives.

Résultat. Le modèle proposé est une conceptualisation des multiples dimensions en jeu lorsque les enfants atteints d’un trouble de l’acquisition de la coordination décident de choisir et de participer à des activités physiques et de persister. Conséquences pour la pratique. L’article discute du rôle possible de l’ergothérapeute dans la promotion d’une vie active et équilibrée. Les interventions visant à rehausser la participation des enfants atteints de troubles de l’acquisition de la coordination à des activités physiques doivent être fondées sur la compréhension des corrélats complexes et multidimensionnels de l’engagement dans des occupations.
Children with developmental coordination disorders (DCD) have significant difficulties performing daily activities that require motor coordination. This aspect of performance has been recognised in the American Psychiatric Association's Diagnostic and Statistical Manual for Mental Disorder (DSM-IV) classification criteria (American Psychiatric Association, 1994). A diagnosis of DCD can only be made if the motor impairment significantly interferes with activities of daily living or academic achievement.

The long-term influence of motor coordination impairments on physical skill levels and mental well-being has been well documented (Cantell, Ahonen & Smyth, 1994). These motor problems are associated with low levels of physical activity and decreased physical fitness levels (O'Beirne, Larkin & Cable, 1994). The majority of children with DCD are inactive in the playground, more solitary and spend more time in onlooker behaviour than their peers (Smyth & Anderson, 2000). In physical education classes children with coordination difficulties have also been found to be less active than their physically well-coordinated peers (Thompson, Bouffard, Watkinson & Causgrove Dunn, 1994).

The physical activity engagements of children with DCD warrant attention in the light of preventive health concerns about the implications of sedentary lifestyles on health and well-being (Sallis & McKenzie, 1991). The low levels of physical activity observed in young children with movement difficulties is an area of concern for occupational therapists working with this population (Bouffard, Watkinson, Thompson, Causgrove Dunn & Romanow, 1996). Altered occupational engagement in age-typical, leisure-time sports and physical activities in childhood and adolescence has social, emotional and physical health implications (Geuze & Borger, 1993). Interventions to increase physical activity participation for children with DCD are dependent on a full understanding of the complex, multi-dimensional correlates of occupational engagement.

In this paper, a model will be proposed to conceptualize the many factors impinging on the decisions to select, engage and persist in physical activities for children with DCD. The impact of motor coordination impairment on physical activity engagement will be reviewed in terms of the preventive health aspects of balancing time between physically active and inactive pursuits. An argument for promoting physical activity in at-risk populations such as children with DCD will also be presented.

Why is a model necessary?

A model is beneficial for identifying key issues that need to be considered when planning interventions for children at-risk of developing sedentary lifestyles. The physical activity engagements of children with DCD are likely to be as diverse and complex as the unique individual and environmental circumstances of each child. Broadly speaking, the reduced engagement in many physical activities can be influenced by external factors such as the social, cultural and physical environment of the child. More specifically, individual characteristics such as each child's unique physical and psychological attributes can also affect their choice, effort and persistence in active occupations.

Using a model will also help identify contributing factors and relationships between the diverse variables that contribute to patterns of physical activity or inactivity. Physical inactivity is a major public health issue and constitutes an area of concern which falls well into the domain of occupational therapists in terms of assessing occupational balance in all areas of daily life (Wilcock et al., 1997). The immediate and long-term consequences of leading a sedentary lifestyle on health have been found to be serious and pervasive (Janz, Dawson & Mahoney, 2000). Cardiovascular diseases, diabetes type II, obesity, colon cancer, osteoporosis and depression have all been linked to inactive lifestyles established during youth (Sallis & Owen, 1999). Physical activity engagement patterns are multi-dimensional and tend to track over time with youths at the extremes of physical activity (i.e., those with the highest and lowest levels of physical activity) tending to maintain their physical activity habits as they grow older (Janz et al., 2000; Sherman, 2000).

SCOPE-IT model for physical activity engagement patterns of children with DCD

The interaction of individual and external multi-dimensional factors that influence physical activity engagement patterns of children with DCD can be viewed using the SCOPE-IT (Synthesis of Child, Occupational Performance & Environment-In Time) model (see Figure 1). The SCOPE-IT model expands on the child-environment-occupation-fit model to include temporal factors (Primeau & Ferguson, 1999). It provides a visual conceptualization of the integral relationship between the child's occupational performance components, the child's occupational engagement and the environmental context in which this occurs (Poulsen, 2001).

The focal point of the SCOPE-IT model is a watch face where the areas of occupational performance have been distributed around the perimeters. By focusing on the central issues of time and occupation this model has attempted to reflect Adolf Meyer's original theoretical encapsulation of the essence of occupational therapy in which the value of balance in the occupational daily rhythms of life was emphasized. Specifically, Meyer delineated four central

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occupations that he described as work and play and rest and sleep, which an individual must be able to balance even under difficulty (Meyer, 1952).

In the current SCOPE-IT model the four categories of work, rest/sleep, play/leisure and ADL (Activities of Daily Living) have been used. At the centre of the watch face are the pivoting hands of time, effort and choice. Motivation theorists (Wigfield & Eccles, 2000) have proposed that an individual's intrinsic and extrinsic motivations, as well as their efficacy beliefs and purposes for engagement in activities, play important roles in decisions about what activities to engage in (i.e. choice), how long to do them (i.e. time) and how much effort to put into them (i.e. effort). The representation of these constructs on the clock hands allows for the quantification of amount of time, effort and choice of activity within the broader categories of work, rest/sleep, play/leisure, and ADL. The temporal component of these pursuits is considered at a qualitative
and quantitative level for individuals functioning in different environmental contexts.

**The temporal level: Occupational performance in time**

The interrelationship of person-level and environment-level factors influences the quality and quantity of time allocated to different activity domains within an individual’s global occupational repertoire. For children with DCD, participation in developmentally typical physical activities varies widely according to the activity context, the variable physical skill level of that child and the psychological make up and background of that individual. It is important to consider all these variables when predicting or encouraging time allocation so that a balanced portfolio of occupational engagements will be a therapeutic outcome.

Economists have traditionally looked at time as a unit of human or social capital (Larson & Verma, 1999). Although adults’ time use in work-related occupations has been measured in terms of inputs into a society’s economy, the quantity of hours and years that children spend in school work has also been regarded in terms of social capital because it can be transformed into marketable knowledge and skills. Conceptualising a child’s use of time in economic terms ignores the widespread effects of developing competencies in broader life skills that have no obvious market value but which contribute significantly to physical and mental well being (Larson & Verma, 1999).

Valuing work over play or other seemingly non-productive activities may lead to the situation where an increasing amount of time is spent in productive activities that are adult-supervised, structured and sedentary. Engagement in free play and outdoor leisure pursuits may be regarded as a less important use of time. Such a limited view of children’s time use ignores the health benefits of balance between occupational pursuits. Occupational therapists have an expanded view of children’s time use and recognize the importance of activity engagement in all areas of life. Balancing time between these different occupations is seen as an opportunity to develop wider life skills that are essential for physical and mental health and well-being (Larson & Verma, 1999).

Children with DCD appear to be one population at risk of imbalance in the time that is allocated to physically active pursuits over sedentary activities throughout life. On the whole, these children spend less time in physically active pursuits and have lower levels of physical fitness than their peers who have no movement coordination difficulties (Bouffard et al., 1996; O’Beirne et al., 1994). Studies of how children with DCD spend their time in the daily occupational tasks of childhood have noted that many engage in solitary behaviour and are vigorously active less often than same-age peers with no coordination difficulties (Bouffard et al., 1996; Cantell et al., 1994; Smyth & Anderson, 2000). A small number of younger children with DCD participate in formal team games in the early school years but withdraw from these activities by seven to eight years (Smyth & Anderson, 2000). Longitudinal studies have confirmed that the low rates of team participation found in childhood continue into early adolescence with individual activities such as archery, swimming and gymnastics or dual activities such as badminton being preferred physical pursuits (Christiansen, 2000).

There is evidence to suggest that for a small percentage of individuals with DCD the ongoing lifelong patterns of low physical activity engagement may be mediated by as yet unidentified factors at an individual or environmental level (Cantell et al., 1994). This small group has been described as investing large amounts of time in physical activities such as team sports, with varying amounts of success (Smyth & Anderson, 2000). In adolescence this small group of active sports participants also appears to have less extreme motor problems (Cantell et al., 1994). Does this apparent outgrowing of the physical coordination difficulties arise from increased investments of time allocated to physical pursuits? What are the individual or environmental characteristics that have supported physical activity involvement for these physically active adolescents with DCD? The longitudinal patterns of activity engagement and the relationships of external and individual variables to physical skill level have not been fully addressed as research issues but may provide important leads to increasing understanding and intervention directions for children with DCD.

**The environment level: Occupational performance contexts**

Environmental factors play an increasingly significant role in skill development with age (Walkley, Holland, Treloar & Probyn-Smith, 1993). Opportunities to practice, interest in the child’s activities by significant others and the quality of instruction are among the many environmental factors shown to influence skill development (Sallis & Owen, 1997). There are numerous constraints/barriers to physical activity in urban environments. Economic constraints influence the provision of facilities in communities. The costs involved in buying equipment, joining clubs or receiving tuition affect participation rates. Other constraints such as space, safety concerns, transport issues and sociocultural beliefs pertaining to age and gender have been measured in relation to the provision of healthy environments for physical activity (Richter et al., 2000).

The teachers, coaches and parental belief and value systems may support or constrain physical activity participation of children with DCD. The school value system has
been recognised as playing an important part in determining the extent to which achievements in various activities are accorded high or low status (Martens, 1996).

Family belief systems also influence physical activity engagement (Brustad, 1993). Parents with competitive outlooks or ego orientations can negatively influence the physical activity involvements of their children (White & Duda, 1994). High individual levels of ego orientation have been associated with poor attitudes and debilitating thoughts about sport and negative affective responses (Duda, 1996). Children with high ego and low task or mastery motivation orientations would rather not attempt an activity at all than risk failure. It is interesting that children with DCD may prefer to engage in skill mastery behaviour in isolation rather than in the presence of their peers in the playground (Smyth & Anderson, 2000).

Peers influence children’s perceptions at all levels and affect physical activity involvement (Portman, 1995). Children with DCD have been found to be less popular and more solitary than their peers who have no coordination difficulties. Children with low motor skills choose to play with other children of similar abilities if possible or engage in more sedentary pursuits such as book reading or fantasy play involving low physical demands. Poorly coordinated children perceive classmates support to be reduced, and are less likely to have a special friend (Rose, Larkin & Berger, 1994).

The low levels of involvement in team activities and preference for single or dual partner activities may limit opportunities to develop a wider circle of friends. Increasing social comparison as children grow older may contribute to selection of single or dual activities over team events with age (Causgrove Dunn, 2000). Sport is not only a public activity in which an individual’s performance can be critically evaluated by onlookers and other team members but it also constitutes an activity where individuals have some degree of control over the decision to withdraw or fully participate. These essential qualities of sport promote ongoing engagement of competent and physically able children. Children with low motor ability combined with low perceived physical self-competence frequently withdraw from sport or physically active pursuits in highly visible achievement situations particularly where free choice is available such as during school recess (Smyth & Anderson, 2000). The school playground constitutes a context where physical competence is observed and evaluated by peers on an almost daily basis. Children with DCD have been observed to spend more time alone in the playground than children with no coordination difficulties (Smyth & Anderson, 2000).

In physical education classes when the prevailing social climate is competitively oriented rather than task oriented, children with DCD have been reported as having lowered perceived physical competence (Causgrove Dunn & Watkins, 1996). The cumulative motoric, social and psychological consequences for low skilled individuals in physical education classes has been postulated as leading to lowered competence perceptions and poorer actual performance across many physical education activity units as well as contributing to learned helplessness (Portman, 1995). A cyclical pattern where initial failure breeds ongoing failure in physical pursuits can become established as a child matures and this may lead to a marked imbalance in physically active versus physically inactive occupational engagement (Portman, 1995).

Physically competent children assume positions of authority and power in team selections, develop negotiating and effective group entry strategies which in turn enhance their social and physical self-perceptions through repeated practice (Evans & Roberts, 1987). The more competent players appear to reap ongoing benefits in all spheres-physically, emotionally and socially. The less competent children on the other hand become excluded and may employ strategies involving aggression or clowning to gain group membership.

The child level: Occupational performance components

The physical characteristics of children with DCD are extremely varied and the selection of physical activities and the ongoing participation levels is likewise variable. A male preponderance has been consistently demonstrated for children with coordination difficulties with gender ratios of up to 4:1 (Smyth, 1992). It has been suggested that impaired motor skills may be more obvious in boys who are more physically active than girls and whose expected participation in a variety of team sports increases with age (Rose, Larkin & Berger, 1997). Children who are disadvantaged by restricted opportunities associated with traditional competitive team sports also include females with no movement difficulties as well as children with DCD. Boys with DCD may be particularly at risk because success in team-oriented sports has been considered to be one aspect of hegemonic masculinity (Wright, Sugden, Ng & Tan, 1994).

Children with DCD have lower fitness levels than their peers without coordination difficulties on measures of aerobic endurance such as the half-mile walk/run and anaerobic measures such as the Wingate cycle ergometer (O’Beirne et al., 1994). These children have been reported as producing more ineffective, extraneous movements and having less propulsion during explosive motor tasks. Low levels of physical fitness contribute to low participation and decreased enjoyment of physical activities and further low levels of fitness (Harvey & Reid, 1997).
The activity deficit hypothesis proposes that poor motor performance and physical fitness may be the result of a lack of sustained effort and practice, which leads to decreased self-perceptions of competence and further lowering of rates of participation in physical activities (Bouffard et al., 1996).

DCD is not an isolated motor problem but is associated with various affective problems even in children as young as six years (Schoemaker & Kalverboer, 1994). Higher levels of trait anxiety manifested by increased feelings of shyness, unhappiness and brooding about what other people might think of them has been demonstrated in children with DCD aged six to nine years (Schoemaker & Kalverboer, 1994). Increased state anxiety arising just before an evaluation of motor performance has consistently been found for girls but inconsistently reported for boys (Rose et al., 1997; Schoemaker & Kalverboer, 1994).

Methodological differences have been suggested as contributing to these findings (Rose et al., 1999). Measuring general feelings of anxiety immediately prior to the motor assessment rather than allowing a time lapse of one week between administration of the motor performance and anxiety measures may have influenced the scores of boys with DCD. The authors also suggested that boys with DCD may avoid expressing unpleasant feelings about sport or deal with them in an oblique and evasive manner (Rose et al., 1999).

Lowered feelings of perceived physical self-efficacy, have been consistently reported for physically inactive children in the community with girls being regarded as particularly at-risk (Eccles, Wigfield, Harold & Blumenfeld, 1993; Trost, Pate, Dowda, Ward & Felton, 1996). Children with DCD have lower physical competence perceptions than their well-coordinated peers and this has been associated with decreased social and scholastic competence perceptions and lowered global self-worth (Klein & Magill-Evans, 1998). Girls with DCD have been identified as having low self-perceptions of competence in all of the above spheres and also in perceptions of physical appearance and behaviourual conduct (Rose et al., 1997).

Lowered feelings of physical efficacy and social competence affect long-term perceptions of how children with DCD feel about themselves. It has been found that the children who outgrow the physical coordination problems do not always outgrow the psychological and social difficulties (Wright, 1997). The prognostic outlook is poorer for children with more signs of dysfunction across a broad spectrum (Shafer et al., 1986; Hellgren, Gillberg, Gillberg & Enerskog, 1993).

Affective and anxiety problems may persist even when the motor problems are not evident (Shafer et al., 1986). Reduced participation in everyday activities has been described for the majority of adolescents with DCD who have fewer social spare-time activities that are non-physical or physical (Cantell et al., 1994). Repeating a grade and having less social contacts or friendships have been found in longitudinal studies of youth with DCD (Geuze et al., 1993; Losse et al., 1991).

Influencing physical activity engagement patterns of children with DCD

Matching the physical characteristics of the child to the requirements of the activity and factoring in cost, safety and environmental considerations requires skill and planning using multi-dimensional models such as SCOPE-IT (Atsalakis & Slep, 1996; Poulse, 2001). Education of children, parents and teachers regarding the lifelong benefits of engaging in physically active pursuits regardless of ability or perceived ability is an essential health promotion goal. The development of programs to increase time spent in adaptive patterns of physical activity engagement for at-risk groups is an important priority for occupational therapists working with children with DCD.

Intervention strategies to increase levels of fitness in children with DCD include increasing personal and parental knowledge about the benefits of physical fitness for current and preventive health reasons. Identifying and encouraging strengths at the individual or environmental level to improve occupational engagement in physical activities that are matched to the needs and abilities of the child and family is an additional intervention goal. Educating individuals about alternative pursuits such as the broader and more encompassing lifestyle activities of walking, cycling, aerobics and swimming may appeal at different developmental stages (Mariens, 1996). These lifestyle activities have the advantages of being non-competitive, self-paced and group-optional and are likely to enhance perceptions of competence and autonomy for the child with DCD. Skiing, swimming, sailing, rock climbing, hiking, martial arts, yoga, weight lifting, dancing, scooterizing, rollerblading, surfing, kayaking and fencing are individual or dual activities that have high status in many peer groups and may also appeal to some children with DCD (Warburton, Slep & Williams, 1991).

Physical environments which support physically active play in unstructured, non-competitive situations can be advocated by occupational therapists working in school environments. Reducing the emphasis on competitive sports and increasing resources directed towards health-related fitness programs has been strongly advocated by health and physical education professionals since the early 1990's however school programs have not always reflected these policy directives (Sallis & McKenzie, 1991). Targeting school provision of physical activity opportunities for children with and without movement difficulties is a vital goal.
if the health-related needs of all children are to be met.

Wider community opportunities for physical activity engagement also need to be promoted by therapists who are seeking flexible and inclusive healthy pursuits for youth with DCD. Provision of walking trails, bicycle tracks, stimulating playgrounds and low-cost non-competitive fitness activities at a community level will facilitate involvement of all groups who are at risk of physical inactivity. Redirection of funds towards the physical underachievers rather than the elite few who excel at sport has widespread benefits at all levels of the community.

Conclusion
Studying occupational performance engagement in the context of models such as the SCOPE-IT provides a structure for reviewing the correlates of activity engagement and disengagement. The unique philosophical background underpinning occupational therapy is the key to conceptualising complex occupational behaviours and understanding the ecology of children’s time use patterns. Identifying factors that influence physical activity habits is an important first step in planning interventions to promote physical activity in at-risk groups such as children with DCD.

It is imperative that occupational therapists identify the activities and conditions that support occupational engagement in physically active pursuits for children with DCD. Inactive lifestyles have been estimated as contributing to over 200,000 premature deaths per year in the United States alone (Sallis & Owen, 1999). Identifying populations who are at-risk of developing inactive lifestyles, such as individuals with DCD, is an important goal of occupational therapy practice. Targeting these populations at an early stage before inactive lifestyles are entrenched is essential if preventive health goals are to be fully realized.

To achieve these goals there is a need to understand the way in which the many factors addressed in this paper influence children’s involvement in physically active behaviours. The SCOPE-IT model provides a framework to help practitioners and researchers to systematically consider the multi-level, multi-dimensional nature of the many factors that interact to influence occupational engagement. The SCOPE-IT model has future potential use for examining occupational engagement in these broader categories and with a range of client populations. It allows for exploration of human potential to engage in the balanced pursuit of occupations that are healthy and personally meaningful.

The complexity of the patterns of influence on occupational performance is seemingly overwhelming. This complexity however also offers unlimited avenues for intervention following thoughtful investigation and development of problem-solving strategies within and across domains at the individual and environmental levels.

References


Introduction to Chapters 4 to 7

In the following four chapters, six research questions were addressed. Two questions focused on between-group differences for boys with and without DCD. The first of these related to physical energy expenditure and physical activity leisure-time participation, while the second dealt with differences in the psychological arena, focusing specifically on self-concept perceptions, dispositional goal orientations, global life satisfaction, perceived freedom in leisure and loneliness.

Four research questions were formulated to investigate mediation processes acting on relationships between physical coordination ability and leisure-time activity participation and the identified psychosocial outcomes. In Chapter 4 the research question pertaining to mediation processes asked, “Do self-concept perceptions act as mediators of relationships between physical coordination ability and both energy expenditure and leisure-time activity participation?”

In Chapter 5 a research question was posed, “Do goal orientations and self-concept perceptions act as mediators of relationships between physical coordination ability and three outcomes; global life satisfaction, general self-concept and leisure participation?” This was followed by investigations in Chapter 6 to answer the question, “Does perceived freedom in leisure mediate between physical coordination ability and both leisure participation and global life satisfaction?” Finally in Chapter 7, the question was posed, “Does leisure-time activity participation mediate physical coordination ability and loneliness?”

Supporting documentation for chapters 4 to 7 are presented in appendices 1 to 5. This included four ethics approvals obtained from Behavioural & Social Sciences Ethical Review Committee, The University of Queensland; Queensland Health, QEII Jubilee Hospital, Health Services District; Education Queensland, Queensland Government; Catholic Education, Archdiocese of Brisbane, that are presented in Appendix 1. Appendices 2, 3 and 4 contain information provided to participants including study design details, parent and child consent forms, and examples of the parent-completed survey and 7-day diary. Correspondence from the American Journal of Occupational Therapy, pertaining to the paper, “Boys with developmental coordination disorder: Loneliness and team sport participation” is presented in Appendix 5.
Chapter 4: Paper 3

Title: Leisure-time physical activity energy expenditure in boys with developmental coordination disorder: The role of Peer Relations self-concept perceptions

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Key words: male, health, participation, motor skills, child

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Abstract

An integral aspect of occupational therapy practice is the facilitation of active participation in health-enhancing leisure for all individuals. Boys with developmental coordination disorder (DCD) are at risk of limited participation in recreational physical activities and this has implications for physical health associated with low energy expenditure. Identification of mechanisms influencing relationships between physical coordination ability and physical activity energy expenditure is therefore warranted. The current study was guided by an ecological open systems model called Synthesis of Occupational Performance and Environment – In Time (SCOPE-IT). This model was used to frame the investigation of self-concept perceptions as potential mechanisms influencing energy expenditure during the out-of-school hours for boys with DCD. Participants were 60 boys with DCD and 113 boys without DCD aged 10 to 13 years who were assessed on the Self-Description Questionnaire (Marsh, 1990) and the Movement Assessment Battery for Children (Henderson & Sugden, 1992). Parents completed 7-day diaries recording intensity, duration, content, social and physical context of leisure-time activities. Boys with DCD were found to have lower mean scores than boys without DCD for energy expenditure and self-concept appraisals of Physical Ability and Appearance, Peer and Parent Relations and General self-concept. Peer Relations self-concept was identified as a significant mechanism mediating the relationship between physical coordination ability and low energy expenditure. The clinical significance of Peer Relations self-concept as a change mechanism influencing the negative relationship between physical coordination ability and sedentary behaviour was discussed.
Introduction

Boys with developmental coordination disorder (DCD) are frequently referred to occupational therapists for evaluation and intervention for leisure-time occupational performance difficulties (Missiuna, Moll, King, Law & King, 2006). Children are diagnosed with DCD when functional motor performance difficulties cannot be explained by age, intellect or by a diagnosed medical or neurological problem (Polatajko, Fox & Missiuna, 1995). Low participation in socially valued leisure pursuits such as team sports is problematic for boys with DCD and may be associated with loneliness (Poulsen, Ziviani & Cuskelly, under review).

Physical activity is essential for children’s healthy development, both physically and mentally. There is some evidence that activity patterns established in childhood carry over into adult life (Biddle, Gorely, & Stensel, 2004). When physical activity is insufficient, serious health concerns, such as obesity, colon cancer, Type II diabetes, cardiovascular disease and depression have been documented. In contrast, there are numerous health advantages of adopting a physically active lifestyle. These include aerobic fitness, skeletal health, improved blood lipids, glucose metabolism, maintaining blood pressure within safe limits, psychological health and personal development (Biddle, Gorely, & Stensel, 2004). Physical inactivity is a major public health concern. Identifying factors associated with different levels of physical activity is a research priority underpinning the formulation of effective interventions to encourage participation in health-enhancing physical activities.

Individual- and environment-level factors interact to influence choice, effort and persistence in physically active pursuits over time (Poulsen & Ziviani, 2004). The Synthesis of Child Occupational Performance and Environment – In Time (SCOPE-IT) model offers a framework for identifying potential mediating mechanisms on pathways between child- and environment-level factors that reciprocally and cyclically influence time spent in physical activities, as well as intensity of physical activity energy expenditure. Variables significantly related to physical activity levels in youth include beliefs about physical self-efficacy, social influence, leisure-time activity patterns, physical fitness, enjoyment and socioeconomic status, age and gender (Sallis, Prochaska & Taylor, 2000). Children and adolescent with DCD have low physical self-efficacy (Hay & Missiuna, 1998), low participation in social and physical activities (Cantell, Smyth & Ahonen, 1994), increased body fat and low cardio-respiratory fitness (Faught, Hay, Cairney & Flouris, 2005).

In leisure-time physical activity contexts, where participation is largely discretionary,
children with poor physical competence have low confidence and low perceptions of peer social support (Segal, Mandich, Polatajko, & Valiant Cook, 2002).

When physical coordination ability is below that expected for age and interferes with activities of daily living, children may experience psychosocial difficulties, including: withdrawal from social as well as physical activities (Cantell, Smyth, & Ahonen, 1994), solitary or onlooker behaviour in the playground (Smyth & Anderson, 2000), and stigmatisation (Segal et al., 2002). Long-term adverse psychosocial outcomes have also been reported for individuals with DCD whose motor skills fall below 15th percentile on a standardized test of motor ability (Rasmussen & Gillberg, 2000). Children may be diagnosed with DCD when functional motor performance difficulties cannot be explained by age, intellect or by a diagnosed medical or neurological problem (Polatajko, Fox, & Missiuna, 1995). There is a complex interplay of child- and environment-level factors influencing physical activity participation and psychological outcomes for children with DCD (Poulsen & Ziviani, 2004).

The majority of studies report higher incidence of DCD in boys over girls with ratios ranging from 3:1 (Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001) to 7:1 (Kadesjo & Gillberg, 1999). Higher social/cultural pressures to engage in sports for boys over girls (Chase & Dummer, 1992), and low perceptions of physical self-efficacy may potentially contribute to withdrawal from, or low rates of participation in leisure-time physical activities (Cairney, Hay, Faught, Mandigo, & Flouris, 2005). Based on the SCOPE-IT framework, which postulates that there are multidimensional influences on behaviour, including both cognitive and social factors, it is suggested that cognitions about peer relations self-concept may also influence participation decisions. For example, self-evaluations about physical abilities (e.g. “I’m not very good at rugby”) are weighed up alongside considerations about peer relations (e.g. “but I’ve made lots of good friends”). These self-evaluations may then affect decisions to persist or withdraw from different activities. Generalized self-concept, as a more pervasive appraisal of overall personal worth, may further act as a mediator of a relationship between motor ability and participation.

Aims of the study

This study aims to investigate leisure-time physical activity participation of boys with DCD, and the psychological mechanisms of self-concept appraisals that potentially influence physical activity energy expenditure. Three research questions were posed. First, a descriptive question was asked to determine group differences using a four-way group split between two DCD and two non-DCD groups to compare self-concept
perceptions and energy expenditure levels of boys with and without DCD during leisure-time. Second, information about frequency of participation in different leisure pursuits was sought by asking: What were the most frequent leisure-time pursuits of boys with and without DCD, and what percent of the out-of-school hours was spent in physical/non-physical, social/non-social and structured/unstructured leisure-time pursuits?

Finally, mediation analyses were conducted to investigate potential relationships between physical coordination ability and energy expenditure to ascertain if self-concept perceptions mediated relationships between physical coordination ability and high, low or total energy expenditure. General self-concept, as well as domain-specific self-concept perceptions of peer and parent relations, physical ability and physical appearance was explored as mediators of a relationship between physical coordination ability and energy expenditure.

**Method**

**Participants**

Participants included 60 boys with DCD and 113 boys without DCD aged between 10 and 13 years who were group-matched for school year level, chronological age and family socioeconomic status (see Table 4.1). All participants were Australian born without Aboriginal or Torres Strait Islander heritage and lived in the Brisbane metropolitan area, Australia. Study participants were assigned to four groups (see Table 4.2), based on Movement ABC scores (Henderson & Sugden, 1992). Children with DCD were split into a moderate and a severe group. The comparison group was also split into two groups; medium and high-level physical coordination.

**Instruments**

*Movement ABC* (MABC; Henderson & Sugden, 1992) is a frequently used test for identification of children aged 4 to 12 years with DCD, and has acceptable reliability and validity (Crawford, Wilson, & Dewey, 2001). Raw scores for manual dexterity, ball skills and static dynamic balance are summed and converted to a percentile rank.

*Slosson Intelligence Screening Test - Revised 3* (SIT-R3; Slosson, Nicholson & Hibpshman, 1990) is a screening test for verbal intelligence with excellent reliability and high concurrent validity.
TABLE 4.1  Demographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>DCD N = 60</th>
<th>Non-DCD N = 113</th>
<th>F-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age</td>
<td>11yrs 7mths (SD = 9.7mths)</td>
<td>11yrs 9mths (SD = 9.3mths)</td>
<td>0.47</td>
</tr>
<tr>
<td>Intelligence(^1)</td>
<td>117 (SD = 18)</td>
<td>No intellectual impairment</td>
<td></td>
</tr>
<tr>
<td>Total Family size</td>
<td>4.45 (SD = 1.1)</td>
<td>4.54 (SD = 1.0)</td>
<td>0.31</td>
</tr>
<tr>
<td>Proportion of one-child families</td>
<td>0.05 (SD = 0.2)</td>
<td>0.10 (SD = 0.3)</td>
<td>1.18</td>
</tr>
<tr>
<td>Parents’ occupational grouping(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher status</td>
<td>88 (78.6%)</td>
<td>51 (85%)</td>
<td></td>
</tr>
<tr>
<td>Middle status</td>
<td>22 (19.6%)</td>
<td>8 (13.3%)</td>
<td></td>
</tr>
<tr>
<td>Lower status</td>
<td>2 (1.8%)</td>
<td>1 (1.7%)</td>
<td></td>
</tr>
<tr>
<td>School characteristics</td>
<td></td>
<td></td>
<td>32.39*</td>
</tr>
<tr>
<td>Independent – boys</td>
<td>39 (65%)</td>
<td>110 (97.3%)</td>
<td></td>
</tr>
<tr>
<td>Independent – co-ed</td>
<td>4 (6.6%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>State funded – co-ed</td>
<td>17 (28.3%)</td>
<td>3 (2.6%)</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Intelligence as measured on Slosson Intelligence Test – Revision 3 (Slosson, Nicholson, & Hibpshman, 1990).


\(*p < .01, **p < .001\)

TABLE 4.2  Group definitions

<table>
<thead>
<tr>
<th>Group</th>
<th>Physical Coordination Ability(^1)</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe DCD</td>
<td>&lt; 5(^{th}) percentile</td>
<td>27</td>
</tr>
<tr>
<td>Moderate DCD</td>
<td>≥ 5(^{th}) percentile but &lt; 15(^{th}) percentile</td>
<td>33</td>
</tr>
<tr>
<td>NON-DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Coordination</td>
<td>≥ 15(^{th}) percentile but &lt; 50(^{th}) percentile</td>
<td>41</td>
</tr>
<tr>
<td>High Coordination</td>
<td>≥ 50(^{th}) percentile</td>
<td>72</td>
</tr>
</tbody>
</table>

\(^1\)Physical coordination ability levels determined by scores on the Movement ABC (Henderson & Sugden, 1992).

**Seven-day leisure-time diary.** Parents record the main activity for each half hour block before school (6 half hour blocks) and after school (14 half hour blocks) for a 7-day period. This measure has been reported to have acceptable levels of compliance and reliability (Larson & Verma, 1999). Additional information about duration and intensity, as well as type of activity, location and presence of other children and parents was also collected for this study.

Activity intensity descriptions are based on those used in the Previous Day Physical Activity Recall measure (PDPAR; Weston, Petosa, & Pate, 1997). The PDPAR has established validity and high test-retest reliability (Weston et al., 1997). Rest is described as being totally inactive and not moving around. Light intensity activities involve regular movement with little change in heart rate or breathing level. Moderate activities are
accompanied by sweating, increased breathing and heart rate, and a feeling of tiredness. Heavy breathing, rapid heartbeat, profuse sweating and feelings of exhaustion on completion are characteristics of vigorous activities.

A total daily score for both low intensity (LPA) and moderate to vigorous (MVPA) physical activities, and total metabolic expenditure (MET) levels was computed for one week’s activities. MET scores for activities were assigned using the adult compendium of energy expenditure where values are multiples of resting metabolic rate (Ainsworth, 2002). Its utility with children has been demonstrated (Trost et al., 2002). One MET is defined as the energy expenditure for sitting quietly at rest. The higher energy expenditure of children was taken into account by describing physical activities as those requiring two METs or more. The MET levels for each main activity during the half hour blocks of time recorded in the 7-day diary were summed and a total metabolic energy expenditure (MET) score was computed for the week’s activities.

**Self- Description Questionnaire**- I (SDQ-I; Marsh, 1990) comprises 76 self-declarative statements rated on a 5-point scale ranging from false to true. Scores for each scale range from 8 to 40 with higher scores indicating more positive self-concept. High internal consistency coefficients are reported for all subscales and adequate test-retest reliability coefficients have also been found (Marsh, 1990). The SDQ-I has normative data based on a sample of 3,562 Australian children, and was considered to be a culturally appropriate measure for participants in this study. As a ceiling effect was apparent when t scores were calculated, raw scores were used instead.

**Procedure**

Ethical clearances were obtained from the appropriate committee at The University of Queensland, and from the health and education services involved. Written consent was obtained from parents and children. Participants were recruited through a school screening program conducted at two independent boys’ schools, therapy clinics and media releases. Inclusion criteria for DCD participants included age, motor ability (<15th percentile MABC), and parent-identification of child difficulties in performing everyday tasks. Exclusion criteria included evidence of intellectual impairment, diagnosed neurological or motor disorders, identified emotional problems or environmental issues that may impact on development (e.g. child abuse, psychiatric disorder), or participation in an intervention program during the past three months.

Inclusion criteria for the comparison groups included: scoring ≥15th percentile on MABC, no evidence of intellectual impairment (based on teacher- and parent-report), no
neurological or motor disorders and no diagnosed emotional problems (based on parent-report). Comparison boys were recruited from two independent boys’ schools and response rates at these schools were 89% and 75% respectively. An additional four schools declined to participate.

Parents completed a questionnaire to determine if children met the inclusion criteria, and a 7-day diary. Children completed the MABC, SIT-R3 (boys with DCD only), and the SDQ-I. All assessments were performed by registered occupational therapists. Diaries were completed following individual assessments. Parents were contacted if data were missing for more than one day, and were interviewed about their son’s leisure activities during the missing period. A total of eight diaries (one from DCD group) were not included in further analyses because of incomplete or poor quality data.

Consensus-coded data was used for categorizing pursuits using three criteria: physical or non-physical (<2 METS); social (>2 children present) or non-social; and structured or unstructured to give a composite activity category. Diary data were coded by the first author with a random sample of 20% of the logs checked for inter-rater reliability (kappa = 0.90).

Analyses

Analysis of variance (ANOVA) tests were run to test for differences in means for energy expenditure variables (LPA, MVPA, Total MET levels), and non-academic self-concept variables between the four groups of boys. Tamhane’s post-hoc analyses were conducted to determine which of the group means differed from each other. Frequency and ranking of participation in different leisure-time activities were then conducted for two groups: DCD and non-DCD, to answer the second question.

To answer the final research question, the mediation strategy developed by Baron and Kenny (1986) was adopted. Firstly, significant relationships between predictor variable (physical coordination ability), mediating variables (self-concept perceptions), and outcome variables (LPA, MVPA, Total METs), were identified using Pearson correlations. Exploratory investigations had found normally distributed data for all variables except Parent Relations self-concept which had a slight negative skew.

To test whether there were different associations between self-concept and energy expenditure variables in the DCD and non-DCD groups an interaction term was included in the linear regression model testing the relationship between energy expenditure and self-concept evaluations by physical coordination group membership. This was not significant; therefore, combined data from all groups was used in subsequent analyses.
The mediation analytic strategy involved a series of linear regression analyses in which each self-concept variable was investigated as a potential mediator of proposed relationships between physical coordination ability (predictor variable) and three outcome variables.

According to Baron and Kenny (1986), a mediator variable is an explanatory mechanism through which a predictor (or independent) variable influences an outcome (or dependent) variable. Significant relationships between predictor and outcome variables were firstly demonstrated. Mediation effects were demonstrated if the significant predictor → outcome relationship was significantly diminished when the effects of the mediator were controlled.

To test mediation in the current study, two steps were performed using linear regression analyses. In step one, outcome variables were regressed on the predictor variable, and in step two outcome variables were regressed on both the predictor and mediator variables. The significance of the drop in $B$ coefficients from step one to two on an approximate $Z$ curve was computed using Sobel’s (1988) equation on the MedGraph program (Jose, 2005).

Results

Descriptive Statistics

Significant between-group differences, were found between DCD and non-DCD groups for LPA, MVPA and Total MET expenditure. There were no significant differences between severe and moderate DCD groups or between medium- and high-level non-DCD groups for these variables (see Table 4.3). Thus, for further descriptive analyses, the DCD groups were combined, as were the non-DCD groups. A large effect size difference between the DCD and non-DCD groups was found for Physical Ability self-concept. There were small effects for differences between groups for General self-concept, Physical Appearance and Peer Relations self-concept.

When percentage of time spent in the eight leisure-time categories was examined, it was found that, for both groups, the highest percentage of out-of-school time use was devoted to sedentary unstructured pursuits such as electronic media use (see Table 4.4). There were significant between group difference for time spent in social-physical activities that were structured ($F (3,161) = 13.74 \ p <.001$) and unstructured ($F (3,161) = 12.44 \ p <.001$).
TABLE 4.3  Means and (standard deviations) for energy expenditure and self-concept

|                      | DCD (M (SD))                          | NON-DCD                          | F-Ratio  | Effect size
|----------------------|---------------------------------------|-----------------------------------|----------|--------------
|                      | Severe (n=26)                         | Moderate (n=33)                   |          |              |
| Energy Expenditure   |                                       |                                  |          |              |
| LPA                  | 151.76 a (11.44)                      | 154.24 a (10.38)                  |          |              |
| MVPA                 | 12.76 a (11.04)                       | 12.27 a (9.21)                    |          |              |
| Total MET            | 269.44 a (44.24)                      | 275.88 a (47.01)                  |          |              |
|                      | Severe (n=27)                         | Moderate (n=33)                   |          |              |
|                      |                                       |                                  |          |              |
|                      | Medium (n=38)                         | High (n=68)                       |          |              |
|                      | (3,161)                               | (3,161)                           |          |              |
|                      | Effect size                           |                                   |          |              |
|                      | $\eta^2_p$                            |                                   |          |              |
|                      |                                       |                                  |          |              |
|                      | Self-concept                          |                                   |          |              |
| -General              | 30.67 a (5.87)                        | 31.42 a (4.51)                    |          |              |
| -Physical ability    | 23.07 a (6.84)                        | 24.15 a (5.46)                    |          |              |
| -Physical appearance | 24.67 a (7.79)                        | 26.45 a (6.09)                    |          |              |
| -Peer relations      | 25.74 a (9.15)                        | 27.03 a (5.31)                    |          |              |
| -Parent relations    | 33.03 (6.25)                          | 33.39 (6.42)                      |          |              |

Effect size $\eta^2_p = \text{Partial Eta squared.}$

1 Energy expenditure = Total number of half hour blocks of time spent before and after school in low physical activity (LPA) and moderate to vigorous physical activity (MVPA) over 7-days. Total MET = total metabolic energy expenditure between 5.30 to 8.30am, and 3.00 to 10.00 pm over 7-days.

2 Self-concept = total raw scores for SDQI (Marsh, 1990).

Superscript letter “a” indicates significant differences ($p < 0.01$) from “b” in Tamhane’s post hoc tests.

* $p <0.01$, ** $p <0.001$
### TABLE 4.4  Participation in physical activities for boys with and without DCD

<table>
<thead>
<tr>
<th></th>
<th>DCD (n = 59)</th>
<th>Non-DCD (n = 106)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%¹</td>
<td>Rank</td>
</tr>
<tr>
<td><strong>Non-Physical activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Unstructured non-social, non-physical e.g. electronic media use alone</td>
<td>40.34 1</td>
<td>32.35 2</td>
</tr>
<tr>
<td>- Unstructured social, non-physical e.g. electronic media use with friends</td>
<td>39.69 2</td>
<td>37.66 1</td>
</tr>
<tr>
<td>- Structured non-social, non-physical e.g. instrument lessons on own</td>
<td>0.04 8</td>
<td>0.24 8</td>
</tr>
<tr>
<td>- Structured social, non-physical e.g. choir, band, chess club</td>
<td>2.56* 5</td>
<td>1.54* 7</td>
</tr>
<tr>
<td><strong>Physical activities (pa)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Structured social-physical e.g. team sports</td>
<td>2.36** 6</td>
<td>6.67** 4</td>
</tr>
<tr>
<td>- Structured non-social, physical e.g. gymnastics, athletics</td>
<td>2.10 7</td>
<td>2.65 5</td>
</tr>
<tr>
<td>- Unstructured social-physical e.g. street ball/running games in groups</td>
<td>9.44** 3</td>
<td>16.34** 3</td>
</tr>
<tr>
<td>- Unstructured non-social, physical e.g. trampolining, swimming</td>
<td>3.19 4</td>
<td>2.54 6</td>
</tr>
</tbody>
</table>

%¹ = Per cent of total leisure-time over 7-day period

* p <0.01, ** p <0.001

### TABLE 4.5  Pearson's correlations for energy expenditure, physical coordination ability and self-concept (N = 165).

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. LPA¹</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. MVPA²</td>
<td>-.94**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Total METs³</td>
<td>-.81**</td>
<td>.84**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Physical coordination ability⁴</td>
<td>-.44**</td>
<td>.49**</td>
<td>.50**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Physical Ability s-c⁵</td>
<td>-.43**</td>
<td>.43**</td>
<td>.47**</td>
<td>.64**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Physical Appearance s-c⁵</td>
<td>-.23*</td>
<td>.20*</td>
<td>.19*</td>
<td>.35**</td>
<td>.59**</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Peer Relations s-c⁵</td>
<td>-.33**</td>
<td>.30**</td>
<td>.33**</td>
<td>.43**</td>
<td>.66**</td>
<td>.63**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Parent Relations s-c⁵</td>
<td>-.11</td>
<td>.10</td>
<td>.20*</td>
<td>.23*</td>
<td>.35*</td>
<td>.36**</td>
<td>.35**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. General s-c⁵</td>
<td>-.19*</td>
<td>.22*</td>
<td>.24*</td>
<td>.42**</td>
<td>.55**</td>
<td>.55**</td>
<td>.65**</td>
<td>.45**</td>
<td></td>
</tr>
</tbody>
</table>

LPA¹ = Low physical activity energy expenditure
MVPA² = moderate to vigorous physical activity energy expenditure
Total METs³ = total metabolic energy expenditure.
Physical coordination ability⁴ = MABC percentile scores
Self-concept (s-c)⁵ scores = total raw scores on SDQI sub-scales (Marsh, 1990).

*p <.01, **p<.001
Correlation analyses revealed moderate negative correlations between physical ability and LPA, but positive associations with MVPA and Total METs (see Table 4.5). All self-concept variables (except Parent Relations) were positively associated with each other and with high energy expenditure (MVPA and Total METs).

Mediation Analyses

Two steps were performed to test the strength of the relationship between physical coordination ability and energy expenditure with and without the self-concept mediators included in the regression. In Step 1, where self-concept mediators were not included, all energy expenditure variables were significantly associated with physical coordination: LPA ($B = -.17, p < .001$), MVPA ($B = .19, p < .001$), and Total METs ($B = .82, p < .001$). In Step 2, only one relationship was significant. The strength of the relationship between physical coordination and physical activity energy expenditure was significantly reduced when Peer Relations self-concept was included in the equation. The Sobel Z indicated partial mediation (see Table 4.6 and Figure 4.1).

### TABLE 4.6 Mediation of the relationship between physical coordination and low physical activity energy expenditure by peer relations self-concept (N = 165)

<table>
<thead>
<tr>
<th>Steps</th>
<th>$R^2$ change</th>
<th>B</th>
<th>95% Confidence Intervals</th>
<th>Sobel’s Test Z score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1.</td>
<td>.20**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>-.17**</td>
<td>-.22 to -.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2.</td>
<td>.22**</td>
<td></td>
<td></td>
<td>-2.49*</td>
</tr>
<tr>
<td>Physical coordination</td>
<td>-.14**</td>
<td>-.20 to -.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer Relations self-concept</td>
<td>-.34</td>
<td>-.66 to -.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sobel’s (1988) test of mediation reflects the degree to which the B for physical coordination changed from step 1 to step 2 on an approximate Z curve.

Step 1 = Low physical activity (LPA) regressed on physical coordination MABC percentile scores (Henderson & Sugden, 1992).

Step 2 = LPA regressed on physical coordination and Peer Relations self-concept total raw scores from the SDQI (Marsh, 1990).

$p < .01$, ** $p < .001$
Figure 4.1  Partial mediation by self-perceptions of peer relations on relationship between physical coordination ability and low physical activity energy expenditure

Note. LPA\(^1\) = Low physical activity energy in rest to light activities.

\(^2\) Direct correlation effect with the mediating variable included in the regression.

\(^3\) Indirect correlation effect is the amount of the original correlation between the predictor variable and outcome variable that now goes through the mediator to the outcome variable.

\(* p < .01, ** p < .001\)

Discussion

During leisure-time boys with DCD were found to spend less time engaged in activities of moderate to vigorous physical energy expenditure. Overall, this leisure-time physical activity pattern contributed to significantly lower total energy expenditure for boys with DCD compared to boys without DCD, consistent with previous information about low physical activity participation for children with DCD (Cairney, Hay, Faught, Mandigo & Flouris, 2005). This study, however, provided additional information about intensity and duration of physical activity engagement in leisure-time activities.

When time-use allocation patterns for the two groups were compared, similarities in the three most common leisure categories were found. The greatest amount of leisure-time for all boys, irrespective of physical coordination ability, was spent in sedentary pursuits such as television viewing, electronic games or computer use, either alone or with friends. This is consistent with information from large-scale studies of boys of this age where electronic media use is the most frequent out-of-school activity (World Health Organization, 2000).
The next most popular activities for both groups of boys were social-physical activities. However, it was at this level that differences between the two groups emerged. Boys with DCD spent significantly less leisure-time in unstructured social physical play and organized social-physical activities, such as team sports, than their well-coordinated counterparts. Only a very small amount of time was spent in these activities for boys with DCD. For boys, no participation in team sports predicts decline in overall physical activity levels over a 2-year period (Barnett, O’Loughlin & Paradis, 2002), suggesting that this is likely to be an activity context where interventions aimed at aligning environmental resources and encouraging personal strengths is particularly important for positive youth development.

In contrast to social-physical activity patterns, time allocated to individual or dyadic sports for boys with and without DCD was similar. This confirms previous research describing greater participation rates for recreational sports, such as badminton and archery, played socially rather than in formal competitions for boys with motor coordination difficulties, and little or no participation in structured social-physical activities, such as team sports (Christiansen, 2000). The social-evaluative nature of competitive team sports was one aspect of structured social-physical activities that parents of several boys with DCD mentioned as being a barrier to participation for their sons. Informal backyard cricket or football games were also perceived as potentially discrediting situations associated with preferential allocation of team members according to ability and dependent on peer group evaluations.

Significantly, self-perceptions of peer relations were found to mediate low energy expenditure patterns and this has clinical implications. Although these findings are preliminary and need to be replicated, Peer Relations self-concept was found to be a change mechanism influencing the negative relationship between physical coordination ability and sedentary behaviour. Therefore, occupational therapists need to consider self-perceptions of social competence as well as physical characteristics of individual children when planning interventions and preventive health programs. Identifying social-physical contexts that are supportive and advocating for situational motivational climates that foster cooperative rather than competitive goals will facilitate participation of boys with DCD. This is consistent with recommendations for health-enhancing physical activity participation based on the SCOPE-IT model where multiple inputs from child-level intrapsychic and physical factors interact with environmental factors to influence activity engagement and contribute to positive mental and physical health outcomes (Poulsen & Ziviani, 2004).
Clearly, large group physical activity is an important social context for early adolescent males (Pellegrini, 1995). Several studies have identified an association between peer difficulties and low levels of participation (Dollman, Norton, & Norton, 2005; Ziviani, Macdonald, Jenkins, Rodger, Batch & Cerin, 2006). Conversely, participation in extracurricular activities, particularly in positively valued peer activities, plays an important role in the improvement of peer relations over time (Sandstrom & Coie, 1999).

It is important to look at correlates of low physical activity energy expenditure separately from those of higher energy expenditure, as these are not simple inverse relationships. Thus, while a mediating relationship was found for Peer Relations self-concept on the negative relationship between physical ability and low physical activity energy expenditure, self-perceptions of peer relations did not change the positive, direct relationship between physical coordination ability and higher levels of energy expenditure.

General self-concept and Physical Ability self-concept were also investigated as mediating variables influencing a significant, inverse relationship between physical ability and low physical activity energy expenditure, and the positive relationship between physical coordination ability and high energy expenditure. No mediating effects were found. Previous research has identified self-perceived efficacy for physical activity as a significant mediator of the relationship between DCD and physical activity participation (Cairney, Hay, Faught, Wade et al., 2005; Cairney, Hay, Wade, Faught, & Flouris, 2006). The non-significant findings in this study may have been related to methodological differences. While Cairney and colleagues (2005) used a mixed gender sample, our study used boys only. Cairney (2005) speculated that Physical self-efficacy, which is a similar, but distinct construct from Physical Ability self-concept, contributed to the significant effects obtained because the girls with DCD who were included in the study, who had low physical self-efficacy, were even less likely than boys with DCD to participate in physical activities.

In the current study, using only boys, Peer Relations self-concept acted as a mediator while Physical Ability self-concept did not, suggesting that for boys, it is the self-perceptions of peer relations, rather than self-perceived physical ability, that has the potential to change low energy expenditure levels. Although there was a reduction in the beta weights for the relationship between physical coordination ability and energy expenditure when Physical Ability self-concept perceptions were controlled, this was not significant.
Limitations and Future Directions

This study was cross-sectional in design; therefore, causal pathways for the demonstrated relationships between physical coordination ability, self-perceptions of peer relations, and low physical activity energy expenditure could not be established. Research using longitudinal or experimental designs, is recommended to investigate change in self-perceived peer relations and the influence this has on sedentary behaviour patterns during leisure for boys with differing levels of physical coordination ability. Larger sample sizes may be needed in future studies with separate investigations for boys and girls, to demonstrate mediating effects. Previous epidemiological research into physical activity behaviour has found that the amount of variance in physical activity is often quite small, accounting for less than 20% (Henning, Brodersen, Steptoe, Williamson & Wardle, 2005).

It is difficult to estimate whether boys with DCD are falling short of current physical activity recommendations of 30 to 60 minutes physical activity per day (Cavill, Biddle & Sallis, 2001), as the diary data included information on out-of-school time use rather than monitoring a whole day’s energy expenditure. Full 24-hour monitoring of physical activity behaviour over representative days using multiple measures would provide information targeted at this question.

Visual inspection of the diary data revealed possible misclassification of activities rated as moderate and vigorous energy expenditure. It was suspected that overestimations of vigorous energy expenditure by parents of boys in both DCD and non-DCD groups occurred. Over-reporting has been found in previous physical activity studies using diary estimates of energy expenditure in children (Anderson, Hagströmer, & Yngve, 2005). Heart rate monitoring research has shown that children rarely engage in extended bouts of vigorous physical activity, spending an average of only 12 to 13 minutes per day, rather than for an entire 30-minute block of time in sustained vigorous activity (Strauss, Rodzilsy, Burack & Colins, 2001).

Participants in this study were drawn from predominantly high socioeconomic status backgrounds and were thus not representative of the general population. In addition, only boys were included in the study. Boys attending independent schools are likely to have greater access to a range of community and school leisure resources. Socioeconomic factors and a large range of environmental and personal correlates of physical activity for boys have been consistently identified in the literature as influencing physical activity time use.
Conclusions

Boys with DCD were found to have lower mean scores than boys without DCD for energy expenditure and self-concept appraisals of Physical Ability and Appearance, Peer and Parent Relations, and General self-concept. Peer Relations self-concept was identified as a significant mechanism mediating the relationship between physical coordination ability and low energy expenditure. The significance of Peer Relations self-concept as a change mechanism influencing the negative relationship between physical coordination ability and sedentary behaviour has clinical implications.

Occupational therapists are advised to find ways to increase enjoyable participation in social-physical activities and to encourage social interaction in clubs where lifestyle individual or dual-person physical activities that de-emphasise social evaluation and social comparison can be carried out in a socially supportive framework. The social mechanisms underlying sustained and enjoyable engagement in physically active pursuits for boys with DCD needs further research. Clinicians can promote a physically active lifestyle for boys with DCD by advising on physical activity options that vary in type, frequency and duration, but which importantly meet psychosocial needs for high self-perceived peer relations.

Acknowledgements

We are very grateful to the families and schools who took part in the study, to Judy Jones who assisted with data collection, Rachel Smith and Kathy Ahern who helped with coding and to Michele Haynes and Ross Darnell for statistical advice.
References


Chapter 5: Paper 4

General self-concept and life satisfaction for boys with differing levels of physical coordination: The role of goal orientations and leisure participation

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Abstract

Participation in leisure-time activities, self-concept perceptions and individual dispositional goal orientations were examined as mediators of relationships between physical coordination and self-evaluations of life satisfaction and general self-concept for 173 boys aged 10–13 years. Participants completed seven-day activity diaries and 12-month retrospective recall questionnaires recording participation in leisure-time activities. Self-report measures of self-concept, global life satisfaction and dispositional goal orientations were also completed. Results showed that boys with moderate to severe physical coordination difficulties had significantly lower self-concept perceptions of physical ability and appearance, peer and parent relations and general self-concept, as well as lower life satisfaction than boys with medium to high levels of physical coordination. The relationships between boys’ physical coordination and their self-perceptions of life satisfaction and general self-concept were significantly influenced by individual self-concept appraisals of physical ability and appearance, peer and parent relations. Adopting task-oriented goals was found to positively change the relationship between physical coordination and both general self-concept and life satisfaction. Team sport participation positively mediated the relationship between physical coordination and life satisfaction. The potential for team sport participation and adoption of task-oriented goals to influence life satisfaction for boys with differing levels of physical coordination was discussed.

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0167-9457/$ - see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.humov.2006.05.003
1. Introduction

Life satisfaction, maintaining positive self-concepts and encouraging healthy participation in a wide range of physically active and mentally stimulating pursuits are important goals for all who work with children. These are subjective and objective indicators of quality of life and are increasingly recognised as contributing to long-term mental and physical health outcomes (Huebner, Suldo, Smith, & McKnight, 2004). The interrelationships between these variables, however, are complex.

Children with physical coordination difficulties are particularly vulnerable to physical activity participation restrictions, either through elective withdrawal or exclusion (George & Feltz, 1995; Mandich, Polatajko, & Rodger, 2003). While the cumulative impact of long-term participation deficits on global life satisfaction and general self-concept is unknown, the relationship between physical coordination and physical ability self-concept, as well as participation in organised and recreational physical activities, has been demonstrated (Cairney, Hay, Faught, Mandigo, & Flouris, 2005). Ecological systems models such as the Synthesis of Child, Occupational Performance and Environment – In Time (SCOPE-IT) (Poulsen & Ziviani, 2004) are particularly useful frameworks for conceptualising the way in which individual (including intra-psychic variables) and environmental constraints can potentially influence participation behaviour and psychosocial outcomes for children with physical coordination difficulties. In this study the SCOPE-IT model framework will be used to explore pathways between intra-psychic variables, leisure-time participation behaviour and both subjective well-being and general self-concept, for boys with varying levels of physical coordination ability.

Boys with DCD may well be disadvantaged and perceive themselves to have lower life satisfaction relative to their well coordinated peers, because of low participation in sports and free play physical activities both in school (Boulton, 1995; Smyth & Anderson, 2000) and during leisure-time (Cairney et al., 2005). Low levels of participation in social-physical activities, such as team sports, may be particularly pertinent for boys, many of whom consider physical prowess and skill development, particularly in the company of their peers, an important aspect of identity development (Lee, Fredenberg, Belcher, & Cleveland, 1999). Team sports have been found to represent significant contexts for socialisation experiences, leadership opportunities, and friendship development (Roberts & Ommundsen, 1996), and participation in these activities has been positively linked to general self-concept (Marsh & Kleitman, 2003). Reduced participation in large-group physical activities is common for boys with severe physical coordination difficulties, and this has been significantly associated with social dissatisfaction and loneliness (Poulsen, Ziviani, Cuskelly, & Smith, submitted for publication).

Children with physical coordination difficulties that are incommensurate with their intellectual ability and who have significant problems with performance of everyday motor activities are described as having DCD (American Psychiatric Association, 1994). The prevalence of DCD in children is five to six per cent of the general population with more...
boys identified as having significant movement difficulties than girls (Missiuna, 1994). Gender ratios vary between 3:1 (Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001) and 7:1 (Kadesjo & Gillberg, 1999). A range of psychosocial problems may face children with DCD including stigmatisation (Segal, Mandich, Polatajko, & Valiant Cook, 2002), high state and trait anxiety (Rose, Larkin, & Berger, 1999), and depressive symptomatology (Francis & Piek, 2003). The aetiology of these problems is complex and multifactorial, with reciprocal interactions existing between both individual and environmental variables. Many of these psychosocial difficulties have been theoretically linked with perceived and actual participation restrictions as well as low general and specific self-concept appraisals (Branden, 1994).

General self-concept (Marsh, 1990) is the extent to which a child feels positively about him/herself. It is often used as an index of emotional adjustment and has significant implications for mental health (Kavussanu & Harnisch, 2000). Low general self-concept has been found for children with movement difficulties (Skinner & Piek, 2001) but equivocal results have also been reported (Barrett, Piek, & Allen, 2003; Cantell, Smyth, & Alonen, 2003). This has prompted researchers to investigate underlying mechanisms contributing to low general self-concept in this group.

Global life satisfaction has been strongly linked with general self-concept (Huebner, 1997). While general self-concept represents a summary evaluation of one’s behaviour and personal characteristics, global life satisfaction refers to the subjective evaluation of the degree to which important needs, goals and wishes have been fulfilled (Huebner et al., 2004). For this reason, life satisfaction is seen as a more sensitive indicator of psychological well-being than general self-concept (Huebner et al., 2004).

1.1. Leisure-time activity participation

Participation in meaningful pro-social activities is positively related to high life satisfaction, low internalising and externalising behaviour and negatively related to depression, anxiety and loneliness (Huebner et al., 2004). Links between leisure-time activities and behavioural adjustment, including absence of conduct problems or depression, and higher academic grades have been found with the social context mediating these activity-adjustment links. Time spent alone is associated with depression, while time spent in unstructured activities without adult supervision is related to poorer academic grades and more conduct problems, at ages 10 and 12 (McHale, Crouter, & Tucker, 2001). Significant positive correlations between leisure participation in organised clubs and academic competence, psychosocial maturity and social competence have been reported for 10-year-old children (Fletcher, Nickerson, & Wright, 2003).

Time invested in different activity settings has been shown to have specific effects on self-concept domains. For example, a significant relationship exists between participation in large-group community activities, high peer relations self-concept and low peer rejection (Schneider, Younger, Smith, & Freeman, 1998). In studies of children with DCD, low physical ability self-concept has been significantly correlated with low participation in physical activity contexts (Cairney et al., 2005). While the physical activity context has been investigated in relation to physical self-concept appraisals, participation in other leisure-time activity contexts has not been investigated for boys with DCD in relation to academic, non-academic and general self-concept.
1.2. Self-concept domains and general self-concept

Studies exploring the contribution of domain-specific self-concept appraisals to general self-concept for children with DCD have found that all domains collectively contribute to general self-concept (Piek, Dworcan, Barrett, & Coleman, 2000; Skinner & Piek, 2001). Unique, direct contributions from individual self-concept domains of physical appearance (Barrett et al., 2003; Francis & Piek, 2003; Piek et al., 2000), scholastic competence (Piek et al., 2000), and behavioural conduct (Francis & Piek, 2003) have been found to contribute a significant proportion of variance to general self-concept.

Perhaps surprisingly, self-perceptions of physical ability have not been found to directly predict general self-concept for children with DCD although they have been found to be significant predictors of general self-concept in children without DCD (Skinner & Piek, 2001). Given that low self-perceived athletic competence has repeatedly been reported by children with movement difficulties (Cantell et al., 2003; Cantell, Smyth, & Ahonen, 1994; Hay, 1992; Losse et al., 1991; Lyttinen & Ahonen, 1989; Schoemaker & Kalverboer, 1994), it might have been expected that low perceptions in the physical ability domain would directly predict low general self-esteem.

It has been proposed that one reason for not finding a direct link between low physical ability self-concept and general self-concept is that children with poor physical coordination may discount the importance of physical ability, hence protecting general self-concept (Harter, 1999). A study investigating perceived competence-importance discrepancies in children with DCD found that low importance placed on athletic ability by children with movement difficulties contrasted with high importance assigned to scholastic competence (Piek et al., 2000). If children with DCD had low self-evaluations of both athletic and scholastic competence this combination was found to significantly contribute to diminished general self-concept. The authors concluded that high academic self-concept may buffer low athletic self-concept in those children with DCD who perceive academic proficiency to be important in their lives (Piek et al., 2000).

1.3. Goal dispositions

Another mechanism that may influence general self-concept of boys with different levels of physical coordination is adoption of different types of cognitive dispositional goals with task- or ego-oriented criteria then being used to evaluate their own performance in achievement situations (Causgrove Dunn & Watkinson, 1994). Dispositions are important cognitive processes that determine adoption of a particular goal and thereby influence task choice, affect, coping, intensity/degree of effort exerted, and performance behaviours for children in different achievement settings (Brunel, 1999). Dispositional variations or proneness to displaying task- or ego-involved goals, the situational characteristics of the motivational climate in the activity environment, and developmental differences influence perceptions of competence (Fry & Duda, 1997).

According to achievement motivation theory (Nicholls, 1989), dispositional goal orientations, particularly in sport, are derived from two orthogonal motivational sources. One source represents task- or mastery-oriented goal dispositions whereby an individual uses self-referenced criteria to determine whether development of competence or progress has been made towards a mastery goal. This is linked with positive feelings about one self and is regarded as being adaptive (Larson, 2000). An adaptive theory of success is where
the perceived antecedents of accomplishment are within the individual's personal determination (White & Zellner, 1996).

An alternative perception of success occurs when external normative-referenced criteria are used to make judgments about demonstrations of competence by comparing one's performance with that of others. This has been termed ego orientation. Other names for ego-oriented goals include competitive, normative, social comparative or ability goals. Adoption of ego-oriented goals over task goals can be associated with maladaptive outcomes when an individual seeks to demonstrate superior ability by using less effort, cheating or blaming others for inferior performance (Fry & Duda, 1997).

For ego-involved children, low ability in the normative sense associated with low perceived competence is one of the most important threats to general self-concept (Kavussanu & Harnisch, 2000). Research exploring the adoption of different cognitive motivational orientations on general self-concept or global life satisfaction of children with DCD has not been undertaken.

The situational motivational climate can also influence self-perceived competence. In physical education classes supporting task-oriented learning or mastery goals, children with DCD were found to have higher perceptions of physical competence. Conversely, participation in classes where there was an ego-oriented motivational climate which emphasized social comparison and normative performance evaluation contributed to decreased self-perceptions of physical competency (Causgrove Dunn, 2000).

Structured extracurricular activity contexts that have formal organisational characteristics and are monitored and time-managed by adult leaders may provide opportunities for these adult leaders to proactively support the development of task-oriented goal dispositions in mastery climates (Schneider et al., 1998). Such settings have been found to have a significant effect on work orientation and internal locus of control (Fletcher et al., 2003). This supports the proposition that structured leisure-time activities, such as sports or youth organisations, provide personal development functions when they promote self-direction and initiative (Larson, 1994).

1.4. Aims

The principal aim of this study was to investigate mediating mechanisms influencing the relationship between physical coordination ability and the outcome variables of life satisfaction and general self-concept. The mediating variables examined were dispositional goal orientations, domain-specific self-concept variables and leisure-time participation. It was predicted that partial mediating effects would be found. By testing for mediational effects it was proposed that explanatory links between child-, activity-, and environment-level variables would be more fully understood. This was undertaken with the aim of understanding varying developmental pathways for boys with DCD, as well as informing intervention programs, and risk and protective factor screening for these children.

2. Method

2.1. Participants

Participants were 173 boys aged 10–13 years attending primary schools in the Brisbane Metropolitan area, Australia. Sixty boys with DCD and 113 boys without DCD were
group-matched for school year level, chronological age and socioeconomic status. Boys who participated in the study were Australian-born from predominantly middle to higher socioeconomic status backgrounds and were without Aboriginal or Torres Strait Islander heritage. Study participants were split into two DCD groups and two non-DCD groups (see Table 1), based on Movement ABC (MABC; Henderson & Sugden, 1992) percentile scores.

2.2. Measures

2.2.1. Movement ABC (MABC)

The MABC (Henderson & Sugden, 1992) consists of three tests of manual dexterity, two tests of ball skills and three tests of static and dynamic balance. Raw scores on items are summed and converted to a percentile rank. It is the most frequently used standardised

Table 1

<table>
<thead>
<tr>
<th></th>
<th>DCD + (n = 27)</th>
<th>Moderate (n = 33)</th>
<th>Non-DCD + (n = 41)</th>
<th>High (n = 72)</th>
<th>F-ratio</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe</td>
<td>1.67*</td>
<td>(1.54)</td>
<td>9.64*</td>
<td>(2.87)</td>
<td>33.85b</td>
<td>(10.49)</td>
</tr>
<tr>
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<td>20.96*</td>
<td>(2.30)</td>
<td>34.44a</td>
<td>(2.16)</td>
<td>24.28b</td>
<td>(2.85)</td>
</tr>
<tr>
<td>Non-DCD1</td>
<td>20.67*</td>
<td>(2.51)</td>
<td>34.98</td>
<td>(3.19)</td>
<td>35.89b</td>
<td>(3.39)</td>
</tr>
<tr>
<td>Non-DCD2</td>
<td>25.07*</td>
<td>(6.84)</td>
<td>36.78b</td>
<td>(5.46)</td>
<td>35.04c</td>
<td>(3.53)</td>
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<tr>
<td>Non-DCD1</td>
<td>26.67*</td>
<td>(7.79)</td>
<td>30.76</td>
<td>(4.65)</td>
<td>31.1b</td>
<td>(5.08)</td>
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<td>25.74*</td>
<td>(9.15)</td>
<td>33.51b</td>
<td>(5.31)</td>
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<td>(4.12)</td>
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<td>Parent relations self-concept</td>
<td>33.33</td>
<td>(6.25)</td>
<td>33.39</td>
<td>(4.62)</td>
<td>35.78</td>
<td>(3.78)</td>
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<td>26.78</td>
<td>(8.27)</td>
<td>28.15</td>
<td>(9.06)</td>
<td>29.22</td>
<td>(7.82)</td>
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<td>Reading self-concept</td>
<td>34.41</td>
<td>(7.54)</td>
<td>32.36</td>
<td>(8.41)</td>
<td>32.41</td>
<td>(8.28)</td>
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<td>General school self-concept</td>
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<td>(7.69)</td>
<td>26.48</td>
<td>(6.69)</td>
<td>28.17</td>
<td>(5.70)</td>
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<tr>
<td>Task orientation</td>
<td>26.44</td>
<td>(3.75)</td>
<td>26.48</td>
<td>(3.68)</td>
<td>28.66</td>
<td>(1.81)</td>
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<td>Ego orientation</td>
<td>16.33</td>
<td>(4.39)</td>
<td>15.86</td>
<td>(3.97)</td>
<td>16.93</td>
<td>(3.70)</td>
</tr>
</tbody>
</table>

Superscript letter "a" indicates significant differences (p < .01) from superscript letter "b" in Tamhane's post hoc tests.

$\eta^2_p =$ partial eta squared.

DCD + groups scored <15th percentile Movement ABC (MABC; Henderson & Sugden). Severe DCD = <5th percentile.

Non-DCD + groups scored >15th percentile MABC. High non-DCD = > 50th percentile.

* p < .01.

** p < .001.
motor test to screen for identification of children with DCD in research (Wilson, 2005). The MABC has adequate reliability, with a minimum test-retest at any age of .75 and inter-rater reliability of .70 (Henderson & Sugden, 1992; Tan, Parker, & Larkin, 2001). Concurrent validity is adequate with an 80% agreement between the MABC and the Bruininks-Oseretsky Test of Motor Performance (Crawford, Wilson, & Dewey, 2001).

2.2.2. Slosson Intelligence Screening Test – Revised 3 (SIT-R3)

The SIT-R3 (Slosson, Nicholson, & Hibpshman, 1990) is a brief screening measure of verbal intelligence assessing the cognitive domains of vocabulary, general information, similarities and differences, comprehension, quantitative ability, and auditory memory. Concurrent validity for the SIT-R3 for screening purposes is high with \( r = .92 \) (Kunen, Overstreet, & Salles, 1996). Kuder-Richardson 20 reliability coefficients range from .88 to .97, and test-retest reliability over a one-week period is .96 (Slosson et al., 1990).

2.2.3. Self-Description Questionnaire – I (SDQ-I)

The SDQ-I (Marsh, 1990) consists of 76 self-declarative statements (e.g., “I can run fast”) that evaluate eight self-concept sub-domains. These include general self-concept, four areas of non-academic self-concept (physical ability, physical appearance, parent and peer relations), and three academic self-concept areas (mathematics, reading and general school). A 5-point scale from false, mostly false, sometimes false and sometimes true, mostly true to true is used. Scores for each scale range from 8 to 40 with higher scores indicating higher self-concept. Ten negatively worded statements are not scored but are included to disrupt response bias. High internal consistency coefficients (above .8) are reported for all subscales and adequate test-retest reliability coefficients (.61) over a 6-month period have also been found (Marsh, Barnes, Cairns, & Tidman, 1984). The SDQ-I yields T scores and percentiles, normed on 3562 Australian second through sixth graders, however, because a ceiling effect was apparent when T scores were used, raw scores were used in all analyses in this study.

2.2.4. Students’ Life Satisfaction Scale (SLSS)

The SLSS (Huebner, 1991) is a seven-item unidimensional self-report measure of life satisfaction for children aged 8-18 years. A 4-point frequency scale, 1 = never, 2 = sometimes, 3 = often and 4 = always, is used to evaluate statements such as “My life is going well”. Total scores range from 7 to 28 with higher scores indicating increased life satisfaction. Internal consistency coefficients (.82), test-retest reliability (.74) over 2-weeks and predictive validity for social stress, depression, anxiety and externalising behaviour are all acceptable (Huebner, 1991; Huebner, Funk, & Gilman, 2000).

2.2.5. Perception of Success Questionnaire – Children’s Version (POSQ-C)

The Children’s Version of the POSQ (Roberts, Treasure, & Balague, 1998) was developed from two questionnaires measuring task and ego goal orientations in academic (Nicholls, Patashnik, & Nolen, 1985) and sport contexts (Jackson & Roberts, 1992). In the current study, the POSQ-C was adapted to measure achievement goal orientations in leisure contexts. Children evaluated their concurrence with 12 statements (e.g., “I try hard”), on a 5-point scale from “strongly agree” to “strongly disagree”. Total scores for each goal disposition ranged from 6 to 30. High internal consistency, a stable two-factor structure and strong construct validity have been demonstrated for the sports POSQ-C
(Roberts et al., 1998). Internal consistency (Chronbach alpha) for the adapted version used in this study was .74 for the task orientation factor and .80 for the ego orientation factor when item 6 "I do better than others" was removed. These internal consistencies (with item 6 dropped) compare favourably with those reported by Roberts et al. (1998).

2.2.6. Seven-day leisure-time diary

On this measure parents are asked to complete a proxy leisure-time diary recording the main activity per half hour block of time before and after school and on weekends for the past seven days. This measure has been reported to have acceptable levels of compliance and reliability (Larson & Verma, 1999). It was modified to include information about the physical location and social context of the activity, the presence of adults and other children during the activity, and the roles of social participants.

2.2.7. Retrospective 12-month leisure survey

Parents recalled their sons’ participation in structured leisure-time activities over the past 12 months and the total number of sessions attended per week for each activity. Information about unstructured leisure-time participation patterns was not collected because of concerns about accuracy of recall of informal play. In contrast, structured time use recall was felt to be more reliable because of predictable timetabling and formal scheduling of the activity over the school year. The retrospective 12-month leisure survey was adapted from a 1-year self-administered physical activity recall questionnaire developed and validated for use with adolescents (Aaron et al., 1995).

2.3. Procedure

Ethical clearance from the Behavioural & Social Sciences Ethical Review Committee, The University of Queensland was obtained. Boys with DCD were recruited through a school screening program conducted at two independent boys’ schools, from therapy clinics and through media releases. Inclusion criteria for the DCD groups were age, physical coordination (<15th percentile MABC), and parent-identification of child difficulties in performing everyday tasks. Exclusion criteria included evidence of intellectual impairment, previously diagnosed neurological or motor disorder and identified emotional problems or environmental issues which may impact on development (e.g., child abuse, psychiatric disorder, attention deficit hyperactive disorder). Boys with DCD were assessed on the SIT-R3 unless they had been assessed on another recognised test of intelligence during the past two years. Boys with an intelligence quotient below 80 were excluded as this precluded them from meeting the criteria for diagnosis of DCD as described by American Psychiatric Association (1994). In addition, boys in the DCD groups were excluded if they had participated in an occupational therapy intervention program during the past 3 months as this may have impacted on leisure-time participation patterns and self-concept perceptions.

Boys in the non-DCD groups were recruited through a school screening program at two consenting boys’ schools. Four non-consenting schools cited response-burden and stigmatisation concerns as reasons for their refusal to participate in the research program. Concerns about stigmatisation were addressed by including all students across eligible year levels in the assessment program at participating schools. The response rate at these schools was 89%. Boys were included in the comparison group if they scored ≥15th percentile on
the MABC. The exclusion criteria used for the comparison group was the same as for the target group. Intelligence was not measured for boys in the comparison group. However, boys with academic difficulties, identified by parent or teacher report, were excluded.

Prior to group allocation, parents of potential participants completed a retrospective 12-month child-leisure survey which included questions about the child's physical, emotional, cognitive and activity participation characteristics. Administration of the MABC and the SIT-R3, for boys with DCD only, was followed by completion of the SDQ-I, SLSS and POSQ-C. All assessments were carried out by registered occupational therapists at schools or occupational therapy centres. Seven-day diaries were completed by parents and returned to the researcher after child evaluations were completed. Quality and accuracy checks were conducted by visually inspecting diary data and then contacting parents about missing data. Eight diaries from the comparison group were rejected because of incomplete or poor data quality.

The researchers used consensus-coded data for categorisation of pursuits based on three criteria: physical/non-physical, social/non-social and structured/unstructured. This resulted in eight activity categories, thus extending the four-category grouping based on social and physical classification of activities used by Cantell et al. (1994). Examples of structured physical categories included team sports (e.g., football) and individual/dyadic sports (e.g., gymnastics). Structured non-physical categories included group activities (e.g., choir) and individual/dyadic lessons (e.g., instrument tuition). Examples of activities that were unstructured included social–physical activities (e.g., street games with peers) and individual/dyadic-physical activities (e.g., shooting basketballs). Unstructured non-physical activities included social sedentary pursuits (e.g., going to movies with peers) or individual/dyadic activities (e.g., reading). Diary data were coded by the first author with a random sample of 20% of the logs checked for inter-rater reliability, by an independent researcher with a kappa of .90.

The compendium of physical activities for adults (Ainsworth, 2002) was used to code physical activity energy expenditure using metabolic energy expenditure (MET) intensity levels as there is no child compendium currently available. In this compendium one MET is defined as the metabolic energy expenditure of sitting still. The cut-off point for determining physical activity in this study was set at >2 METS to account for the higher resting energy expenditure rate of boys aged 8–12 years when compared to adults (Harrell et al., 2005). The criterion for determining that an activity was social was more than two peers recorded as being present for the majority of the half hour block.

2.4. Data analysis

To investigate differences between the four groups of boys (severe and moderate DCD, medium and high non-DCD), analyses of variance (ANOVA) tests were run. Differences between groups were tested using means in physical coordination, life satisfaction, goal orientations, self-concept perceptions and leisure-time participation. Tamhane’s post hoc analyses determined which of the means for the different sized groups differed from each other. Investigation of the distribution of life satisfaction and parent relations self-concept revealed a positive skew which could not be normalized using log transformations. It was decided to proceed using ANOVA tests as the test of ANOVA is robust for skewness when sample sizes are large (Tabachnick & Fidell, 2002). However, Kruskal–Wallis tests for non-parametric statistics were also run to confirm whether the ANOVA data was
supported. A .01 criterion of statistical significance was employed for all tests to reduce the probability of Type I errors.

Spearman’s correlations were computed for the whole group to examine associations between outcome variables (life satisfaction and general self-concept), mediating variables (self-concept sub-domains, task and ego goal orientations and leisure participation) and the predictor variable (physical coordination), rather than Pearson’s correlations, given the non-normal distribution of life satisfaction and parent relations self-concept scores. In addition, correlations between variables for the DCD and non-DCD groups were run to compare direction and strength of effects observed for the whole group.

Before mediation effects were tested the proposed mediator variables were regressed on the predictor variable of physical coordination to ensure that a significant relationship existed (Baron & Kenny, 1986). A mediator is an explanatory link in the relationship between two other variables and the main purpose of mediational analyses is to examine why an association between a predictor and outcome exists. The data analytic strategy developed by Kenny and colleagues (Baron & Kenny, 1986; Frazier, Tix, & Barron, 2004) has been increasingly adopted to explore mediation effects in child development research (Rose, Holmbeck, Millstein Coakley, & Franks, 2004).

Multivariate strategies such as mediational models illustrate a pathway of influence among variables and involve two distinct steps to test for significant effects. In Step 1 the outcome variables were regressed on the predictor variable. In Step 2 the outcome variables were regressed on both the predictor and mediating variables. Mediation was determined as occurring when a previously significant relationship in Step 1 was diminished when the effects of mediation were controlled. In these regression equations the combined data from the DCD and non-DCD groups were used. To determine significance of mediation effects the Sobel’s test was computed using the MedGraph program (Jose, 2005).

3. Results

3.1. Group differences on physical coordination tasks, life satisfaction, self-concept, perception of success and leisure participation

Repeated measures ANOVAs using the four groups (severe and moderate DCD, medium and high level non-DCD) were used for the continuous variables of physical coordination, life satisfaction, self-concept, perceptions of success and leisure participation. Boys with DCD reported significantly lower life satisfaction, general self-concept, perceptions of physical ability and appearance, peer and parent relations and task goal orientations than boys without coordination difficulties (see Table 1). Tamhane’s post hoc analyses revealed that there were no significant differences between severe and moderate DCD groups or between medium and high groups without DCD for these variables. Effects sizes (partial eta squared) for significant main effects were high for physical ability self-concept and life satisfaction, and moderate for general self-concept and perceptions of peer relations. Guidelines suggesting that effect sizes accounting for >15% of the variance indicate substantial differences among the means were applied (Hinton, 1996). The effect sizes for task goal orientations and perceptions of parent relations self-concept were considered weak. It was noted that there was wider variability within DCD groups for self-concept and goal appraisals but not for life satisfaction, than the non-DCD groups.
Analyses of variance, with follow-up post hoc tests showed that there was a main effect for group for participation in social–physical activities, both structured (e.g., team sport) and unstructured (e.g., informal outdoor group play) (Table 2). Effect sizes were moderate for structured social–physical and unstructured social–physical activity mean differences. The survey of past year activities showed significantly more time per week in structured social activities of a non-physical nature by the DCD group in comparison to the non-DCD group but the effect size was low.

3.2. Preliminary analyses of correlates

Correlations between DCD, life satisfaction, self-concept, goal orientations and leisure participation for the whole group are reported in Table 3. Strong negative correlations were found between DCD on the one hand and physical ability self-concept and life satisfaction on the other. Moderate negative associations were found between DCD and the following: General self-concept, physical appearance and peer relations self-concept, and participation in structured and unstructured social–physical activities. The correlations

Table 2
Means and (standard deviations) for leisure participation

<table>
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<tr>
<th></th>
<th>DCD Severe (n = 27)</th>
<th>DCD Moderate (n = 33)</th>
<th>Non-DCD Medium (n = 41)</th>
<th>Non-DCD High (n = 72)</th>
<th>F-ratio (3, 169)</th>
<th>Effect size $\eta^2_p$</th>
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<tr>
<td><strong>Structured leisure</strong></td>
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<td>Social + pa</td>
<td>1.04a</td>
<td>1.91b</td>
<td>4.22b</td>
<td>4.36b</td>
<td>26.67**</td>
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<td>e.g. team sport</td>
<td>(1.89)</td>
<td>(1.61)</td>
<td>(2.72)</td>
<td>(2.36)</td>
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<tr>
<td>Social + non-pa</td>
<td>1.00</td>
<td>0.94</td>
<td>0.61</td>
<td>0.19</td>
<td>5.07**</td>
<td>.08</td>
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<td>e.g. choir</td>
<td>(1.96)</td>
<td>(1.39)</td>
<td>(1.0)</td>
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<td>Non-social + pa</td>
<td>0.52</td>
<td>0.67</td>
<td>0.71</td>
<td>0.50</td>
<td>1.90</td>
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<td>e.g. gymnastics</td>
<td>(0.75)</td>
<td>(0.89)</td>
<td>(0.90)</td>
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<td>Non-social + non-pa</td>
<td>0.50</td>
<td>0.67</td>
<td>0.71</td>
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<td>e.g. music lesson</td>
<td>(0.76)</td>
<td>(0.89)</td>
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<th>DCD Severe (n = 26)</th>
<th>DCD Moderate (n = 33)</th>
<th>Non-DCD Medium (n = 38)</th>
<th>Non-DCD High (n = 68)</th>
<th>F-test (3, 161)</th>
<th>Effect size $\eta^2_p$</th>
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<td><strong>Unstructured leisure</strong></td>
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<tr>
<td>Social + pa</td>
<td>12.08a</td>
<td>12.70a</td>
<td>22.71b</td>
<td>21.99b</td>
<td>12.44**</td>
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<td>e.g. street games</td>
<td>(9.02)</td>
<td>(10.40)</td>
<td>(11.28)</td>
<td>(9.18)</td>
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<tr>
<td>Social + non-pa</td>
<td>54.00</td>
<td>50.91</td>
<td>50.37</td>
<td>51.76</td>
<td>0.18</td>
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<td>e.g. movies with friends</td>
<td>(24.57)</td>
<td>(22.07)</td>
<td>(18.97)</td>
<td>(18.43)</td>
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<tr>
<td>Non-social + pa</td>
<td>4.42</td>
<td>4.03</td>
<td>3.26</td>
<td>3.57</td>
<td>0.36</td>
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<td>e.g. bicycling</td>
<td>(5.15)</td>
<td>(5.63)</td>
<td>(3.52)</td>
<td>(4.98)</td>
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<tr>
<td>Non-social + non-pa</td>
<td>53.00</td>
<td>53.21</td>
<td>45.03</td>
<td>43.47</td>
<td>2.47</td>
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<td>e.g. reading</td>
<td>(27.62)</td>
<td>(26.79)</td>
<td>(18.44)</td>
<td>(14.89)</td>
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Structured leisure$^2$ = Total sessions/week over past 12 months. Unstructured leisure$^2$ = Total 30 min blocks over past seven days. pa = physical activity > 2 METs, non-pa = non-physical activity < 2 METs. Social = >2 peer participants.

Superscript letter “a” indicates significant differences ($p < .01$) from superscript letter “b” in Tamhane’s post hoc tests.

$^* p < .01$.

$^{**} p < .001$. 
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<td>.29</td>
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<td>20</td>
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</tbody>
</table>

**Table 3**

Correlations between developmental coordination disorder (DCD), life satisfaction, self-concept, goal orientations and leisure participation (N = 173)

Key:
1. DCD = 1, non-DCD = 0
2. life satisfaction
3. general self-concept
4. physical ability self-concept
5. physical appearance self-concept
6. peer relations self-concept
7. parent relations self-concept
8. mathematics self-concept
9. reading self-concept
10. general school self-concept
11. task orientation
12. ego orientation
13. structured social physical activities
14. structured social non-physical activities
15. structured non-social physical activities
16. structured non-social non-physical activities
17. unstructured social physical activities
18. unstructured social non-physical activities
19. unstructured non-social physical activities
20. unstructured non-social non-physical activities

* p < .01

** p < .001
between variables for the two groups, DCD and non-DCD, were comparable to those found using data from the combined group.

A strong negative correlation between unstructured time spent in social and non-social activities that were non-physical was also found. Unstructured time was largely spent in electronic media use with social versus non-social sedentary activities such as television viewing, computer or electronic games being played alone or in the company of family members or peers. Structured social–physical activity participation was positively correlated with life satisfaction and domain-specific self-concept evaluations of physical ability and appearance, peer relations and participation in unstructured social–physical activities.

Two strongly, positively correlated self-concept domains, physical ability and peer relations, also showed the largest number of strong to moderate positive correlations with life satisfaction, general self-concept, physical appearance self-concept and structured social–physical participation. Task-oriented goal orientation was moderately correlated with general self-concept, physical appearance and peer relations self-concept.

3.3. Mediation analyses

The results of the mediation analyses supported task goal orientations, self-concept perceptions of, physical ability and appearance, peer and parent relations as mediators of relationships between physical coordination on the one hand and both general self-concept and life satisfaction on the other (Tables 4 and 5, Figs. 1 and 2). Academic self-concept perceptions did not contribute. $z$-Scores for mediation effects ranged from 2.21 to 6.34.

Table 4
Mediation of relationship between physical coordination and general self-concept by self-concept domains and task orientations ($N = 173$)

<table>
<thead>
<tr>
<th>Steps</th>
<th>$R^2$ change</th>
<th>$B$</th>
<th>95% Confidence intervals</th>
<th>Sobel’s test $z$-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.18**</td>
<td>.05**</td>
<td>.04/0.07</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.40**</td>
<td>.04**</td>
<td>.03/0.06</td>
<td>6.34**</td>
</tr>
<tr>
<td>Task orientation</td>
<td>.74**</td>
<td>.55/0.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.31**</td>
<td>.01</td>
<td>-.01/0.04</td>
<td>5.23**</td>
</tr>
<tr>
<td>Physical ability self-concept</td>
<td>.32**</td>
<td>.21/0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.36**</td>
<td>.02**</td>
<td>.02/0.05</td>
<td>4.12**</td>
</tr>
<tr>
<td>Physical appearance self-concept</td>
<td>.34**</td>
<td>.24/0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.45**</td>
<td>.02**</td>
<td>.01/0.04</td>
<td>5.20**</td>
</tr>
<tr>
<td>Peer relations self-concept</td>
<td>.41**</td>
<td>.32/0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.31**</td>
<td>.04**</td>
<td>.03/0.06</td>
<td>2.77**</td>
</tr>
<tr>
<td>Parent relations self-concept</td>
<td>.34**</td>
<td>.22/0.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Step 2: general self-concept regressed on physical coordination and self-concept mediating variables using total raw scores from the Self-Description Questionnaire I (Marsh, 1990), and task goal orientations as measured by total scores on Perceptions of Success Questionnaire (Roberts et al., 1998).

Sobel’s test of mediation reflects the degree to which the $B$ for physical coordination changed from Step 1 to Step 2 on an approximate $Z$ curve.

* $p < .01$.
** $p < .001$.,
Table 5
Mediation of relationship between physical coordination and life satisfaction by leisure participation, task goal orientations and self-concept domains (N = 173)

<table>
<thead>
<tr>
<th>Steps</th>
<th>$R^2$ change</th>
<th>$B$</th>
<th>95% Confidence intervals</th>
<th>Sobel’s test $z$-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.29**</td>
<td>.05**</td>
<td>.04/0.06</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.32**</td>
<td>.04**</td>
<td>.03/0.06</td>
<td>2.33**</td>
</tr>
<tr>
<td>Structured social physical activities (e.g. team sports)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.38**</td>
<td>.05**</td>
<td>.04/0.06</td>
<td>2.21*</td>
</tr>
<tr>
<td>Task orientation</td>
<td>.35**</td>
<td>.21/0.48</td>
<td>.01/0.04</td>
<td>3.83**</td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.41**</td>
<td>.02**</td>
<td>.14/0.29</td>
<td></td>
</tr>
<tr>
<td>Physical ability self-concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.41**</td>
<td>.04**</td>
<td>.03/0.05</td>
<td>4.50**</td>
</tr>
<tr>
<td>Physical appearance self-concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.43**</td>
<td>.03**</td>
<td>.02/0.05</td>
<td>4.50**</td>
</tr>
<tr>
<td>Peer relations self-concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical coordination</td>
<td>.36**</td>
<td>.05**</td>
<td>.03/0.06</td>
<td>2.51*</td>
</tr>
<tr>
<td>Parent relations self-concept</td>
<td>.18**</td>
<td>.09/0.26</td>
<td>.09/0.26</td>
<td></td>
</tr>
</tbody>
</table>


Step 2 = life satisfaction regressed on physical coordination and self-concept mediating variables using total raw scores from the Self-Description Questionnaire I (Marsh), leisure participation as measured by total sessions/week over past 12 months, and Task Orientations as measured by total scores on Perceptions of Success Questionnaire (Roberts et al., 1998).

Sobel’s test of mediation reflects the degree to which the $B$ for physical coordination changed from Step 1 to Step 2 on an approximate $Z$ curve.

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

Fig. 1. Partial mediation by team sport participation, task orientations and self-concept domains of physical ability and appearance, peer and parent relations on relationship between physical coordination and general self-concept.

Only one leisure context, structured social–physical activity engagement, significantly mediated between physical coordination and life satisfaction, with a low, but significant $z$-score. Ego goal orientations did not significantly mediate any outcomes.
4. Discussion

Understanding pathways of influence on leisure-time physical activity participation, and life satisfaction and general self-concept for boys with varying levels of physical coordination ability was the principal aim of this study. An ecological systems model, SCOPE-IT (Poulsen & Ziviani, 2004), guided this research. It was proposed that child-level intra-psychic variables including dispositional goal orientations and domain-specific self-concept variables, would mediate a proposed relationship between physical coordination ability and quality of life outcomes. In addition, it was proposed that time spent in different leisure-time activity participation contexts would also influence these relationships. It was predicted that partial mediating effects would be found, and that future research will be necessary to unravel the influence of other child- and environment-level variables.

4.1. Mediation effects – dispositional goal orientations and self-concept perceptions

Adopting task-oriented goals, but not ego-oriented goals, was found to partially mediate the relationship between physical coordination and both general self-concept and life satisfaction for boys with different levels of physical coordination. This finding supports previous research where boys who were task-oriented rather than ego-oriented were more likely to have a positive physical ability and general self-concept (Kavussanu & Harnisch, 2000). For boys with low physical coordination skills, demonstrating improvement and effort are realistic sources of competence evaluation, particularly in relation to physical ability self-appraisals. Adaptive patterns of learning, striving to increase understanding and skill, high effort and cooperation with peers are also associated with adoption of task goals (Fry & Duda, 1997). During stressful situations it has been shown that athletes who adopt task orientations demonstrate greater problem solving and coping strategies (Duda & Whitehead, 1998). On the other hand, maladaptive motivational performance patterns including cheating or blaming external sources for poor performance, low expectations of future performance and attributions of fixed ability which contribute to helpless responses.
or amotivation have been associated with adoption of predominantly ego- over task-oriented goals (Brunel, 1999; Smiley & Dweck, 1994).

Testing the mediational effects of dispositional goals as an explanatory variable accounting for or explaining the relationship between physical coordination ability and life satisfaction has not been previously undertaken. This study found that having a high task-oriented goal disposition positively mediated this relationship. These results point strongly to the need for practitioners to look at means of enhancing the adoption of a task-oriented leisure focus in boys with DCD.

Current intervention approaches for children with DCD that focus on child-identification of task-oriented goals have been shown to be highly effective in achieving functional motor performance goals (Wilson, 2005). Using a strategy-based problem-solving approach to select and prioritise goals in intervention programs developed for children with DCD is consistent with adopting a task-oriented focus. The proliferation of goal setting tools, such as the perceived efficacy and goal setting system (Missiuna & Pollock, 2000), and the Canadian occupational performance measure (Law et al., 1998), reflects clinical appreciation of the importance of self-determined task-oriented directions when working with children with DCD (Missiuna, Mandich, Polatajko, & Malloy-Miller, 2001).

Children who participate in task-oriented motivational activity milieus show increased enjoyment, higher physical self-concept evaluations, positive self-feelings, higher persistence and lower rates of dropping out from elective leisure pursuits (Larson, 2000). Structured task-oriented activity contexts where adults foster children's self-evaluation of progress based on internalised performance standards and self-monitoring of effort increase perceived competence (Reinboth, Duda, & Ntoumanis, 2004). On the other hand, ego-oriented climates where ability is seen as fixed and peer-referenced can lead to low self-competence evaluations, particularly in physical activities where skills are readily apparent to participants and observers. In these social situations children with lower levels of skill are more likely to withdraw or have low levels of participation.

High self-concept perceptions of physical ability and appearance, peer and parent relations were also found to partially mediate the relationship between physical coordination and both general self-concept and life satisfaction for boys with different levels of physical coordination. It is possible that self-concept perceptions reciprocally interact alongside dispositional goal orientations in influencing these outcomes. A previous study investigating physical ability self-concept evaluations of children with and without DCD proposed that protective mechanisms were adopted by some children with low physical coordination who also reported high physical ability self-concept (Causgrove Dunn & Watkinson, 1994). Self-protective mechanisms included the adoption of task-oriented self-appraisals of effort and progress to maintain positive perceptions of competence and motivation. Children who used external comparisons of performance, such as comparing their own performance with peers, were more likely to have low perceptions of physical competence. In contrast, using self- rather than other-referenced judgments of success was associated with positive physical ability self-concept evaluations.

4.2. Mediation effects – leisure-time participation

Participation in social–physical activities, such as team sports, was found to act as a mediator between physical coordination ability and both global life satisfaction and general self-concept. Team sports are important contexts for peer socialisation, social status
and physical health for boys. Previous research has found that participation in structured extracurricular activities is associated with less depression in school-age children (McHale et al., 2001) and affords higher social status and less loneliness for boys in some sports-oriented western countries (Chase & Dummer, 1992; Poulson et al., submitted for publication). For children with dispositions of ego goal orientations, or for individuals who are participating in situational motivational climates that are predominantly ego-involved, a common belief is that sport participation is a means to an end, with the end being to enhance the sports participants' social status (Roberts et al., 1998). Children who do not possess the physical ability to participate in sports may instead be stigmatised and experience peer rejection (Segal et al., 2002).

Structured social non-physical activities, such as choir, provide opportunities for peer affiliation and skill development in adult-monitored environments. However, these pursuits are not always socially recognised by the peer group, with more males valuing sports over cultural pursuits than females (Beale, 1991). As boys move into early adolescence the peer group identities (e.g., "jocks", "brains") and other groups who are identified in relation to their leisure pursuits become more entrenched (Barber, Eccles, & Stone, 2001). Social endorsement of participation in extracurricular activities may reflect cultural, family, or school values. For example, cultural values have been posited as one possible explanation for the finding that children and adolescents with DCD who live in Finland and who do not participate in social–physical activities do not have low general self-concept (Cantell et al., 1994). In contrast, in the current study, it was found that boys who reported low participation in team sports had significantly lower general self-concept and life satisfaction than boys who spent more time in these leisure pursuits. This may have been related to specific social–environmental characteristics impacting on the participants in this study who were predominantly recruited from independent, single gender schools. Alternatively, it may have been related to broader cultural beliefs about socially valued popular pastimes for males in western countries such as Australia (Swain, 2000).

In the current research only team sports participation was identified as a significant mediator of the relationship between physical ability and life satisfaction. This means that the boys in this study who participated in team sports, irrespective of their level of physical ability, had higher life satisfaction than those who did not. Team sports participation could thus be seen as a protective mechanism for this indicator of well-being in Australian boys. This has to be interpreted cautiously however, because encouraging boys with DCD to participate in team sports without appropriate levels of support could be detrimental to general self-concept and life satisfaction.

4.3. Group differences – dispositional goal orientation and self-concept perceptions

There were no significant differences between boys with and without DCD in terms of adoption of ego- or task-oriented goals. Significant differences were found for general self-concept and non-academic self-concept sub-domains between the two groups. Boys with DCD had significantly lower self-concept evaluations in the non-academic domains of physical ability and appearance, peer and parent relations than boys without DCD, irrespective of the severity of physical coordination difficulties. There were no significant differences in academic self-concept domains of reading and mathematics. The largest effect size for between-group mean differences was for physical ability self-concept. The findings of low self-perceptions of physical ability for boys with DCD replicates other studies.
where low self-evaluations of athletic competency have almost universally been reported (Cairney et al., 2005).

4.4. Group differences—life satisfaction and leisure-time activity participation

Life satisfaction has been regarded as an interpersonal strength which buffers against adverse life events and is a key indicator of positive psychological well-being (Greenspoon & Saklofske, 2001). Understanding and evaluating global life satisfaction provides important information about children at risk for subsequent psychological problems. In this study, life satisfaction was found to be a more sensitive psychosocial indicator than general self-concept, showing the second largest effect size, after perceptions of physical ability self-concept, in mean differences between boys with and without DCD. Life satisfaction more broadly ties in with feelings of satisfaction or dissatisfaction with participation in everyday life situations or activities of interest or value to the individual.

Positive experiences in one social physical activity setting may also transfer across to other social or physical contexts. Performance competency has been identified as being an important component of participation and peer group acceptance, with skill development in one activity niche transferring to other activities (Mandich et al., 2003). In the current study it was found that there were strong correlations between structured and unstructured social-physical activity participation. Thus boys with DCD who reported low participation in the more formal context of organised team sports, also described low participation when adult-guided participation was absent in free play contexts with peers in physical activities such as backyard cricket or playing touch football in the local park. These are important developmental niches, associated with positive self-concept perceptions, feeling good and having fun (McCullagh, Matzkanin, Shaw, & Maldonado, 1993).

5. Conclusions and future direction

In summary, boys with DCD rated their quality of life as significantly inferior to that of boys without DCD. The results of this study suggest, however, that two potential paths influencing life satisfaction and general self-concept for boys with differing levels of physical coordination ability are participation in structured social–physical activities during leisure and adoption of task-oriented goal dispositions. Participation in team sports mediated the relationship between physical ability and life satisfaction for boys aged 10–13 years. This supports the proposition that participation in team sports, a popular leisure pursuit in Australia, is important in influencing life satisfaction for boys of this age.

Adoption of task-oriented goals, but not ego-orientations, were found to significantly mediate between actual physical ability and both life satisfaction and general self-concept, physical ability and appearance self-concept and perceptions of peer relations. Future research investigating situational goal orientations, and in particular the evaluation of task-oriented climates for boys with low levels of physical coordination is proposed. This will lead to a further understanding of practical means to enhance and evaluate extracurricular pursuits so that enjoyable, active participation by all participants, regardless of levels of physical ability, is accompanied by incremental skill acquisition, social development and positive self-evaluations about competence and life satisfaction. Identifying factors to improve outcomes for boys who partake in both social–physical and social–non-
physical activities is a key goal for future research leading to the development of effective intervention programs.

It was also found that boys with DCD spent significantly less time in team sports, and unstructured social-physical play, but spent more time in structured social non-physical leisure pursuits such as science clubs, choir and band than boys without DCD. Positive correlates of participation in team sports included general self-concept, peer and parent relations self-concept, physical ability and appearance self-concept, and participation in unstructured social-physical activities, as well as life satisfaction.

Future directions for research include implementation of longitudinal, person-oriented studies, with children from different socioeconomic groupings, ages and gender, to further investigate the complex interactions between physical ability, cognitions about one's self and behaviour. In keeping with an ecological systems framework model, such as SCOPE-IT, other factors that were not measured in the study, including the motivational climate, presence of family and peer support, social capital of child and family members, length of exposure and skill acquisition may also be considered as mechanisms influencing participation outcomes and experiences. Longitudinal studies are needed to further investigations into the causal relationships between participation, child- and environment-level factors, and functioning throughout life. Only longitudinal research can unravel causal directions amongst these integrally connected elements and lead to understanding about how processes start and how they interact with each other (Eccles, 2005).

Acknowledgements

We are very grateful to the families and schools who took part in the study, to Judy Jones who assisted with data collection, Kathy Ahern for assistance with data coding, and to Michele Haynes and Ross Darnell for statistical advice.

References


Swann, J. (2000). 'The money's good, the fame's good, the girls are good': The role of playground football in the construction of young boys' masculinity in a junior school. *British Journal of Sociology of Education*, 21, 95–109.


Chapter 6: Paper 5

Title: Perceived freedom in leisure and physical coordination ability: Impact on out-of-school activity participation and life satisfaction

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Key words: developmental coordination disorder, participation, physical activity, psychosocial factors, quality of life

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Abstract

Background  Perceived freedom in leisure (PFL) is explored as a potential mechanism mediating relationships between physical coordination ability and both global life satisfaction and leisure-time physical activity participation for boys with differing levels of physical coordination. Understanding psychological mechanisms contributing to low rates of participation in physical activities for boys with developmental coordination disorder (DCD) is a clinical and research priority, with potential to inform clinical interventions and preventive health initiatives.

Method  Sixty boys aged 10 to 13 years with DCD and 113 boys without DCD completed self-report measures of PFL and life satisfaction. Seven-day leisure-time activity diaries and 12-month retrospective recall questionnaires were completed by parents.

Results  Lower self-appraisals of PFL and overall life satisfaction were found for boys with DCD compared to boys without DCD. PFL mediated relationships between physical ability and both life satisfaction and team sport participation.

Conclusion  Perceived freedom in leisure, comprising self-appraisals of leisure needs satisfaction and competence, depth of involvement and perceived control over leisure outcomes was a significant mechanism influencing leisure-time participation and life satisfaction for boys. The implications for effective intervention and preventive health promotion are discussed.
Introduction

Perceived freedom in leisure (PFL) is a cognitive motivational construct where perceptions of leisure competence and control over leisure experiences, satisfaction of leisure needs and depth of involvement influence leisure behaviour and global life satisfaction (Ellis & Witt, 1994). Children with developmental coordination disorder (DCD), who have difficulties performing everyday activities requiring motor coordination, spend less time participating in recreational physical activities and may experience lower PFL than children without DCD (Cairney, Hay, Faught, Mandigo, & Flouris, 2005). The potential impact of PFL on leisure-time participation patterns and life satisfaction has not been explored for boys with differing levels of physical coordination.

Boys with DCD have marked impairment in the development of motor coordination that impacts on functional performance of daily motor activities or academic achievement, but is not the result of any medical condition or intellectual impairment (American Psychiatric Association, 2000). DCD affects approximately six per cent of the childhood population with higher prevalence in males, hence the focus of this study (Cairney et al., 2005). Frustration, anxiety and stigmatisation of boys with DCD who experience barriers to full participation in physical activities on the playground, sports field and in physical education settings, all important developmental contexts for males, may contribute to low perceptions of global life satisfaction (Rose, Larkin, & Berger, 1997; Segal, Mandich, Polatajko, & Valiant Cook, 2002).

There is evidence that many children with DCD do not “outgrow” their physical coordination difficulties and that psychosocial difficulties and low participation in social and physical leisure-time pursuits may persist into adolescence and adult life (Cantell, Smyth & Ahonen, 1994; Rasmussen & Gillberg, 2000). Despite potentially adverse outcomes, positive pathways and resolution of physical and psychosocial problems can occur through specific interventions and through optimal child-activity-environment fit (Missiuna, 2001; Mandich, Polatajko, & Malloy-Miller, 2001; Mandich, Polatajko & Rodger, 2003). It is incumbent on researchers and practitioners to identify mechanisms contributing to full participation in occupations of childhood, such as leisure pursuits, that are associated with positive physical and mental health outcomes.

Grounded in attribution theory (Weiner, 1974), PFL describes a state of mind where intrinsic motivation and self-perceptions of competence and internal control underpin voluntary action. Attribution theory proposes that individuals attribute internal or external, as well as stable or unstable causes, to evaluate leisure experiences and to make decisions about participation. Freedom to choose whether or not to participate in leisure
is related to attributions about successful or unsuccessful leisure experiences.

Another component of PFL, depth of involvement, is drawn from the activity-based theory of flow, where optimal matching between a child’s level of skill and the challenge posed by an activity results in deep absorption and is associated with positive emotions (Csikszentmihalyi, 1990). In flow, a sense of control over the process and outcomes follows clear identification of goals and unambiguous feedback about progress. These experiences are perceived to be so fulfilling and satisfying that the child wishes to recreate the experience over and over again.

For boys with DCD, flow experiences may be more likely in those non-physical pursuits where an optimal balance between the child’s level of skill and the challenge of the activity, exists. However, flow may also occur in physically active pursuits where skills are matched with goals that are individually rather than normatively referenced. This ensures deep involvement that is integral to PFL. Instances of satisfying, vigorous participation in social-physical activities, such as football, even in the face of limited normatively defined success have been described for a small number of boys with DCD (Cantel et al, 1994).

For determined athletes, perceptions of internal control over the leisure process, perceptions of competence based on perceived effort rather than ability and the resultant deep involvement which characterises intrinsically motivated leisure needs satisfaction and flow experiences may be critical determinants of participatory decisions. Perceived freedom in leisure, which incorporates all these elements, may prove to be a useful construct when investigating links between individual characteristics of boys with DCD and activity participation, as well as with psychosocial outcomes, such as life satisfaction.

**Aims of the study**

The primary aim of this study was to determine whether perceptions of freedom in leisure mediate between physical coordination ability and leisure-time activity participation, as well as impacting on life satisfaction appraisals for boys with varying levels of physical coordination ability. Two research questions were posed. Firstly; what are the differences between PFL, life satisfaction and leisure-time activity participation of boys with and without DCD? Secondly, mediation processes were explored to answer the question; does PFL mediate relationships between physical coordination ability and both leisure-time activity participation and life satisfaction?
Method

Participants

Participants were 60 primary school-aged boys with DCD, and 113 boys without DCD, Australian-born, from predominantly middle to higher socioeconomic backgrounds, and who were without Aboriginal or Torres Strait Islander heritage. Groups were matched for school year level, chronological age and socioeconomic status. Boys were allocated to four groups (see Table 6.1) based on physical coordination ability on the Movement ABC (MABC: Henderson & Sugden, 1992). Boys scoring < 15th percentile MABC were divided into two DCD groups because previous research has found psychosocial and activity participation patterns may vary according to severity of DCD (Schoemaker & Kalverboer, 1994).

Boys without DCD were also allocated to two groups. Allocation to comparison groups based on MABC performance > 50th percentile has been used in previous investigations (Skinner & Piek, 2001). However, in this study a medium-level comparison group, comprising boys who scored between > 15th percentile and <50th percentile MABC, was also included so that a continuum of MABC scores could be used in mediation analyses.

<table>
<thead>
<tr>
<th>Group</th>
<th>Movement ABC score</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe DCD</td>
<td>Below the 5th percentile</td>
<td>27</td>
</tr>
<tr>
<td>Moderate DCD</td>
<td>Equal to or above the 5th percentile but below the 15th percentile</td>
<td>33</td>
</tr>
<tr>
<td>NON-DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Coordination</td>
<td>Equal to or above the 15th percentile but below the 50th percentile</td>
<td>41</td>
</tr>
<tr>
<td>High Coordination</td>
<td>Equal to or above the 50th percentile</td>
<td>72</td>
</tr>
</tbody>
</table>

Instruments

Movement ABC (MABC; Henderson & Sugden, 1992), measures motor ability in children aged 4 to 12 years on tests of manual dexterity (3 items), ball skills (2 items) and balance (3 items). In this study total percentile scores were used. Test-retest reliability ($r = .75$), inter-rater reliability ($r = .70$) and concurrent validity against Bruininks-Oseretsky Test of Motor Performance ($r = .80$) are adequate (Crawford, Wilson, & Dewey, 2001;
Slosson Intelligence Screening Test - Revised 3 (SIT-R3; Slosson et al, 1990) is a screening test for verbal intelligence with high internal consistency coefficients, test-retest reliability ($r = .96$) and high concurrent validity against the Stanford-Binet: Fourth edition ($r = .92$) (Kunen, Overstreet, & Salles, 1996).

Students’ Life Satisfaction Scale (SLSS; Huebner, 1991), for students aged 8-18 years, comprises seven self-declarative statements (e.g. “My life is going well”) rated on a 4-point frequency scale, 1 = never, 2 = sometimes, 3 = often and 4 = always. Total scores range from 1 to 20 with higher scores indicating increased life satisfaction. Adequate internal consistency ($r = .82$), test-retest reliability ($r = .74$) and predictive validity for social stress, depression, anxiety and externalising behaviour at 12 months are reported (Huebner, 1991; Huebner, Funk, & Gilman, 2000).

Leisure Diagnostic Battery – Short Form Version A (LDB-S; Witt & Ellis, 1989) comprises 25 items: perceived competence in leisure (5 items), perceived control scale (10 items), leisure needs (6 items) and depth of involvement (4 items) selected from a principal factor analysis of the 95-item LDB-Long form. The short form for adolescents aged 9 to 14 years uses a 3-point rating scale, “sounds a lot like me”, “sounds like me”, and “doesn’t sound like me”, with total scores ranging from 1 to 75. Two factors include: PFL-1 – competence and control, PFL-2 – depth of involvement and satisfaction of leisure needs (Ellis & Witt, 1994). Internal consistencies are high ($r = .83$ to .94, with moderate predictive validity for life satisfaction ($r = .43$ to .81) (Witt & Ellis, 1989).

Seven-day leisure-time diary. Parents completed 7-day diaries recording main activities, social and environmental context during out-of-school time, per half-hour block. Acceptable levels of compliance and reliability are reported (Larson & Verma, 1999).

Retrospective 12-month leisure survey, adapted from a one-year self-administered physical activity recall questionnaire, measures participation in structured leisure activities (Aaron, Kriska, Dearwater, Cauley, Meek & LaPorte, 1995).

Procedure

Ethical clearances from university, health and school authorities were obtained prior to recruitment of participants from therapy clinics, school screening programs at two independent boys’ schools, and media releases. Inclusion criteria for DCD participants included age, motor ability (<15th percentile MABC), and parent-identified difficulties in performing everyday tasks. Exclusion criteria included intellectual impairment (<80 on
SIT-R3), diagnosed neurological or motor disorders, and identified emotional problems (e.g. psychiatric disorder, attention deficit hyperactive disorder) based on parent interview and report.

Boys without DCD, scoring >15th percentile MABC, and having no intellectual impairment, neurological or motor disorders, emotional problems or environmental issues impacting on development based on parent and teacher report, were recruited from two independent boys’ schools. All students in Years 6 and 7 were invited to participate in the study. Response rates were high, with 89% and 75% of families electing to participate, respectively at participating schools.

Parents and boys completed consent forms prior to completion of child assessments and 7-day diaries. Eight diaries with incomplete or poor quality data were excluded. Consensus-coded data for categorising pursuits as physical/non-physical, social/non-social and structured/unstructured resulted in eight composite activity categories (see Table 6.2).

<table>
<thead>
<tr>
<th>Activity Groupings</th>
<th>Physical¹</th>
<th>Social²</th>
<th>Structured³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team sports</td>
<td>e.g. football, cricket, basketball</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Organised non-physical groups</td>
<td>e.g. choir, band, chess</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Physically active group play</td>
<td>e.g. chasing, street ball games</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Sedentary group recreation</td>
<td>e.g. electronic media use with friends</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Individual and dyadic sports</td>
<td>e.g. gymnastics, athletics, tennis</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Individual sedentary lessons</td>
<td>e.g. instrument lessons, tutoring</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Solitary physically active play</td>
<td>e.g. walking, trampolining, cycling</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Solitary sedentary play</td>
<td>e.g. electronic media use alone</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

¹Physical activities performed at >2 METS for majority of half hour block (Ainsworth, 2002).
²Social activities involving ≥2 children.
³Structured activities with adult-organised training or performance activities.
Analyses

To answer the first research question, repeated measure ANOVAs were run, with significance levels set at <.01, to reduce probability of Type 1 errors. Tamhane’s post-hoc tests explored differences in means for physical coordination ability, life satisfaction, PFL, and leisure-time activity participation between four groups. Kruskal-Wallis tests for non-parametric data were run due to a small negative skew which could not be normalised with log transformations. These were found to support the ANOVA data. In addition, the test of ANOVA is robust for skewedness when sample sizes are large (Tabachnick & Fidell, 2002).

Spearman’s correlations were computed to examine associations between outcome (life satisfaction and leisure participation), mediating (PFL) and predictor (physical coordination ability) variables given non-normal distributions of PFL and life satisfaction scores.

To answer the second research, a series of regression analyses were performed using the combined data from both DCD and non-DCD groups. To test whether there was a different association between PFL and the outcome variables for the DCD and non-DCD groups, an interaction term was included in the linear regression term for group by PFL interaction.

The mediation strategy followed the procedure recommended by Baron & Kenny (1986). Mediation effects for PFL acting on relationships between physical coordination ability and the outcome variables (leisure participation activity categories and life satisfaction) were investigated. Two steps to test mediation were performed. In step one, the outcome variables were regressed on the predictor variable. In step two, the outcome variables were regressed on both the predictor and mediating variables. To determine significance of mediation effects the Sobel’s (1988) test was computed using the MedGraph program (Jose, 2005).

Results

Descriptive Statistics

Boys with DCD had significantly lower life satisfaction, PFL and participation in social-physical activities, both structured and unstructured than boys without DCD (Table 6.3). Effect sizes for these variables were moderate. Tamhane’s post hoc analyses found no significant differences between severe and moderate DCD groups, and also no differences between medium and high level non-DCD groups for any variables.
Strong to moderate negative correlations were found between DCD and life satisfaction, PFL and participation in structured and unstructured social-physical activities. Life satisfaction and PFL were strongly, positively correlated (Table 6.4).

### TABLE 6.3
**Means (standard deviations) for motor ability, life satisfaction, perceptions of freedom in leisure and leisure participation**

<table>
<thead>
<tr>
<th></th>
<th>DCD (M, SD)</th>
<th>NON-DCD</th>
<th>F-Ratio</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe (n = 27)</td>
<td>Moderate (n = 33)</td>
<td>Medium (n = 41)</td>
<td>High (n = 72)</td>
</tr>
<tr>
<td><strong>Physical coordination</strong></td>
<td>1.67 *</td>
<td>9.64 *</td>
<td>33.85 *</td>
<td>82.65 *</td>
</tr>
<tr>
<td>(1.54)</td>
<td>(2.87)</td>
<td>(10.49)</td>
<td>(15.99)</td>
<td></td>
</tr>
<tr>
<td><strong>Life satisfaction</strong></td>
<td>19.37 *</td>
<td>20.09 *</td>
<td>24.44 *</td>
<td>24.28 *</td>
</tr>
<tr>
<td>(9.79)</td>
<td>(5.16)</td>
<td>(5.70)</td>
<td>(5.98)</td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Freedom in</strong></td>
<td>51.04 *</td>
<td>54.94 *</td>
<td>65.05 *</td>
<td>65.43 *</td>
</tr>
<tr>
<td>Leisure <strong>– Total score</strong></td>
<td>(5.11)</td>
<td>(3.66)</td>
<td>(4.01)</td>
<td></td>
</tr>
<tr>
<td><strong>– Factor 1</strong></td>
<td>29.81 *</td>
<td>31.88 *</td>
<td>38.34 *</td>
<td>38.94 *</td>
</tr>
<tr>
<td>(Competence and control)</td>
<td>(6.11)</td>
<td>(3.66)</td>
<td>(4.01)</td>
<td></td>
</tr>
<tr>
<td><strong>– Factor 2</strong></td>
<td>21.22 *</td>
<td>23.21 *</td>
<td>26.22 *</td>
<td>26.65 *</td>
</tr>
<tr>
<td>(Involvement and needs)</td>
<td>(4.23)</td>
<td>(2.86)</td>
<td>(2.36)</td>
<td></td>
</tr>
<tr>
<td><strong>Structured leisure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 27)</td>
<td>(n = 33)</td>
<td>(n = 41)</td>
<td>(n = 72)</td>
<td></td>
</tr>
<tr>
<td>Social + pa</td>
<td>1.04 *</td>
<td>1.91 *</td>
<td>4.22 *</td>
<td>4.36 *</td>
</tr>
<tr>
<td>(e.g. team sport)</td>
<td>(1.89)</td>
<td>(1.61)</td>
<td>(2.72)</td>
<td>(2.36)</td>
</tr>
<tr>
<td>Social + non-pa</td>
<td>1.00</td>
<td>0.94</td>
<td>0.61</td>
<td>0.19</td>
</tr>
<tr>
<td>(e.g. choir)</td>
<td>(1.96)</td>
<td>(1.39)</td>
<td>(0.10)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>Non-social + pa</td>
<td>0.52</td>
<td>0.67</td>
<td>0.71</td>
<td>0.50</td>
</tr>
<tr>
<td>(e.g. gymnastics)</td>
<td>(0.75)</td>
<td>(0.89)</td>
<td>(0.90)</td>
<td>(0.92)</td>
</tr>
<tr>
<td>Non-social + non-pa</td>
<td>0.50</td>
<td>0.67</td>
<td>0.71</td>
<td>0.50</td>
</tr>
<tr>
<td>(e.g. music lesson)</td>
<td>(0.76)</td>
<td>(0.89)</td>
<td>(0.89)</td>
<td>(0.88)</td>
</tr>
<tr>
<td><strong>Unstructured leisure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n = 26)</td>
<td>(n = 33)</td>
<td>(n = 38)</td>
<td>(n = 68)</td>
<td></td>
</tr>
<tr>
<td>Social + pa</td>
<td>12.08 *</td>
<td>12.70 *</td>
<td>22.71 *</td>
<td>21.99 *</td>
</tr>
<tr>
<td>(e.g. street games)</td>
<td>(9.02)</td>
<td>(10.40)</td>
<td>(11.28)</td>
<td>(9.18)</td>
</tr>
<tr>
<td>Social + non-pa</td>
<td>54.00</td>
<td>50.91</td>
<td>50.37</td>
<td>51.76</td>
</tr>
<tr>
<td>(e.g. movies friends)</td>
<td>(24.57)</td>
<td>(22.07)</td>
<td>(16.97)</td>
<td>(18.43)</td>
</tr>
<tr>
<td>Non-social + pa</td>
<td>4.42</td>
<td>4.03</td>
<td>3.26</td>
<td>3.57</td>
</tr>
<tr>
<td>(e.g. bicycling alone)</td>
<td>(5.15)</td>
<td>(5.63)</td>
<td>(3.52)</td>
<td>(4.98)</td>
</tr>
<tr>
<td>Non-social + non-pa</td>
<td>53.00</td>
<td>53.21</td>
<td>45.03</td>
<td>43.47</td>
</tr>
<tr>
<td>(e.g. reading)</td>
<td>(27.62)</td>
<td>(26.79)</td>
<td>(18.44)</td>
<td>(14.89)</td>
</tr>
</tbody>
</table>

\( \eta^2 \) = Partial Eta squared (Effect size).

Superscript letter “a” indicates significant differences (p < .01) from superscript letter “b” in Tamhane’s post hoc tests.

Structured leisure1 = Total number of activity sessions per week over past 12 months.

Unstructured leisure2 = Number of half-hour blocks of time over past 7-days.

Perceived freedom in leisure mean total raw score (Witt & Ellis, 1989)

Life satisfaction mean total raw score (Huebner, 1991).

* p <0.01, ** p < 0.001
**TABLE 6.4**  Correlations between developmental coordination disorder (DCD), life satisfaction, perceptions of freedom in leisure and leisure participation

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
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<tbody>
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<td>2</td>
<td>-.66**</td>
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<td></td>
<td></td>
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<tr>
<td>3</td>
<td>-.69**</td>
<td>.66**</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>-.53**</td>
<td>.37**</td>
<td>.41**</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>.29**</td>
<td>-.24*</td>
<td>-.24**</td>
<td>-.22*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-.16</td>
<td>.18</td>
<td>.22*</td>
<td>.11</td>
<td>-.04</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>7</td>
<td>.07</td>
<td>.05</td>
<td>-.07</td>
<td>-.09</td>
<td>.15</td>
<td>.08</td>
<td></td>
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<tr>
<td>8</td>
<td>-.48**</td>
<td>.22*</td>
<td>.30**</td>
<td>.26**</td>
<td>-.02</td>
<td>.05</td>
<td>.08</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>.01</td>
<td>-.04</td>
<td>.03</td>
<td>-.03</td>
<td>-.10</td>
<td>-.10</td>
<td>-.18</td>
<td>-.01</td>
<td></td>
<td></td>
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<td>.03</td>
<td>.08</td>
<td>.08</td>
<td>.01</td>
<td>-.19*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>.18</td>
<td>-.12</td>
<td>-.22*</td>
<td>-.06</td>
<td>.00</td>
<td>-.06</td>
<td>.18</td>
<td>-.37**</td>
<td>-.68**</td>
<td>.09</td>
<td></td>
</tr>
</tbody>
</table>

**Key**

1.  DCD¹  
   (Coding: DCD¹ = 1, non-DCD = 0)  
2.  Life satisfaction  
3.  Perceived freedom in leisure  
4.  Structured social-physical activities  
5.  Structured social non-physical activities  
6.  Structured non-social physical activities  
7.  Structured non-social non-physical activities  
8.  Unstructured social-physical activities  
9.  Unstructured social non-physical activities  
10. Unstructured non-social physical activities  
11. Unstructured non-social non-physical activities

*N = 173 for structured leisure, N = 165 for unstructured leisure

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

**Mediation Analyses**

Interaction effects for relationships between PFL and both life satisfaction and loneliness were not significant providing support for mediation analyses using combined group data. Mediation effects were found for PFL acting on two outcome variables; life satisfaction, and structured social-physical activity participation (see Table 6.5). Mediation effects for PFL-1 and 2 were also investigated for these relationships, with both factors operating in the same way as total PFL and having the same levels of significance.
TABLE 6.5 Mediation of relationships between physical coordination ability, life satisfaction and activity participation by perceived freedom in leisure (N=165).

<table>
<thead>
<tr>
<th>Outcome variable</th>
<th>Steps</th>
<th>$R^2$ change</th>
<th>$\beta$</th>
<th>95% confidence intervals</th>
<th>Sobel’s Test z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life satisfaction</td>
<td>Step 1</td>
<td>.30**</td>
<td>.05**</td>
<td>.04/.06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physical coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>.46**</td>
<td>.03**</td>
<td>.01/.04</td>
<td>4.54**</td>
</tr>
<tr>
<td></td>
<td>Physical coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PFL</td>
<td>.19**</td>
<td>.14/.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structured social-physical</td>
<td>Step 1</td>
<td>.16**</td>
<td>.03**</td>
<td>.02/.04</td>
<td></td>
</tr>
<tr>
<td>activities (Team sports)</td>
<td>Physical coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>.22**</td>
<td>.02*</td>
<td>.01/.03</td>
<td>3.55**</td>
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<td></td>
<td>Physical coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PFL</td>
<td>.08**</td>
<td>.04/.13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 1 = Outcome variables: life satisfaction total raw scores (Huebner, 1991), and structured social-physical activity participation units of time per week, regressed on predictor variable, MABC percentile scores (Henderson & Sugden, 1992).

Step 2 = Outcome variables: life satisfaction total raw scores and structured social-physical activity participation units of time per week, and mediator variable, perceived freedom in leisure (PFL) total raw scores (Witt & Ellis, 1989) regressed on predictor variable, MABC percentile scores.

Sobel’s (1988) test of mediation reflects the degree to which the $\beta$ for motor ability changed from Step 1 to Step 2 on an approximate Z curve.

*p < 0.01, **p < 0.001.

Discussion

It was found that boys with DCD had significantly lower participation in all social-physical activities than boys without DCD. These findings are consistent with previous research where low recreational physical activity engagement has been reported for children with DCD (Cairney et al., 2005). The largest effect size differences between boys with and without DCD for leisure-time activity participation were observed for two contexts; structured and unstructured social-physical activities. Large group physical activities are important developmental contexts for boys. Low participation in structured and unstructured social-physical contexts may mean that boys with DCD miss out on opportunities for enjoyable social and physical experiences in these settings.

Lower self-appraisals of PFL and overall life satisfaction were found for boys with DCD compared to boys without DCD. These are new, but not unexpected findings, given previous research examining related constructs for children with DCD. Increased symptoms of depression (Francis & Piek, 2003), low general self-concept (Skinner & Piek, 2001) and anxiety (Sigurdsson et al., 2002) have been found in children with DCD.
characteristics which are associated with low perceived quality of life (Huebner, Suldo, Smith, & McKnight, 2004).

Perceived freedom in leisure was identified as a significant mediator of relationships between physical coordination ability and life satisfaction, as well as with one activity context; team sports participation. It has been proposed that leisure-time activity participation may have more impact on quality of life than any other experience (Kelly, 1996). Indeed, leisure needs satisfaction and perceived leisure competence, which are components of PFL, have been found to contribute both directly and indirectly to life satisfaction (Brown & Frankel, 1993). For it is during the leisure-time hours that the sense of freedom to participate in activities of one’s own choosing is most likely. Also, there is increased likelihood that one will choose to spend time engaged in pursuits that are intrinsically motivating because these are the pastimes in which one feels a sense of competence, control and enjoyment (Witt & Ellis, 1989).

It was found that when PFL was low and a child had negative cognitions about self-perceived competence, control, depth of involvement and unfulfilled leisure needs, this was associated with low perceived life satisfaction. These cognitive appraisals of PFL are described by Witt and Ellis (1989) as internal barriers to participation in leisure activities. External barriers may also impact on leisure participation, and need to be considered by practitioners when examining the child-, activity-, and environment fit, as this also has the potential to impact on participation and life satisfaction appraisals. Exclusionary selection practices, socially evaluative motivational climates, low perceived peer or parental support; safety concerns about risk or physical injury and stereotypical gender perceptions can marginalise subordinated players and act as barriers to participation (Swain, 2004).

According to the SCOPE-IT model (Synthesis of Child, Occupational Performance and Environment – In Time) there is a need to consider child- and environment-level factors to promote engagement in personally meaningful activities, and this has health benefits (Poulsen & Ziviani, 2004). For example, up-skilling children’s physical and psychological capacities, helping children cope with requirements of different social-physical environments, identifying potentially discrediting social-physical leisure environments and acting as advocates of supportive practices in organised, community team sports are health-enhancing and preventive health initiatives. Previous research has shown that when barriers to leisure participation are removed for children with DCD, either through inclusive mastery climates in organised group settings (Valentini & Rudisill, 2004), individualized direct instructions (Wall, 2004), or self-guided mastery of occupational
performance goals (Missiuna et al, 2001), higher participation in a range of motor-based leisure experiences becomes possible. Interventions aimed at increasing elements of PFL, such as perceived self-efficacy and control, may enhance participation in social-physical activity participation and life satisfaction.

The findings of the study must be regarded as exploratory with replication required using larger sample sizes, broader social groups, across cultures, genders and with a wider range of intelligence scores. As directional relationships cannot be established through mediational analyses alone, it is recommended that future research, including longitudinal and experimental designs, be directed towards investigating causal pathways.

**Conclusion**

Boys with DCD experienced lower life satisfaction, PFL and spent less time in all social-physical activities than boys without DCD. Perceived freedom in leisure was found to be one internal process that mediated the relationship between physical ability and both leisure participation and life satisfaction outcomes. However, other mediators such as external environmental barriers to participation and perceived quality of life are likely and should be evaluated. There is also a need to consider direction of effects in future research so that interventions can be targeted at likely entry points in a possible cycle where physical ability, PFL, life satisfaction and leisure-time activity participation patterns interact and reciprocally influence each other. This has potential implications for effective intervention and preventive health initiatives.

**Acknowledgements**

We are grateful to the families and schools who took part in the study, to Judy Jones who assisted with data collection and to Michele Haynes and Ross Darnell for statistical advice.
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Chapter 7: Paper 6

Title: Boys with developmental coordination disorder: Loneliness and team sport participation. American Journal of Occupational Therapy.

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Key words: extracurricular activities, social participation, leisure

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Abstract

The mediational role of team sports and other leisure-time occupations for boys aged 10 to 13 years on the relationship between physical coordination ability and perceptions of loneliness was investigated. Sixty boys with developmental coordination disorder (DCD) and 113 comparison boys without DCD completed a self-report measure of loneliness. Parents recorded information on leisure-time involvement over seven days. Boys with DCD recorded significantly higher loneliness and lower participation rates in all group physical activities, whether structured (e.g. team sports) or unstructured (e.g. informal outdoor play) than boys without DCD. A negative relationship between physical coordination ability and loneliness was mediated by participation in team sports. No other leisure-time pursuits were found to be significant mediators. Childhood physical coordination difficulties were significantly associated with loneliness. However, participation in team sports acted as one potential mechanism mediating the inverse relationship between physical coordination ability and loneliness in boys. In addition, it is advised that occupational therapists act as advocates to support boys with DCD who choose to participate in team sports. Further investigations are recommended to determine aspects of team sports environments that promote an optimal child-, activity-, environment fit.
Introduction

Occupational therapists involved in the management of children with developmental coordination disorder (DCD) are increasingly attentive to the impact of poor motor performance on social inclusion as well as physical activity participation (Chen & Cohn, 2003). Children with restricted participation in everyday life situations are at-risk of experiencing social isolation, victimization and rejection by peers. Loneliness can become chronic when social participation restrictions continue for a long period (Rubin & Coplan, 2004). Children with DCD have limited engagement in organized and recreational social-physical activities (Cairney, Hay, Faught, Wade, Corna & Flouris, 2005). When participation in activities with friends increases, however, quality of life can improve even when motor impairment is not resolved (Mandich, Polatajko, & Rodger, 2003).

The primary purpose of this study was to examine the impact of leisure-time occupational performance patterns and contexts on perceptions of loneliness in boys with DCD. The defining feature of DCD is marked impairment in the development of motor coordination that is below the level expected for intelligence or chronological age, in the absence of neurological or sensory problems, and which interferes with activities of daily living. The incidence of DCD has been estimated as six per cent of the childhood population (American Psychiatric Association, 2000). The majority of studies report higher incidence of DCD in boys over girls with ratios ranging from 3:1 (Miller, Missiuna, Macnab, Malloy-Miller, & Polatajko, 2001) to 7:1 (Kadesjo & Gillberg, 1999).

Boys who play less sport outside school and are perceived by teachers to be less physically active than classmates are at higher risk of depressive symptoms (Tomson, Pangrazi, Friedman, & Hutchison, 2003). Two potential mechanisms have been proposed for understanding the association between occupation and adjustment – (1) child effects which suggests that better adjusted children become more involved in adaptive occupational performance contexts because of individual psychological characteristics, and (2) environmental effects which propose that social environments, such as those found in structured activity settings with peers, facilitate the development of social ties and support adaptive functioning (McHale, Crouter, & Tucker, 2001). The importance of the child-occupation-environment fit is integral to ensuring adaptive outcomes associated with participation in personally meaningful leisure-time occupations (Poulsen & Ziviani, 2004). The social context may be particularly important given that a key component of loneliness is lack of pleasurable engagement or connectedness with others (Goossens & Beyers, 2002). Another mechanism for understanding the
relationship between physical activity and adjustment includes cultural perceptions of what it means to be a "real" boy in different milieus. Thus, the emphasis placed on sporting excellence in some school environments may lead to loneliness and depression in those singled out for disapprobation because of non-participation (Swain, 2004).

In many western cultures, participation in team sports is endorsed for boys as a site of controlled masculinity, and success has high social status (Burgess, Edwards, & Skinner, 2003). Further, the social context of large group physical activities preferred by boys may contribute to lower feelings of isolation and loneliness (Pellegrini & Smith, 1998). For boys, having DCD can be a barrier to full participation in social-physical activities such as team games (Smyth & Anderson, 2001). Nevertheless, participating in alternative pursuits with peers, such as choir, band or youth groups may provide comparable opportunities to develop these social networks.

**Aims of the study**

The aims of this study include firstly, to describe the psychosocial self-perceptions of loneliness and the physical and social leisure-time participation patterns of boys aged 10 to 13 years with and without DCD. A second aim is to identify leisure-time activity participation contexts that are associated with adaptive outcomes (such as less loneliness) for boys with varying levels of physical coordination. Occupational performance processes that may impact on a proposed relationship between physical coordination and loneliness will be investigated. Three aspects of leisure-time occupational performance will be investigated as potential mediators; the social and physical leisure-time context, as well as the level of structural organization for different leisure pursuits. This study is exploratory in nature and aims to ascertain whether there are activity-adjustment links.

**Method**

**Participants**

Sixty boys with DCD and 113 boys without DCD aged between 10 and 13 years were group-matched for school year level, chronological age and socioeconomic status (see Table 7.1). Boys who participated in the study lived in the Brisbane metropolitan area; were Australian born without Aboriginal or Torres Strait Islander heritage; and were from middle to higher socioeconomic status backgrounds. Study participants were assigned to four groups based on Movement ABC (MABC) scores (Henderson & Sugden, 1992) (see Table 7.2).
TABLE 7.1 Demographic characteristics

<table>
<thead>
<tr>
<th></th>
<th>DCD</th>
<th>Non-DCD</th>
<th>F-values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 60</td>
<td>N = 113</td>
<td></td>
</tr>
<tr>
<td>Mean age</td>
<td>11yrs 7mths (SD = 9.7mths)</td>
<td>11yrs 8mths (SD = 9.3mths)</td>
<td>0.47</td>
</tr>
<tr>
<td>Intelligence</td>
<td>117 (SD = 18)</td>
<td>No intellectual impairment</td>
<td></td>
</tr>
<tr>
<td>Total Family size</td>
<td>4.45 (SD = 1.1)</td>
<td>4.54 (SD = 1.0)</td>
<td>0.31</td>
</tr>
<tr>
<td>Proportion of one-child families</td>
<td>0.05 (SD = 0.2)</td>
<td>0.10 (SD = 0.3)</td>
<td>1.18</td>
</tr>
<tr>
<td>Parents’ occupational grouping2</td>
<td></td>
<td></td>
<td>1.02</td>
</tr>
<tr>
<td>Higher status</td>
<td>51 (85%)</td>
<td>89 (78.8%)</td>
<td></td>
</tr>
<tr>
<td>Middle status</td>
<td>8 (13.3%)</td>
<td>22 (19.5%)</td>
<td></td>
</tr>
<tr>
<td>Lower status</td>
<td>1 (1.7%)</td>
<td>2 (1.8%)</td>
<td></td>
</tr>
<tr>
<td>School characteristics</td>
<td></td>
<td></td>
<td>32.39*</td>
</tr>
<tr>
<td>Independent – boys</td>
<td>39 (65%)</td>
<td>110 (97.3%)</td>
<td></td>
</tr>
<tr>
<td>Independent – co-ed</td>
<td>4 (6.6%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>State funded – co-ed</td>
<td>17 (28.3%)</td>
<td>3 (2.6%)</td>
<td></td>
</tr>
</tbody>
</table>

1Intelligence as measured on SIT-R3 (Slosson et al., 1990) -DCD group. Parent and teacher report of no intellectual impairment for non-DCD group.


*p <.001

TABLE 7.2 Group definitions

<table>
<thead>
<tr>
<th>Group</th>
<th>Movement ABC score</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Severe DCD</td>
<td>Below the 5th percentile</td>
<td>27</td>
</tr>
<tr>
<td>Moderate DCD</td>
<td>Equal to or above the 5th percentile but below the 15th percentile</td>
<td>33</td>
</tr>
<tr>
<td>Non-DCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Coordination</td>
<td>Equal to or above the 15th percentile but below the 50th percentile</td>
<td>41</td>
</tr>
<tr>
<td>High Coordination</td>
<td>Equal to or above the 50th percentile</td>
<td>72</td>
</tr>
</tbody>
</table>

Instruments

Movement ABC (MABC; Henderson & Sugden, 1992) consists of three tests of manual dexterity, two tests of ball skills and three tests of static and dynamic balance. Raw scores are summed and converted to percentiles. Adequate reliability (Henderson & Sugden, 1992) and acceptable concurrent validity are reported (Crawford, Wilson, & Dewey, 2001).
TABLE 7.3  Coding of leisure-time pursuits

<table>
<thead>
<tr>
<th>Activity Groupings</th>
<th>Physical¹</th>
<th>Social²</th>
<th>Structured³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team sports</td>
<td>e.g. football, cricket, basketball</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Organised non-physical groups</td>
<td>e.g. choir, band, chess</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Physically active group play</td>
<td>e.g. chasing, street ball games</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Sedentary group recreation</td>
<td>e.g. electronic media use with friends</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Individual and dyadic sports</td>
<td>e.g. gymnastics, athletics, tennis</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Individual sedentary lessons</td>
<td>e.g. instrument lessons, tutoring</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Solitary physically active play</td>
<td>e.g. walking, trampolining, cycling</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Solitary sedentary play</td>
<td>e.g. electronic media use on own</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

¹Physical activities performed at >2 METS for majority of half hour block.
²Social activities involving >2 children.
³Structured activities with adult-organised training or performance activities and regular timetabling.

Slosson Intelligence Screening Test – Revised 3 (SIT-R3; Slosson et al., 1990) was used to determine whether the child met the exclusion criteria of intellectual impairment. If the child had been recently assessed on another recognized test of intelligence the scores from this assessment were recorded and the SIT-R3 was not administered. Reliability of the instrument is excellent (Slosson et al., 1990) with high concurrent validity for screening purposes against the Stanford-Binet: Fourth edition ($r = .92$) (Kunen, Overstreet, & Salles, 1996).

The Loneliness and Social Dissatisfaction Questionnaire (Asher & Wheeler, 1985) is a 24-item self-report questionnaire assessing the subjective experience of loneliness. Chipuer’s (2001) modification of this 24-item self-report questionnaire was used to provide a context-free measure of loneliness. Sixteen core items measuring perceptions of loneliness and eight filler items are presented as statements to which children respond on a five-point scale from always true to not true at all. A total loneliness score is computed with scores ranging from 16 to 80. Higher scores indicate greater loneliness. Three items can be extracted to provide a Pure Loneliness score. This questionnaire has been shown to have excellent psychometric properties, consistent factor structure across samples, high internal consistency and good test-retest reliability (Goossens & Beyers,
2002). The use of a total loneliness score that was context-free was adopted over the pure loneliness score, as suggested by Asher and Wheeler (1985).

**Seven-day leisure-time diary.** On this measure parents are asked to complete a leisure-time diary of their son’s past week’s out-of-school activities. An activity description for each half hour block is recorded. This instrument was modified to include information about the physical location and social context of the activity. The roles and relationships of adults and children to the target child were also included. This measure has been reported to have acceptable levels of compliance and reliability (Larson & Verma, 1999).

**Retrospective 12-month leisure survey.** Parents recalled their sons’ participation in structured leisure-time activities over the past 12 months and the total number of sessions attended per week for each activity. Information about unstructured leisure-time participation patterns was not surveyed because of concerns about accuracy of informal recall of play, which may have been more variable and subjective. In contrast, structured time use recall was felt to be reliable because of formal timetabling of activity sessions. The retrospective 12-month leisure survey was adapted from a one-year self-administered physical activity recall questionnaire developed and validated for use with adolescents (Aaron et al., 1995).

**Procedure**

Ethical clearance was obtained from all centres involved in the study. Boys with DCD were recruited from therapy clinics and through a school screening program conducted at two independent boys’ schools, as well as by media releases and snowball recruitment. Boys were assigned to the DCD group if they scored < 15th percentile MABC, and had difficulties with daily living skills on parent questionnaires and clinical interviews. Inclusion criteria included no intellectual impairment, no diagnosed emotional, neurological or motor disorder and no intervention during the past three months that impacted on leisure-time participation patterns.

Boys in the comparison group were recruited through a school screening program at two boys’ schools. Four non-consenting schools cited response burden and stigmatisation concerns, for refusal to participate. Concerns about stigmatisation were addressed in participating schools by including all consenting students across eligible year levels. The response rate at these schools was 89% and 75% respectively. Boys in the comparison group scored ≥15th percentile on the MABC, and other inclusion criteria were the same as for the target group. Intelligence was not measured in the comparison group, but boys identified as having academic or behavioural difficulties by either parents or teachers
were excluded.

Prior to group allocation, parents of potential participants completed a retrospective 12-month child-leisure survey that included questions about the child’s physical, emotional and cognitive characteristics and were interviewed about child’s performance of activities of daily living. Administration of the MABC, the Slosson Intelligence Test-Revised (Slosson, Nicholson, & Hibpshman, 1990), for boys with DCD only, was followed by completion of the Loneliness and Social Dissatisfaction Questionnaire (Asher & Wheeler, 1985). Assessments were carried out by registered occupational therapists at schools or occupational therapy centres. Parents filled out seven-day diaries after child evaluations were completed. Quality and accuracy checks were conducted by visually inspecting diary data and contacting parents about missing data. Eight diaries from the comparison group were rejected because of incomplete or poor data quality.

The researchers used consensus-coded data for categorization of pursuits based on three criteria, physical/non-physical, social/non-social and structured/unstructured (examples in Table 7.3). This resulted in eight activity categories, thus extending the four-category grouping based on social and physical classification of activities used by Cantell, Smyth and Ahonen (1994). Diary data were coded by the first author with a random sample of 20% of the logs checked for inter-rater reliability with a kappa of 0.90.

The compendium of physical activities for adults was used to code energy expenditure using metabolic energy expenditure (MET) intensity levels (Ainsworth, 2002). Its utility with children has been documented in previous research (Trost et al., 2002). One MET is defined as the metabolic energy expenditure of sitting still. The cut-off point for determining physical activity in this study was set at >2 METS to account for the higher resting energy expenditure rate of boys aged 8 to 13 years compared to adults (Harrell et al., 2005).

**Analyses**

To investigate differences between the four groups of boys (severe and moderate DCD, medium and high non-DCD), analysis of variance (ANOVA) tests were run. The first analysis was to test differences in means for loneliness and leisure-time activity participation variables. Investigation of the distribution of Total Loneliness scores for all study participants revealed a positive skew. This was largely driven by boys in the non-DCD groups. Log transformations were unable to normalize the data. The test of ANOVA however, is robust when sample sizes are large (Tabachnick & Fidell, 2002). ANOVA data were supported by Kruskal-Wallis test results. Tamhane’s post-hoc analyses were
conducted to determine which of the means for the different sized groups were different from each other.

To test for significant relationships between the dependent or outcome variable (loneliness), the mediating variables (leisure-time activity participation) and the predictor variable (physical coordination ability) correlations were computed using Spearman’s correlations because of non-normal distribution of total Loneliness scores. In the correlational analyses one representative variable for each activity category was selected in order to reduce the data set. For structured activity participation a 12-month recall of the number of sessions per week was selected. Unstructured activity data were derived from the seven-day diaries.

To test whether there was a different association between loneliness and leisure-time activity participation in each of the groups, an interaction term was included in the linear regression term of loneliness and leisure-participation variables for physical coordination group membership. To examine whether leisure participation in different social contexts mediated the relationship between level of loneliness and physical coordination, a series of regression equations was computed using combined data from DCD and non-DCD groups.

The mediation analytic strategy involved firstly, regressing the mediator variables (leisure-time activity participation) on the predictor variable of physical coordination ability. Next, two steps were performed to test for mediation effects. In step one the outcome variable (loneliness) was regressed on the predictor variable. In step two the outcome variable was regressed on both the predictor and mediating variables. To determine significance of mediation effects Sobel’s (1988) test was computed using the MedGraph program (Jose, 2005).

**Results**

**Descriptive Statistics**

Means and standard deviations for loneliness, physical coordination and leisure time participation variables are reported in Table 7.4. Statistical significance was set at .01 for all statistical tests to reduce the likelihood of Type I error. There was a significant group effect for Total Loneliness. Tamhane’s post hoc analyses revealed that boys with DCD experienced greater loneliness than boys without DCD irrespective of allocation to severe or moderate DCD group. There were no significant differences between the two non-DCD groups or between the two DCD groups.
TABLE 7.4  Means and (Standard Deviations) for loneliness, physical coordination and leisure

<table>
<thead>
<tr>
<th></th>
<th>DCD (M(SD))</th>
<th>NON-DCD</th>
<th>F-Ratio</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe (n = 27)</td>
<td>Moderate (n = 33)</td>
<td>Medium (n = 41)</td>
<td>High (n = 72)</td>
</tr>
<tr>
<td>Total Loneliness</td>
<td>38.33a (12.18)</td>
<td>35.03a (11.27)</td>
<td>22.46b (4.73)</td>
<td>21.30c (5.03)</td>
</tr>
<tr>
<td>Team Sport – 7-day1</td>
<td>3.19c (5.31)</td>
<td>3.03c (4.41)</td>
<td>5.59c (5.66)</td>
<td>10.46c (7.92)</td>
</tr>
<tr>
<td>– 12-month (sess)2</td>
<td>1.04a (1.89)</td>
<td>1.91a (1.61)</td>
<td>4.22b (2.72)</td>
<td>4.36c (2.36)</td>
</tr>
<tr>
<td>– 12-month (n)3</td>
<td>0.52a (0.98)</td>
<td>1.06a (0.86)</td>
<td>1.93b (1.13)</td>
<td>2.25b (1.49)</td>
</tr>
<tr>
<td>Structured social/non-pa – 7-day1</td>
<td>3.67a (5.41)</td>
<td>3.12a (5.17)</td>
<td>2.97a (4.48)</td>
<td>1.61b (3.20)</td>
</tr>
<tr>
<td>– 12-month (sess)2</td>
<td>1.00a (1.96)</td>
<td>0.94a (1.39)</td>
<td>0.61b (0.10)</td>
<td>0.19b (0.49)</td>
</tr>
<tr>
<td>– 12-month (n)3</td>
<td>0.67a (0.78)</td>
<td>0.61a (0.66)</td>
<td>0.46b (0.78)</td>
<td>0.17b (0.41)</td>
</tr>
<tr>
<td>Unstructured social/pa – 7-day1</td>
<td>12.08a (9.02)</td>
<td>12.70a (10.40)</td>
<td>22.71b (11.28)</td>
<td>21.99b (9.18)</td>
</tr>
<tr>
<td>Unstructured social/non-pa – 7-day1</td>
<td>54.00 (24.57)</td>
<td>50.91 (22.07)</td>
<td>50.37 (18.97)</td>
<td>51.76 (18.43)</td>
</tr>
<tr>
<td>Structured non-social/pa – 7-day1</td>
<td>3.31 (4.62)</td>
<td>2.33 (4.65)</td>
<td>4.44 (6.42)</td>
<td>3.14 (4.96)</td>
</tr>
<tr>
<td>– 12-month (sess)2</td>
<td>1.15 (1.61)</td>
<td>1.85 (3.63)</td>
<td>2.66 (2.67)</td>
<td>1.86 (2.31)</td>
</tr>
<tr>
<td>– 12-month (n)3</td>
<td>0.93 (1.17)</td>
<td>0.91 (0.91)</td>
<td>1.12 (1.08)</td>
<td>1.18 (1.27)</td>
</tr>
<tr>
<td>Structured non-social/non-pa - 7day1</td>
<td>0.35 (0.80)</td>
<td>0.55 (1.00)</td>
<td>0.33 (0.74)</td>
<td>0.32 (0.89)</td>
</tr>
<tr>
<td>– 12-month (sess)2</td>
<td>0.52 (0.76)</td>
<td>0.67 (0.89)</td>
<td>0.71 (0.90)</td>
<td>0.50 (0.92)</td>
</tr>
<tr>
<td>– 12-month (n)3</td>
<td>0.48 (0.64)</td>
<td>0.55 (0.56)</td>
<td>0.56 (0.74)</td>
<td>0.33 (0.56)</td>
</tr>
<tr>
<td>Unstructured non-social/pa - 7day1</td>
<td>4.42 (5.15)</td>
<td>4.03 (5.63)</td>
<td>3.26 (3.52)</td>
<td>3.57 (4.83)</td>
</tr>
<tr>
<td>Unstructured non-social/non-pa</td>
<td>53.00 (27.62)</td>
<td>53.21 (26.79)</td>
<td>45.03 (18.44)</td>
<td>43.47 (14.89)</td>
</tr>
</tbody>
</table>

pa = physical activity >2 METs, non-pa = non-physical activity ≤ 2 METS.

7-day1 = Total time in half-hour blocks over previous 7-days (DCD Severe N = 26, DCD Moderate N = 33, non-DCD Medium N = 38, non-DCD High N =68).

Structured12-mth (sess)2 = Total number of activity sessions per week over past 12-months

Structured 12-mth (n)3 = Total activities per week over past 12 months.

Structured sessions (DCD Severe N = 27, DCD Moderate N = 33, non-DCD Medium N = 41, non-DCD High N =72).

Total Loneliness = Mean total raw scores (Asher & Wheeler, 1985)

Physical Coordination - MABC = Mean percentile scores (Henderson & Sugden, 1992).

Superscript letter “a” indicates significant differences \( p<0.01 \) from “b” in Tamhane’s post hoc tests.

Effect size \( \eta^2 \) = Partial eta squared.

\*p <0.01, \**p <0.001
Participation in all social-physical activities was less for boys with DCD compared to boys without DCD. This difference was significant regardless of whether the social activity was structured or unstructured. ANOVAs showed the mean level of team sport participation was significantly less for boys with DCD compared with boys without DCD on all three measures of team sport participation. Time spent in unstructured social-physical play was also significantly reduced for boys with DCD compared to boys without DCD. Significantly more time was spent in structured social/non-physical activities by the DCD group compared to the highly coordinated non-DCD group of boys. The seven-day diary data results were not significantly different but demonstrated a trend that mirrored these results.

When correlations for the combined group data were analysed, strong positive correlations between DCD and loneliness were found (see Table 7.5). Positive correlations between DCD and participation in non-physical activities such as choir (structured and social) and between loneliness and participation in these more sedentary activities were weaker, but significant at the $p < .001$ level. Moderate negative correlations were found between DCD and team sport participation. Participation in these structured social-physical activity contexts was negatively associated with loneliness. Weak negative relationships between loneliness and time spent in unstructured group physical activities, and between DCD and time in these social-physical play contexts was also found.

There were also correlations between different activity contexts. For example, time spent alone in sedentary activities such as television viewing was negatively related to time spent in these types of pursuits with other children present. Time spent in structured social-physical activities, such as team sports, was negatively associated with structured time use in social activities of a more sedentary nature. Time spent outdoors with friends in physically active informal games and activities was also negatively correlated with time spent in solitary, sedentary group activities.

**Mediation Analyses**

The interaction effect for the relationship between leisure-time activity participation and loneliness was not significant providing support for mediation analyses using the combined group data. Leisure-time activity participation variables were firstly regressed on physical coordination. Two leisure participation variables were significantly associated with physical coordination: number of sessions of team sports played per week over the past 12 months ($B = .03, p = .01$) and the number of sessions of structured social non-physical activities attended per week over the past 12 months ($B = -.02, p = .01$).
### TABLE 7.5  Spearman’s correlations for loneliness, developmental coordination disorder (DCD) and leisure participation

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Total loneliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. DCD</td>
<td>.69**</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Team sport</td>
<td>-.40**</td>
<td>-.53**</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Structured social</td>
<td>.30**</td>
<td>.29**</td>
<td>-.22**</td>
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<td>-.06</td>
<td>.00</td>
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<td>-.68**</td>
<td>-.06</td>
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Note: *p < .01, **p < .001. pa = physical activity, non-pa = non-physical activity
DCD$^1$ = <15th percentile Movement ABC (Henderson & Sugden, 1992). Coded DCD = 1, non-DCD = 0.

$N = 173$ for 12mth leisure survey$^2$ (number of sessions)

$N = 165$ for 7-day diary variables$^3$ (half hour blocks per week).

Two steps were then performed where loneliness was regressed on physical coordination alone, in Step 1 ($B = -.17, p = .02$), and then loneliness was regressed on physical coordination and team sports participation ($B = -.14, p = .02$) and structured social non-physical activities ($B = .04, p = .59$), in Step 2. The number of sessions of team sports per week over the past year was found to be the only significant predictor of loneliness. The strength of the relationship between physical coordination and loneliness with and without the mediating variable of team sport participation included in the regression was then compared in order to determine whether control of team sport participation significantly reduced the relationship between predictor and outcome variables (Table 7.6).
TABLE 7.6  Mediation of the relationship between physical coordination and total loneliness by team sport participation (N = 173)

<table>
<thead>
<tr>
<th>Steps</th>
<th>R² change</th>
<th>B</th>
<th>95% Confidence Intervals</th>
<th>Sobel’s Test</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>Z score</td>
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<tr>
<td>Step 1</td>
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<td></td>
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<tr>
<td>Physical coordination</td>
<td>0.31**</td>
<td>-0.17**</td>
<td>-0.20 to -0.13</td>
<td></td>
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<tr>
<td>Step 2</td>
<td></td>
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<td></td>
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<tr>
<td>Physical coordination</td>
<td>0.34**</td>
<td>-0.14**</td>
<td>-0.18 to -0.10</td>
<td>-2.49*</td>
</tr>
<tr>
<td>Team sport participation</td>
<td></td>
<td>-0.76**</td>
<td>-1.31 to -0.22</td>
<td></td>
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</tbody>
</table>

Step 1 = Outcome variable - total loneliness raw scores (Asher & Wheeler, 1985) - regressed on predictor variable - MABC percentile scores (Henderson & Sugden, 1992).

Step 2 = Outcome variable - total loneliness raw scores - and mediator variable - team sport participation units of time per week - regressed on predictor variable - MABC percentile scores.

Sobel’s (1988) test of mediation reflects the degree to which the \( B \) for physical coordination changed from step 1 to step 2 on an approximate \( Z \) curve.

* \( p < .01 \), ** \( p < .001 \)

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**Figure 7.1**  Partial mediation by team sport participation on relationship between physical coordination and loneliness

1 Direct correlation effect with the mediating variable included in the regression.

2 Indirect correlation effect is the amount of the original correlation between the predictor variable and outcome variable that now goes through the mediator to the outcome variable.

*\( p < .01 \), **\( p < .001 \).

The relationship between physical coordination and loneliness was significantly smaller when team sport participation was included in the equation than when it was omitted, but
it was still greater than zero, thus suggesting partial mediation. Figure 7.1 depicts the significant partial mediation of the relationship between physical coordination and loneliness by team sport participation ($Z = 2.49$, $p < .01$).

**Discussion**

Boys with DCD in this study reported more loneliness than boys without DCD. These clear differences between boys with and without DCD are of concern because of potential adverse outcomes including depression, unhealthy attributional styles and low self-worth associated with loneliness (Qualter & Munn, 2002). In addition, boys with DCD participated in fewer structured social-physical activities, such as team sports, than did boys without DCD. They also spent more time in structured non-physical activities with large groups of peers, such as choir, than boys in the well coordinated group, and this was associated with higher levels of loneliness.

Participation in structured extracurricular activities has been associated with less depression in middle childhood, particularly for boys who are active sports participants (McHale et al., 2001). Team sport participation was found to be associated with low loneliness for boys in this study. Positive processes operating in these structured extracurricular activities that have the potential to protect against loneliness may include the presence of non-parental adult mentors, affiliation benefits, and emotional investment in activities to promote academic, affective and behavioural competencies.

In this study, all leisure-time activities were examined for their potential role as mediators of the relationship between physical coordination and loneliness. These were classified on the basis of structure, social context and physical activity. Team sports incorporate all three elements, being highly structured, involving large groups of children, and involving moderate to vigorous energy expenditure.

Team sports participation was the only activity context that significantly mediated the relationship between loneliness and physical coordination ability. Although other social activity contexts involving structured and unstructured time spent with peers in group settings were explored for their potential as mediators, team sports alone influenced loneliness for boys with different levels of physical coordination. Thus, team sports participation is one mechanism through which physical coordination influences feelings of loneliness reported by boys in the pre- to early adolescent years.

To understand why team sports participation acted as a mediating influence on perceptions of loneliness for boys it is necessary to consider elements of the team milieu.
that might militate for or against loneliness. Links between activities and adjustment have been explained by the social context rather than the content of the activities (McHale et al., 2001). Team sports offer opportunities for affiliation, supportive networks, turn-taking and leadership possibilities. These benefits of participation vary with the motivational climate and goal orientation of the group, and are implicitly linked with structural elements of the activity context including how the adult leader organises training sessions, the level of competition or grading of the team, and the rules of engagement.

Detailed information on aspects of the social and structural characteristics of team sports was not recorded in the current study. It could be that participation per se, regardless of level of proficiency, provides a buffer against loneliness. Poor physical performance in competitive or performance-oriented motivational climates is a discrediting attribute however, and it is possible that participation alone would not ameliorate loneliness in these environments. It may, in fact, lead to anxiety, negative affect, reduced enjoyment and lack of personal satisfaction; emotions which have been reported for children with DCD (Fitzpatrick & Watkinson, 2003; Segal, Mandich, Polatajko, & Valiant Cook, 2002). Other elements of the child-environment-occupation fit may be important to consider.

Social stigmatisation, by peers who are securely located in the sporting realm, may contribute to feelings of loneliness for boys with DCD (Segal et al., 2002). This may be endorsed in cultures where stereotypic views of masculinity are promoted in power sports such as rugby (Swain, 2004). Highly visible peer groups, such as the sporting “jocks” who participate in popular team sports, may also discredit participation in alternative social extracurricular activities such as choir, chess club or art groups. Several boys in the study perceived art and choir to have low social status although some artistic activities such as cartooning were exceptions as they were socially valued.

Although high loneliness and low participation in team sports is reported by many boys with DCD, a small number remain active participants in games such as football, even when faced with limited success and higher levels of physical injury than their peers (Cantell, Smyth, & Ahonen, 2003; Cantell, Smyth, & Ahonen, 1994). Ongoing engagement for boys described as “determined” athletes may be facilitated by optimal child-occupation-environment fit. Support by parents, coaches and others may be particularly important for these children. While some boys reported a more encouraging peer environment, others described active rejection, a situation that is more strongly associated with loneliness than being overlooked or neglected (Asher & Wheeler, 1985).
Clinical Implications

The findings of this study have implications for occupational therapy practice. In particular, questions are raised as to whether occupational therapists should endorse team sport participation for boys with DCD, and if so, how, and in what context team sport participation is likely to be beneficial. Experienced practitioners working with boys with DCD have traditionally voiced concerns about the negative impact of highly competitive team sports and non-supportive physical activity environments for individuals with poor physical coordination (see for example, Missiuna et al., 2003). Thus, a conservative approach to intervention has seen many practitioners steering children with DCD towards non-competitive, life style activities where skills can be acquired sequentially, and where success if measured through individual achievement rather than collective performance (see, for example, Poulsen & Ziviani, 2004).

In this study it was found that for the small number of boys with DCD who participated in team sports, loneliness was lower and social satisfaction was higher, irrespective of the child’s level of physical coordination ability. Therefore, it would appear that team sport participation offers psychological benefits for participants, and should not be discounted as a potential leisure pursuit for boys with DCD. However, parents and practitioners need to be able to identify team sport characteristics and environments that are likely to be supportive to a child’s mental health.

It is recommended that occupational therapists who work with children with DCD, obtain information from the child, their parents and the non-parental adult leaders involved in community team sports, to identify the characteristics of the child, activity and environment that underpin an optimal fit. Amongst the child characteristics impacting on team sport participation are age, physical, cognitive, affective and motivational factors. For example, younger children with DCD are more likely to participate in team sports than older children with DCD. Perhaps this is related to an increased emphasis on mastery of skills and acquisition of game rules knowledge in entry-level team sports which have a developmental focus, compared to team sports comprised of early adolescent children where competitive goals are more likely to be emphasized.

Knowledge of child characteristics required for different team sports, as well as information about activity- and environment-specific factors including costs, availability, coaching accreditation programs, parent and extended family support, level of competition, intensity and focus of training programs are practical considerations that underpin decisions about potential “fit” for each child. Most importantly, practitioners need to evaluate the motivational climate of the proposed team sport environments.
Understanding the situational motivational climate implies that practitioners will gain information about whether the coaching program is directed towards a mastery-oriented climate that promotes personal improvement, learning and self-referenced skill acquisition, rather than an ego-involving or competitive motivational climate where social comparison or normative referencing of ability is the focus. Mastery-oriented motivational climates are associated with increased enjoyment and life satisfaction (Spray, 2000). Therefore, asking the child if he is having fun and if the team sport sessions are going well, may tap into the enjoyment and satisfaction factors. However, it is recognised that team sports environments are multidimensional and a full appraisal of the way in which tasks are structured, how success and failure are appraised, the grouping of children by ability and so on, are also important considerations.

The achievement goal framework is one approach with potential to inform clinical decisions about team sport participation (for example, Nicholls, 1989; Ntoumanis & Biddle, 1999). Occupational therapists are advised to consider adopting a role advocating mastery-oriented motivational team climates. This will mean promoting a shift from a competitive team sports orientation to cooperative learning, peer interaction, and from public to private recognition for accomplishments or progress (Henert, 2001). Encouraging communities and schools to adopt models such as the “sports for peace” approach where affiliation and learning processes are emphasized (Ennis, Solmon, Satina, Loftus, Mensch & McCauley, 1999), or the TARGET model, an acronym for Tasks, Authority, Recognition, Grouping, Evaluation and Time, applied coaching program based on the principles of achievement goal theory (Epstein, 1989; Treasure, 2000), has the potential to increase participants’ enjoyment, persistence and involvement in team sports.

It is further recommended that therapists support the implementation of the proposed rating classification system for American Youth Sport Programs that would enable parents to make informed decisions about team sport participation (Wiersma, 2005). This rating scheme classifies youth sports on criteria such as level of competition, cost, skill, participation opportunities and time commitments. For example, level 1 is characterized by a focus on skill acquisition across all playing positions, low cost and time commitment, no try-outs or team cuts, and no formal competitions or scoring.

Collaboration with community partners, families and children requires a shared motivational vision and adoption of child-centred practices to ensure optimal participation outcomes. This means working with the boys who have DCD, the teams, the parents and
the coaches in collaborative partnerships. Provision of information to educate parents, teachers and other key individuals based on research about how to create an optimal child-, activity-, environment fit for children with DCD is an initial step in this process (see for example Missiuna, 2003; Missiuna & Pollock, 2006).

**Limitations and future directions**

Since this study was cross-sectional, experimental manipulation of the mediator variable, team sport participation, was not possible. However, a plausible connection between physical coordination, loneliness and team sport participation was demonstrated and the significant mediating effect of team sport participation on loneliness for boys with DCD survived multiple empirical tests. Direction of effect cannot be resolved using a mediational model. Longitudinal investigation would contribute to understanding about directional effects.

The difficulties inherent in measuring a subjective experience such as loneliness are mitigated by evidence that the scores of children who do report loneliness may be considered accurate (Terrell-Deutsch, 1999). Future studies might consider collecting information on the developmental course of loneliness in children with DCD. Prolonged loneliness has been shown to lead to internalizing problems such as depression; however, developing alternative areas of competencies in valued pursuits may influence participation and mental health outcomes at different ages (Goossens & Beyers, 2002).

More detailed activity participation information might be obtained by using a retrospective 24-hour cued interview recall method of attaining information from both child and parent/s, with probing about the social and structural characteristics of leisure environments. Comparison of gender, age and socioeconomic differences in participation in structured physical and non-physical activities would broaden applicability of findings.

The findings of the study must be treated with caution given the non-representative sample where there was a discrepancy between the proportion of boys in each group who came from an all boys or a co-educational school, and where there was a high proportion of boys from higher socioeconomic status backgrounds. This is an important factor to consider in terms of social variable such as loneliness. Also, the mean intelligence score of the DCD group was 117, which is in the top range of “high average”. Future research with a more representative population is recommended.

A final limitation of the study relates to the investigation of mediation effects using
combined data from the two groups. When the residuals for the loneliness scores were analysed it was found that the residuals were positively skewed and thus the standard errors were influenced by non-normally distributed data for the comparison group. This was due to missing information from one quadrant of the distribution for loneliness scores of the non-DCD group. While the DCD groups’ scores for loneliness were normally distributed, there were few boys in the comparison group who reported high loneliness. While the DCD group was comprised of many boys who were referred from therapy clinics because of identified problems with motor coordination and functional impairment, the comparison group was recruited through a school screening program. Although there was a high response rate at these schools, the families who decided to refuse participation may have done so because of social, behavioural or other reasons, which may have influenced the distribution of loneliness scores. Although the skewed data for Total Loneliness for the comparison group was an inherent problem of the sampling procedure the regression analyses are robust to slight skewness (Tabachnick & Fidell, 2002). There was evidence of slight bimodality, which could artificially inflate the correlations, therefore, these results must be regarded as exploratory and could be improved with a full range of loneliness scores. These issues could be addressed in future research.
Conclusion

The implications of having physical coordination difficulties as a 10- to 13-year old boy must be considered beyond motor difficulties alone. The findings of this study indicate increased feelings of loneliness for boys with DCD compared to boys without DCD. Importantly, it was found that the amount of time spent engaged in team sports mediated the negative relationship between loneliness and level of physical coordination ability.

Therapeutic use of occupational performance interventions include ensuring access and ongoing support for boys with physical coordination difficulties who choose to participate in team sport activities. The effect of low participation in team sports for boys with DCD, either through overt or covert exclusion, may be to reduce opportunities to develop affiliation with a large proportion of the peer group and thus increase feelings of loneliness. The health and social implications of this must be acknowledged. There is growing concern by health practitioners that this at-risk population whose poor motor performance, high levels of loneliness and reduced physical activity participation may have detrimental secondary sequelae.

Acknowledgements

We are very grateful to the families and schools who took part in the study, to Judy Jones who assisted with data collection and to Michele Haynes and Ross Darnell for statistical advice.
References


Chapter 8: Summary of Findings

This thesis represents an extension of knowledge in the study of children with DCD by detailing their physical activity leisure-time participation patterns and psychosocial characteristics. In addition, and more importantly, it provides new data about processes influencing relationships between physical coordination ability and quality of life-related outcomes. The identification of perceived freedom in leisure (PFL) as a mechanism influencing participation in team sports, a controversial activity context for boys with DCD, but one which was found to mediate between physical coordination ability and both loneliness and global life satisfaction, is significant because of its clinical implications. This knowledge also has the potential to inform future research and contribute to theory development.

Exploration of mechanisms is an essential step towards identifying causal agents influencing developmental trajectories of boys with DCD, and in this study mediation analyses were guided by an ecological open systems model called SCOPE-IT. This model proposes that activity participation is determined by a multitude of intra-psychic and physical factors interacting with physical and social contextual features of the environment to influence occupational performance in areas such as leisure. The pathways linking these child- and environment-level factors reciprocally and cyclically influence time spent, effort and choice about activity participation that subsequently impacts on quality of life.

This study, therefore, moves beyond a descriptive analysis of the psychosocial features and leisure-time activity participation patterns of boys with DCD directing attention towards mechanisms that may be used to change the lives of these individuals. Many of the variables explored as mechanisms in this study have not been previously examined in quantitative research designs using large numbers of boys with DCD. However, detailed qualitative research with parents (Ahern, 2000; Mandich et al., 2003; Missiuna, Moll, King et al., 2006; Segal et al., 2002), retrospective studies with adults who had movement difficulties (Fitzpatrick & Watkinson, 2003), clinical information and observations from longitudinal investigations (Cantell et al., 2003; Cantell et al., 1994) have informed practice and provided direction for this study. In addition, this study was designed to respond to Missiuna’s (2006) call for investigation of processes linking physical, psychosocial and occupation-based engagements of children with DCD.

The thesis-by-publication format was selected for the presentation of the current research findings. A sustained and coherent theme running throughout the program of
research is the exploration of differences between boys with and without DCD on identified psychosocial and leisure participation variables, followed by investigation of the mechanisms contributing to a favourable or unfavourable child-leisure-environment fit for boys with DCD. The SCOPE-IT model developed in this thesis enabled the selection of variables that potentially mediated between relationships identified in correlation analyses. In early papers (Chapters 2 and 3), a compelling argument for the need to explore mechanisms influencing activity participation in different occupational contexts, through the use of models such as SCOPE-IT, was expounded. The four empirical articles presented in Chapters 4 to 7 followed a similar format to provide cohesion in the investigative and reporting processes. Firstly, in-depth explorations of between-group differences were reported, followed by correlational analyses of the proposed pathways between variables. Finally, the mediating mechanisms influencing these relationships were investigated.

Boys with DCD were found to have different experiences of leisure, including lower participation in team sports and informal social-physical activity than boys without DCD, and these patterns of leisure-time use were associated with lower self-appraisals of quality of life. In addition, however, the sustained and coherent theme of the thesis was the identification of mechanisms influencing relationships between physical coordination ability and both activity participation and quality of life-related outcomes.

Univariate analyses of variance between groups identified key areas of concern. The finding that boys with DCD had lower energy expenditure levels than boys without DCD was a new contribution to the literature, but was not an unexpected finding. Cairney and colleagues (2005; 2006) have provided convincing evidence of the cardiovascular implication of low levels of aerobic fitness, higher levels of obesity and low levels of recreational physical activity participation, all of which are associated with having DCD for school-aged children.

In the current study, an additional finding about physical activity participation was the importance of the social contextual features of leisure-time activity participation. Specifically, the significant impact of the social-physical activity context for boys with DCD was identified. It was found that boys with DCD spent less time in both structured and unstructured social-physical activities than boys without DCD. Previous studies have not discriminated between structured and unstructured social/non-social physical activities, yet these may have been sites for the protective levels of physical activity to occur.

Lower participation in both structured and unstructured social-physical activities was
associated with lower physical activity energy expenditure patterns of boys with DCD compared to boys without DCD. From a physical health perspective this was a significant finding because boys with DCD can be considered a population at-risk of developing sedentary lifestyles with the attendant health implications for development of obesity, diabetes Type II, cardiovascular diseases and depression that this entails (Sallis, Prochaska, Taylor, Hill, & Geraci, 1999). Given world-wide health concerns (World Health Assembly, 2004) about the adverse health implications of sedentary behaviour and the implications of physical inactivity in youth for later life, the low energy expenditure levels identified in this study are cause for alarm. Longitudinal studies to explore tracking of low levels of physical activity energy expenditure are warranted. Although this information must be regarded as preliminary and requires validation through the use of motion sensors or heart rate monitors over representative 24-hour periods, it is a warning that the low physical activity energy expenditure levels of boys with DCD should not be ignored. The inclusion of data about physical activity energy expenditure levels during the school day as well as during the out-of-school hours would also allow practitioners to evaluate whether boys with DCD are meeting health guidelines for recommended minimal amounts of energy expenditure per day.

From a mental health perspective, the finding that boys with DCD participate in fewer social-physical activities than boys without DCD was also perturbing because these leisure-time use patterns were associated with high loneliness, a state of mind that is linked with higher levels of depressive symptomatology (Boivin, Hymel, & Burkowski, 1995). In addition, low participation in large-group physical activities was associated with low levels of life satisfaction. The higher loneliness and lower global life satisfaction of boys with DCD compared to boys without DCD was disquieting, although not unexpected, given evidence of potential mental health problems in many children (Francis & Piek, 2003), adolescents (Sigurdsson, van Os & Fombonne, 2002), and adults with DCD (Rasmussen & Gillberg, 2000).

Low levels of participation in all social-physical activities were associated with lower PFL for all the boys in the study. This global construct, incorporating self-perceptions of leisure competence and control, depth of involvement and leisure needs satisfaction was found to be a significant mediator between physical coordination ability and both team sport participation and life satisfaction. Team sport participation was found to act on the relationship between physical coordination ability and life satisfaction. Perceived freedom in leisure was pivotal in acting on pathways between physical ability, team sports and life satisfaction. This finding provides insights into potential intervention strategies for children with DCD, although it must be emphasised that replication with more diverse
samples of children with DCD is essential. Also, given the limitations of mediation analyses in relation to establishing directional effects, conclusions about causality cannot be made.

Perceived freedom in leisure taps the experience of leisure beyond the mere quantification of free time. Thus, the finding that boys with DCD had lower PFL as well as lower levels of participation in all social-physical activities is important when considering perceived quality of life for these children. This construct is particularly informative for clinicians using SCOPE-IT as a model for considering the child-activity-environment fit when evaluating participation decisions and patterns of time use that impact on quality of life for boys with DCD. At the heart of the SCOPE-IT model are the three variables, time spent, choice and effort.

Choice, time investment and effort are elements of the SCOPE-IT model that build upon already established conceptual models such as the Person-Environment-Occupation (PEO) model (Law et al., 1996). The temporal element of SCOPE-IT is an additional element not fully developed in earlier models, such as the PEO. Daily patterns of occupational engagement, evaluated with tools such as the Canadian Occupational Performance Measure (Law et al, 1998) provide clinical information about children’s daily time use patterns. However, PFL operationalises the concept of choice, as portrayed on the watch face. Occupation-based tools, such as Personal Projects Analysis (Little, 2005) have further potential to inform clinical practice about effort expended in daily occupations, although further research is required to develop these methodologies for use with children.

Occupational therapists have a unique role to play in the recognition, early identification and overall management of children’s occupational behaviour. Models such as SCOPE-IT provide a conceptual base for advancing the theoretical background of paediatric occupational therapy practice, driving future research for methodologies to understand activity engagement, and informing clinical practice. The SCOPE-IT model symbolises the complex relationships between child, occupation and environment that impact on quantity and quality of everyday time use and quality of life.

Spending time in team sports was not only strongly, positively associated with global life satisfaction and general self-concept, but it was also positively associated with self-concept perceptions of physical ability and appearance, peer and parent relations, task and ego goal orientations, and high energy expenditure. These findings highlight the importance of team sports in the lives of the boys in this Australian study. Although individual sports and physical activities are more likely to carry over into adulthood, team
sports are the most prevalent physical activities during pre-adolescence and adolescence (Sallis et al., 1992). Team sport participation is a highly contentious issue for individuals with movement difficulties. Clinicians and researchers have noted that team sports are stressful activities avoided by many children with DCD (Christiansen, 2000; Kirby, 2004; Missiuna, Moll, King, Law et al., 2006; Rose, Larkin & Berger, 1999). Parents are faced with difficult decisions about whether participation in these potentially psychologically damaging situations are to be avoided at all costs and alternative activities promoted, or whether to persist in efforts to find supportive social-physical contexts and facilitate group membership and physical activity participation. Concerns about missed opportunities for social connections and skill acquisition need to be weighed against concerns about damage to self-concept.

This thesis documented the low self-concept perceptions in all non-academic domains for boys with DCD compared to boys without DCD. Low physical ability self-concept for boys with DCD was expected given past research supporting this finding (Cairney, Hay, Faught, Mandigo et al., 2005; Cantell et al., 1994; 2003; Rose et al., 1997; Schoemaker et al., 1994; Skinner & Piek, 2001). Low perceptions for all other non-academic self-concepts and general self-concept perceptions of boys with DCD were also found. Some previous research has identified similar outcomes for boys with DCD (Rose et al., 1997; Schoemaker & Kalverboer, 1994), however, there have been other studies where no differences between the self-concept perceptions of peer relations, physical appearance, and general self-concept for children with and without DCD were reported (Cantell et al., 1994; Piek et al., 2000).

This study differed from previous studies showing non-significant findings in terms of the measurement tools selected, study participant characteristics, socioeconomic background and schools attended by the boys, and design methodology. The strengths of this study in producing more consistent, reliable results included the removal of the confounding issue of gender and age. Boys within a narrow age band were selected as study participants. In addition, all boys were in mainstream schools attending years 5, 6 or 7, and had not made the transition to a middle or secondary school environment. Study participants were from middle to higher socioeconomic background, which, although limiting applicability of findings to more diverse populations, did help control for the influence of socioeconomic considerations on extracurricular activity participation. While cultural influences may have contributed to differences between the longitudinal investigations of Finnish youth (Cantell et al, 1994; 2003) and this study, this does not fully explain the variation in findings (Piek et al., 2000; Skinner & Piek, 2001). Possibly the most important differences related to the gender and age of the participants and to
adherence to meeting Criterion B for diagnosis of DCD according to DSM-IV (American Psychiatric Association, 2000), that functional interference with academic achievement or activities of daily living is associated with marked impairment of the development of motor coordination. In this study all children with DCD had significant functional impairments identified by parents, while in Piek and colleagues’ (2000) studies this was not evaluated. In later studies Piek and colleagues (2006) justify their position of not strictly adhering to this criterion because of difficulties in operationalising this criterion. Functional impairments at school or at home would potentially impact on all self-concept perceptions and activity participation. These issues will be discussed in more detail below.

The decision to choose Marsh’s (1990) SDQ-I measures to explore self-concept perceptions, rather than the Harter scales (1985) which have been used in previous studies was related to the culturally appropriate use of a measurement for the Queensland school children that was normed on an Australian population. The SDQ-I was also chosen because of its position as one of the most highly validated and psychometrically sound instruments measuring self-concept that is currently available (Byrne, 1996).

Lower task-oriented dispositional goal orientations were reported by boys with DCD compared to boys without DCD. Adoption of a task-oriented goal disposition was associated with a range of positive outcomes for children with DCD. This adds to, and extends similar findings by other researchers such as Henderson, May and Umney (1989). Adoption of a task-oriented goal disposition was positively and moderately associated with global life satisfaction and general self-concept, as well as positively and weakly associated with self-concept perceptions of physical ability and appearance, peer and parent relations.

Individual goal orientations were not associated with any leisure-time activity participation context. Rather, it is likely that a complex interaction between dispositional goals, situational goals and other psychological processes, such as self-concept perceptions, and locus of control influence motivation to participate in different leisure-time activities (Causgrove Dunn, 2000).

Perceived freedom in leisure was seen as a global construct incorporating decisions about competence and control in leisure engagements, as well as appraisals of depth of involvement and leisure-need satisfaction. These four components of PFL influence choice, effort and time spent in different recreational pursuits. Dispositional goal orientations were seen as complementary to PFL, but tapping a distinct aspect of
motivation that may be particularly critical in structured activity settings, such as sports. Adopting a task-oriented dispositional goal orientation was not found to influence the relationship between physical coordination ability and participation in individual or team sports. However, PFL, alone amongst all the psychological mechanisms investigated in the study, did significantly mediate a physical coordination ability-team sport link.

There may well be other psychological variables not investigated in this study that contribute to participation decisions about time use, effort and choice, the variables at the heart of the SCOPE-IT model. By delving into the processes and understanding these dynamic and evolving means of influencing outcomes for boys with DCD, new contributions to the development of effective interventions in clinical practice are possible. Processes are more open to change than are static variables, and understanding these mechanisms suggest directions for facilitation of positive developmental trajectories for boys with DCD.

**Outline for presentation of research findings**

The detailed discussion of the findings will be presented according to the following plan. Firstly, in this chapter, the SCOPE-IT framework which guided the research investigations will be briefly reviewed as a basis for explaining ecological processes influencing leisure participation and quality of life-related outcomes for boys with DCD.

Secondly, a discussion of the results from descriptive analyses of leisure-time physical activity engagement patterns and energy expenditure will be presented. Findings of between-group differences for global life satisfaction, self-concept perceptions, dispositional goal orientations, loneliness and PFL for boys with and without DCD will be compared with previous research where possible. As much of the current research is original and therefore exploratory, the contribution of these findings to theory development will be identified.

In addition to discussing the results from these univariate analyses, significant correlations between variables will be highlighted. The purpose of this is to identify potential mediating mechanisms acting on relationships between physical coordination ability and quality-of-life and leisure participation outcomes that were theoretically proposed using the SCOPE-IT model as a framework showing the interacting pathways between child-, activity-, and environment-level factors.

Thirdly, the results of the series of mediation analyses reported in Chapters 4 to 7 will be discussed in Chapter 9 and a hypothetical model linking pathways between physical coordination ability, team sports participation, PFL, and both global life satisfaction and
loneliness will be proposed. The central component of this model will be identified and the implications of this finding will be discussed from a clinical point of view. Future guidelines for research, addressing the limitations of the current study, will be outlined.

**Understanding activity engagement in DCD: A systems model**

The introduction to this thesis proposed that there are multiple determinants and processes influencing children’s engagement in leisure-time occupational performance. The first paper, presented in Chapter 2, introduced the SCOPE-IT model as a basis for conceptualising these multiple determinants and the processes by which they influence children’s engagement in leisure-time occupations.

In the second paper (see Chapter 3), a more focused examination of the influences on physical activity leisure-time behaviour for children with DCD were presented. In this paper, evidence linking motor incoordination to low levels of recreational physical activity participation and low self-concept for children with DCD was advanced. Low participation in team games, low perceived physical and peer self-concept and low task-oriented goal motivation were amongst the child-level variables identified as offering potential explanations for lower perceived quality of life in children with DCD. Environment-level influences on physical activity engagement patterns were further recognised as contributing to decisions to engage and persist in recreational physical activities, with features of the social context of leisure-time participation potentially influencing loneliness and global life satisfaction.

**Research questions for descriptive analyses**

Three research questions were formulated to investigate between-group differences for boys with and without DCD, and to identify relationships between the variables under investigation.

1. Are there differences between time spent in social/non-social, structured/unstructured leisure-time physical/non-physical activities and energy expenditure levels for boys with and without DCD, and are there relationships between these variables?

2. Do boys with DCD have different perceptions of freedom in leisure, global life satisfaction, general self-concept and other non-academic self-concept perceptions, task and ego goal orientations, and self-appraisals of loneliness from those of boys without DCD?

3. Are there relationships between physical coordination and the following mediator
and outcome variables; leisure-time participation, energy expenditure, PFL, goal orientations, self-concept perceptions, loneliness and global life satisfaction?

To answer the first research question a series of univariate analyses of variance and bivariate measures of association were conducted to investigate differences between physical activity patterns of time use and energy expenditure during the out-of-school hours for boys with and without DCD, and the relationships between these variables for all study participants. Correlation analyses using the combined group scores were reported, given findings that tests of parallelism were not significant. Relationships between variables for the DCD and non-DCD group were of similar strength and direction to the results of correlations for the combined group.

A hibernation culture? Low energy expenditure and low participation in social-physical leisure-time activities

Boys with DCD had lower physical activity energy expenditure and spent less time in moderate to vigorous physical activities than boys without DCD. When patterns of leisure-time use were examined, the largest amount of time was allocated to sedentary pursuits for all boys, not just those with DCD. Out-of-school, low energy expenditure activities typically occurred inside the family home or the homes of friends and neighbours. Examples of low energy expenditure activities included television viewing, computer use and playing electronic games, either alone or with other individuals.

The finding that all boys, regardless of physical coordination ability, spent the greatest proportion of their leisure-time “hibernating” indoors in sedentary activities is consistent with findings from time use studies (Australian Bureau of Statistics, 2003; Hofferth & Sandberg, 2001; Larson, 2001; Walton, Hoerr, Heine, Frost, Roisen, & Berkimer, 1999; Wells & Blendinger, 1998). Boys with DCD spent significantly more time, however, in these low energy expenditure activities, and far less time than their well-coordinated peers in activities requiring moderate to vigorous energy expenditure, such as outdoor games and sports. Low participation for boys with DCD in both team sports and informal social-physical activities was found.

Low participation in team sports, described in longitudinal studies (Cantell et al., 1994), qualitative research (Fitzpatrick & Watkinson, 2003) and smaller scale studies of boys with movement difficulties (Christiansen, 2000) was confirmed. When the DCD and non-DCD groups were each split into two groups based on levels of physical coordination ability, it was found that the severity of physical coordination difficulties within the DCD group, and physical skill level within the non-DCD group did not influence the results.
This finding differs from other studies where severity of physical coordination difficulties was associated with low scholastic achievement and scholastic ability self-perceptions, and low participation in social-physical leisure pursuits for the more severe group but not a less impaired group (Cantell et al., 1994).

Differences in study designs, participant characteristics (e.g. IQ test scores, mixed gender) and academic backgrounds (e.g. level of academic achievement, school characteristics - mainstream/non-mainstream, co-educational/single gender, and independent/state schools) may have contributed to this variation in findings. For example, in Cantell and colleagues' longitudinal studies (1994; 2003), participants in a less physically impaired group with predominantly fine motor and visual perception difficulties, differed from the more severe DCD group, but not the control group without DCD, in terms of participation in social-physical activities. In fact, several members of the less physically impaired group were described as determined participants in team sports, despite limited success. Interestingly, both the more severe group with DCD and the less impaired group who had been re-classified as an intermediate group with only fine motor and visual perceptual difficulties at 15 years participated in similar numbers of social non-physical activities. Both these groups differed from the non-DCD group in Cantell's studies (1994; 2003).

It is difficult to make direct comparisons between the study reported here and those of Cantell and colleagues (1994; 2003), as participants were allocated to groups based on performance on different assessment tools. Also, a three-way group split based on perceptual-motor difficulties, rather than a four-way allocation of participants to groups based on physical coordination ability and functional impairment was used in the Cantell studies. In addition, several youths in the DCD group in Cantell's studies (1994; 2003) attended non-mainstream schools, while participants in this study all attended mainstream schools, and the social culture associated with these different school environments may have impacted on leisure-time use.

Social-physical activity settings are the most common forum for interpersonal interactions for preadolescent boys from middle to upper social groups (Zeijl, du Bois-Reymond, & Te Poel, 2001; Zeijl, Te Poel, Dubois-Reymond, Ravesloot, & Meulman, 2000). Boys of all ages also tend to be involved in larger peer group social interactions than dyadic interaction (Schneider, Younger, Smith, & Freeman, 1998) and spend more free time in team sports than girls of the same age (Carpenter, Huston, & Spera, 1989; Posner & Vandell, 1999). In these social-physical activities there are opportunities for physical contact, physical methods of communicating, and intense experiences of pleasure and
pain (Gard & Meyenn, 2000). These experiences occur in milieus where rules, social scripts and goals are associated with socialisation experiences, learning opportunities and skill acquisition (Larson & Verma, 1999). Participation in large-group settings, particularly in adult-structured and more formal contexts, is a developmental context where preadolescent males acquire a differentiated network of peers as well as a set of skilled physical and social behaviours.

Participation in structured individual or dual-person sports was not significantly different for boys with and without DCD in the current study. There was also no difference between time spent in unstructured physical activities that were solitary or dual-person. The lower energy expenditure reported for many boys with DCD compared to boys without DCD was largely attributable to low rates of participation in large-group physical activities. It is difficult to determine whether boys with DCD are meeting the recommended guidelines for minimal amounts of physical activity energy expenditure per day, as diary data in the current study was confined to the out-of-school hours. Given previous research findings suggesting low participation in physical education classes (Causgrove Dunn & Watkinson, 1996; Portman, 1995; Thompson, Bouffard, Watkinson, & Causgrove Dunn, 1994) and in social-physical activities during school recess (Smyth & Anderson, 2000), it is likely that low energy expenditure in both structured and unstructured social-physical activity contexts continued throughout the day. Low participation in all social-physical activities for boys with DCD and attendant low physical activity energy expenditure has potential implications for physical health. It also means that social-emotional experiences, available through popular physically active pursuits of childhood involving large peer groups, are limited for boys with DCD.

While boys with DCD participated in fewer social-physical leisure-time activities, they spent more time in social non-physical activities that were structured, such as choir and band, than boys without DCD. There was a diverse range of social non-physical groups in which boys with DCD participated, including a pet rat club, cactus-growing club, robotics and science clubs, blue tongue lizard association, theatre production groups and a Harry Potter friendship society. Adults who helped the boys locate these alternative social groups demonstrated resourcefulness and ingenuity. Boys who did not participate in structured social non-physical groups described spending weekend time, “visiting relatives … we chat, sit there and chat, and do nothing”.

A time trade-off between physical and non-physical activities, particularly for structured activities may have accounted for some of the time use differences between DCD and non-DCD groups. Participation in structured group activities that were not physically
oriented hypothetically provided alternative opportunities for interpersonal interactions and social networks for boys with DCD. The fact that they were found to be associated with higher perceptions of loneliness and were inversely associated with global life satisfaction and PFL is perplexing and perturbing. Perhaps, the lower social status assigned to participation in structured social non-physical activities over demonstrations of athletic prowess in team or individual sports, particularly for boys, is one reason for social and global dissatisfaction. Alternatively, perhaps boys with DCD perceived they had less freedom in leisure to spend time doing physically active as well as physically less active pursuits. Perceived freedom in leisure, influencing both choice and time allocation to different leisure pursuits is central to the SCOPE-IT model and is pivotal in influencing activity engagement and perceived quality of life (see Chapters 2 and 3).

**Perceived freedom in leisure (PFL)**

It was found that boys with DCD had lower PFL than boys without DCD. This finding, although not previously documented using the construct of PFL, was not unexpected. Information from qualitative studies provided clear indications that low perceptions of leisure control and competence and feelings of low satisfaction of leisure needs, as well as less involvement in recreational activities occur for some, but not all children with DCD (Fitzpatrick & Watkinson, 2003; Mandich et al., 2003; Missiuna, Moll, Law et al., 2006; Segal et al., 2002). Low PFL was strongly associated with low global life satisfaction for all boys, which is also consistent with expectations from previous research (Huebner & Terry, 1995).

Perceived freedom in leisure is a global rather than context-specific construct measuring general self-appraisals of leisure competence, control, leisure needs satisfaction and depth of involvement. Although children were asked to consider recreation broadly when making appraisals, contextual associations may have been salient, and influenced cognitions. During completion of the questionnaires on PFL, boys frequently asked for clarification of the word “recreation” in self-declarative statements such as “I usually have fun when I do recreation activities” or “I get excited when I do recreation activities”. While several boys commented about enjoyment and excitement experienced during specific leisure pursuits, such as contact sports, others spontaneously reflected on low levels of excitement during the pursuit of other activities that were current or uppermost in their mind. For example, sailing was identified by one boy as a sport that “doesn’t excite me, but sets me free”. Kayaking was offered as a suggestion by another child, as an “activity that I’m pretty low class at and hardly exciting for a delicate boy like me”.

It is interesting, therefore, to examine the associations between PFL and participation in
different leisure-time contexts. The contexts that were found to be positively associated with PFL were those involving social-physical activity participation in both structured and unstructured contexts. Time spent in organised sports of any kind was positively related to PFL. These physical activities were highly associated with feelings of importance, experiences of fun, opportunities to make friends and feelings of competence.

Conversely, low PFL was associated with high levels of participation in non-physical activities such as organised clubs or groups like choir, band, science or youth groups. An inverse relationship was also found between PFL and spending a lot of time alone indoors occupied in sedentary activities like television viewing, computer use, listening to music or reading. These solitary, non-physical activities were unlikely to fulfil leisure needs for social contacts, or to enhance perceptions of personal control over leisure outcomes.

These results provide support for PFL influencing the two of the motivation-related constructs at the heart of the SCOPE-IT model: choice and time allocation to leisure pursuits. Choice and time spent in different occupational performance areas are central elements that are related but not interdependent with amount of effort expended during activity engagement. Effort and time spent in different leisure pursuits may be influenced by perceptions about depth of involvement and enjoyment associated with participation in self-perpetuating, intrinsically motivating activities (Csikszentmihalyi & Kleiber, 1991). Time investment is related to choice, but quality of experience is determined by effort which is underpinned by PFL. Perceived freedom in leisure may influence perceptions about availability of leisure options and allocation of leisure-time based on appraisals of competence, control and satisfaction of leisure needs, as well as affective experiences. As such, PFL is closely associated with overall appraisals of quality of life, such as cognitions about global life satisfaction.

**Life satisfaction**

Global life satisfaction has been regarded as an indicator of both concurrent and future adaptive functioning (Huebner et al., 2004). The finding of significantly lower global life satisfaction for boys with DCD compared to boys without DCD has not been previously reported prior to this study. This finding is, however, congruent with previous empirical studies showing high rates of depressive symptomatology (Francis & Piek, 2003), low general self-concept (Skinner & Piek, 2001), persistent anxiety (Sigurdsson et al., 2002), social withdrawal (Smyth & Anderson, 2000) and stigmatisation (Segal et al., 2002) in children with DCD.
The links between leisure-time participation and global life satisfaction were investigated with a view towards identifying out-of-school activity contexts that may be fulfilling and satisfying. Time spent in domains where an individual has interests, talents and strengths and that are characterised by positive experiences will enhance a sense of competence and will promote continued engagement (Deci & Ryan, 2000; Eccles & Harold, 1991). Successful functioning in one domain will enhance a sense of competence, according to White’s (1959) model of mastery motivation.

Ecological models of participation behaviour expand this theoretical framework beyond the individual by considering the effect of context on human performance and outcomes such as global life satisfaction. The social context of structured activities has been linked with general self-concept, behavioural adjustment (Eccles & Barber, 1999) and global life satisfaction (Gilman, 2001). Key characteristics theoretically contributing to adaptive outcomes in these structured leisure contexts include the presence of non-parental adults who encourage skill-building, social connections and who model other development-enhancing factors (Eccles & Harold, 1991; Larson, 2001).

In the current study, global life satisfaction was significantly associated with participation in social-physical activities but not social non-physical activities. In fact, global life satisfaction was inversely associated with participation in structured social non-physical activities, indicating that for the boys in this study, the physical activity element of the structured social activities was an important aspect contributing to global life satisfaction. The reasons for this association are unclear. Boys are more interested in sports and play more team sports than girls throughout their school years (Bradley, McMurray, Harrell, & Deng, 2000). Even when sitting down and watching television, boys are more interested in action-adventure programs and sports-related telecasts than girls (Huston, Wright, Marquis, & Green, 1999). There appear to be strong gender-differentiated patterns of time use in relation to physical activity participation and sports-related interests that increase in older children (Mauldin & Meeks, 1990).

Boys who do not participate in culturally normative patterns of time use may feel at odds with the social worlds in which they live. In many communities there are also more opportunities for boys to play team sports from an early age, than non-physical activities, such as choir or band. Thus, boys may be either predisposed to more vigorous sports activity in team sports, have more opportunities to play in team sports with local children or children from their circle of school friends, or enjoy the physicality and the rough and tumble associated with contact team sports, than non-physical leisure pursuits.

These physical and social elements of team sports may be important factors contributing
to life satisfaction in the lives of young males. The thrills and intense feelings associated with moderate to vigorous physical energy expenditure in team sports may be more satisfying than low physical activity energy expenditure in activities such as choir. Although, as one boy with DCD commented, “I work very hard in choir, just trying to stand up straight and not fall over”.

The physical contact element of many team sports is missing from many individual or dual-person physical activities, as well as from non-physical activities such as choir. The physicality of contact sports, and the associated thrills and calculated risk-taking, broken bones, cut lips and blackened eyes might also be seen as tangible evidence of a masculine identity (Swain, 2003). As one boy commented, “I discovered footy (AFL – Australian Football League) was for me, not going along to choir … When you play AFL you’re half scared and half exhilarated. You get kinda hyped up when you see the size of some of the big guys you have to tackle. It’s just a MUST!”

Socialisation processes that normalise sports injury, physical violence and domination in team sports such as rugby, may be culture- or context-specific. For example, in Australia, rugby league has been described as a “flag-carrier” of masculinity (Hutchins & Mikosza, 1998). The alternative view, where violence and toughness in football is seen to be indicative of a natural, pre-disposition in males, has been discredited (Burgess, Edwards, & Skinner, 2003). Rather, it has been proposed that a reiterative process between sporting prowess, toughness and violence is strongly implicated in the construction of masculine identities and this is sanctioned by social institutions that support participation and provide many pathways allowing easy access to sports, such as football.

In addition, boys may feel social pressures or expectations from family members to participate in team sports rather than activities such as choir. Fathers of boys with DCD voiced concerns about their sons not being able to participate in team sport and being identified as “different”. One mother commented that she had covertly sought help for her son when he refused to participate in any type of organised sport, even though her husband “would be upset if he thought … might have coordination difficulties”.

Participation in social non-physical activities may not be a first or preferred choice for many boys. For example, one boy with DCD commented, “I’m in the choir and our choir leader is fun as (can be), but I still want to make a team. I nearly got in one last year – I’m trying to get in one this year”. Another clear indication that the church youth group was not a first choice activity for one boy with DCD was the comment that “my personal ambition is not to go to church as often”. The reasons behind low life satisfaction
associated with social non-physical activity participation are speculative, but may be associated with a range of reasons related to cultural and social expectations, perceived or real barriers preventing participation in social-physical activities which biologically or psychologically fulfil boys.

**Self-concept perceptions**

Boys with DCD had lower general self-concept and lower self-perceptions in all four non-academic self-concept domains; physical ability, physical appearance, and peer and parent relations, than boys without DCD. Effect-size differences between groups for parent relations were small.

A strong effect was demonstrated for lower physical ability self-concept of boys with DCD compared to boys without DCD. The results of this study are further evidence contributing to a large body of findings about the low physical ability self-concept of boys with DCD (Cairney, Hay, Faught, Mandigo et al., 2005; Rose et al., 1997; Schoemaker et al., 1994; Skinner & Piek, 2001; Cantell et al., 1994; 2003). Physical ability self-concept is a significant contributor to general self-concept in males with or without DCD and females with DCD, but not females without DCD (Piek, Baynam, & Barrett, 2006).

A small effect-size between-group difference was found for physical appearance self-concept when boys with and without DCD were compared. This finding is supported by some studies (Losse et al., 1991; Piek et al., 2006; Rose et al., 1997; Skinner & Piek, 2001), but not by others (Cantell et al., 1994; 2003; Piek et al., 2000). Age, gender and cultural differences do not explain these disparate results. When multivariate results were compared with univariate results in one study, unique between-group differences were only found for academic and physical ability self-concept (Piek et al., 2006).

The fact that children with DCD are more prone to obesity (Cairney, Hay, Faught, & Hawes, 2005), and have lower physical fitness (Cairney, Hay, Wade et al., 2006) may have implications for body image self-perceptions. Body mass index and physical fitness were not measured in any studies exploring physical appearance self-concept perceptions. In the current study, boys from both groups spontaneously made comments about physical attributes (e.g. “I’d like to build up my muscles so I look less runty”), indicating that there may have been widely held attitudes about body image in all study participants. One parent of a boy with DCD commented that as her son had grown larger he had “found his size to be quite an advantage” when playing rugby. In contrast, other parents of boys with DCD described negative experiences and pejorative labelling associated with physical attributes of their child, such as “fat slob”, “string bean” and
“rubber band”. Physical appearance self-concept has been found to significantly predict general self-concept for children and adolescents regardless of physical coordination ability level (Piek et al., 2000; Skinner & Piek, 2001).

Perceptions of peer relations self-concept were significantly lower for boys with DCD compared to boys without DCD. The SDQ-I Peer Relations scale, used in the current study as a culturally appropriate measure for Australian children, has not been widely used in research with boys who have DCD. Instead, Harter’s (1985) scale measuring social acceptance self-perceptions has been chosen. Previous research findings about peer relations self-concept perceptions are inconclusive. While not all studies have found similar results to the current study, several that reported significant differences between groups were similar in having a greater proportion of males with DCD in the study (see Schoemaker, 1994), and having similar ages to those in the study (Rose et al., 1997). Social acceptance self-perceptions have been reported as the second largest contributor to general self-concept, after physical appearance self-concept (Harter, 1987). Parents of boys with DCD commented on occasions when their sons had been subjected to various types of negative commentary, such as being told, “You’re a sissy - you throw like a girl”, “We don’t want you on our team– ya blouse”. Thus, boys with DCD may become marginalised and subordinated in settings where physical competency is perceived to contribute to masculine identities and membership in the dominant male culture (Swain, 2004).

Significantly lower general self-concept was found for boys with DCD compared to boys without DCD. This finding is consistent with that found by Skinner and colleagues (2001) but differs from Cantell’s (1996; 2003) findings in longitudinal studies of Finnish children and adolescents. Cultural differences may have influenced results. In cultures where there is less emphasis on athletic prowess and higher recognition of competence in other areas of talent or interest, general self-concept may be preserved for individuals with poor motor skills (Cantell et al., 2003). In Australia, a hegemonic view of masculinity where importance is placed on physical proficiency as a desirable attribute for boys (Gilbert & Gilbert, 1998), may negatively influence general self-concept. Boys with DCD may be at greater risk of being marginalised in such cultures (Evans & Roberts, 1987).

According to cultural resource theory (Miller, Sabo, Farrell, Barnes, & Melnick, 1999), participation in dominant team sports may provide males with personal and social resources that increase their commitment to traditional masculine scripts. In Britain, team sports are the only physical education option in many schools (Kirby, 2004), therefore, not being able to play popular team sports, such as rugby, may have an impact on social
standing and general self-concept within this culture (Smyth & Anderson, 2001). It has been suggested that in cultures that hold these values DCD could be considered a social disorder (Kirby, 2004).

Although cultural differences may explain a proportion of the variance in general self-concept findings, there have been no cross-cultural comparison studies to rigorously investigate this proposition. Also, there is evidence, consistent with ecological systems theory (Bronfenbrenner, 1977), that within broad macrosystems, where cultural and social forces shape thoughts, feelings and actions, there are lower level systems that also impact on these variables. For example, studies from the same metropolitan area in Perth, Western Australia, have found non-significant (Piek et al., 2000; 2005) and significant differences (Skinner & Piek, 2001) between general self-concept for children with and without DCD.

There were no significant differences between academic self-concept perceptions; mathematics, reading or general school for boys with and without DCD. While these non-significant results for academic self-concept perceptions are consistent with several research investigations (Barrett et al., 2003; Piek et al., 2000; Skinner & Piek, 2001), other studies have reported an association between severity of DCD and low academic self-concept (Cantell et al., 1994; Skinner & Piek, 2001).

The boys with DCD in this study had mean IQ test scores in the above average range and attended mainstream schools. This may have partially explained the non-significant between-group differences that were found for academic self-concept perceptions of boys with and without DCD. In contrast, lower academic self-concept and attendance at non-mainstream schools for participants with DCD was associated with low IQ test scores in one study comparing adolescents with and without DCD (Cantell et al., 1994). The adolescents in Cantell and colleagues’ (1994) study with low academic self-concept also had lower academic achievement and many were in special education classes.

Piek and colleagues (2006) also reported lower academic self-concept for both adolescents (12-15½ years) and younger children (7½-11 years) with DCD compared to participants without DCD. Children were assumed to be of at least average intelligence, although no formal evaluation of IQ was made. Poorer fine motor skills were associated with lower academic self-concept in the DCD group, and no gender effects were present. In addition, adolescents had lower academic self-concept than the younger group.

There is conflicting evidence about age-related effects on perceived scholastic ability for adolescents with DCD. An earlier study by Skinner, Piek and colleagues (2001) found
lower academic self-concept perceptions for children with DCD aged 8-10 years compared to children without DCD, but not for 12-14 year olds. This contradicts other studies about age effects showing significant between-group differences on this construct for early adolescents with and without DCD (Piek et al., 2006).

In support of the findings of the current study, non-significant differences in academic self-concept for children aged 8 to 12 years 11 months with and without DCD were reported (Piek et al., 2000). This was confirmed in another study by Barrett and colleagues (2003) with children aged 7 to 11 years with and without DCD. Children were excluded from both these studies if Verbal IQ was below 80 on the Weschler Intelligence Scale for Children -II (Weschler, 1991), which was the same cut-off point adopted in the current study.

Gendered developmental trajectories for individuals with DCD may contribute to different findings. The psychosocial implications of having DCD are more severe for girls in terms of general self-concept, when associated with fine motor difficulties and low academic self-concept (Piek et al., 2006). Fine motor ability was not controlled in an earlier study where it was found that girls with DCD had lower academic self-concept perceptions than girls without DCD, and boys with and without DCD (Rose et al., 1997). For boys, athletic ability is one of the most important determinants of social status (Chase, 2001). Academic self-concept and fine motor competence are less important than physical ability self-concept in determining the general self-concept of boys with DCD than girls with DCD (Piek et al., 2006). Cairney and colleagues (2005) found no support for a gender by DCD interaction with regard to perceived physical ability self-concept, but other self-concept perceptions were not investigated.

**Task orientation**

Dispositional goal orientations are cognitive motivational constructs which influence affective experiences, task behaviour and activity participation patterns (Duda, 1989). Adoption of a task goal orientation is associated with more adaptive outcomes than adoption of ego-oriented goals (Duda, 1987). Task goals, which are also known as learning, mastery or improvement goals (Brunel, 1999) positively predict all measures of well-being (Kaplan & Maehr, 1999). Increased persistence, positive effect, optimistic orientations, creative problem solving (Kaplan & Maehr, 1999) and higher intrinsic motivation (Brunel, 1999) are associated with task goals.

Task orientation was significantly lower for boys with DCD compared with boys without DCD, however effect sizes were small. Positive relationships between task goal
orientations and all non-academic self-concept perceptions, life satisfaction and general self-concept were found. There was a weak association between task goal orientations and the leisure-time activity context of individual or dual-person sports. This category included physical activities such as swimming, running, golf or tennis where personal best performances may be considered an integral aspect of the activity. Ego-oriented goal dispositional motivations were associated with no participation variables and were weakly, positively associated with physical ability and peer relations self-concept perceptions.

Previous research has identified a relationship between dispositional task orientation goals and perceptions of a mastery-oriented physical education climate, which influence perceived competence in physical education for children with movement difficulties (Causgrove Dunn, 2000). Physical education classes emphasising a mastery motivational climate influence intrinsic motivation and ongoing participation in physical education (Brunel, 1999).

Achievement goal theory (Nicholls, 1989) emphasises an ecological approach to understanding the interactions between an individual’s subjective views of ability, effort and the social climate of the achievement situation under evaluation. There are complex, reciprocal interactions between self-perceptions of competence, perceptions of the motivational climate, adoption of goal orientations and participation. The combination of low task- and high ego-goal orientations in association with low perceived and actual physical coordination ability is linked with maladaptive learning strategies (Kaplan & Maehr, 1999), giving up or withdrawing from the activity (White & Duda, 1993), helplessness, negative affect, poor performance (Smiley & Dweck, 1994), de-valuing the activity, self-handicapping and choosing unrealistically easy or difficult tasks, thus restricting opportunities to acquire new skills (Duda, 1987). High ego-goal orientation is associated with low general self-concept (Gibbons et al., 1997). Conversely, high task- and low ego orientations are associated with high general self-concept and adaptive motivational and behaviour patterns, irrespective of whether children are high or low in their perceptions of normative ability (Gibbons et al., 1997; Kaplan & Maehr, 1999).

Loneliness

Loneliness of children with DCD has received scant empirical attention. However, it is known that boys with DCD can experience stigmatisation (Segal et al., 2002) and have poor self-perceptions of social competence (Schoemaker & Kalverboer, 1994), difficulties socialising outside the classroom (Missiuna, Moll, Law et al., 2006), and social isolation on the playground (Smyth & Anderson, 2000). These cognitions and patterns of
behaviour can contribute to subjective experiences of loneliness.

Parents in this study spontaneously described social difficulties experienced by their child with DCD when trying to join groups or fitting in with peers, and this is supported in the literature (Mandich et al., 2003; Segal et al., 2002). One parent of a boy with DCD described the “joy of finding a soul-mate”, in the form of another boy with coordination difficulties who joined the local basketball club with her son. Another parent mentioned her son’s “shopping buddy”, another boy who went out with her son to the local shopping mall, where they walked around observing other people and “trying to walk in a straight line so that they didn’t knock other people, and each other, over”.

Small friendship networks and missed opportunities to participate in valued leisure pursuits have been reported and this lends support to the premise that children with DCD may experience loneliness and social dissatisfaction (Rodger & Mandich, 2005). In fact, concerns about the limited social worlds of their children with DCD have been highlighted as of greater concern than worries about academic achievement to parents of these children (Cohn, 2001). Boys with DCD described experiences when they were alone at home. The bedroom was seen as a sanctuary by many. For example, “I shut the door and I can play Lego without anyone bothering me”, and “I have a little rest when I need to - I watch my fish and I feed them”, were comments made by boys with DCD.

Children with DCD perceive themselves to have less support from best friends or classmates and are less likely to have a close friend than others (Rose et al., 1994). Schoemaker and Kalverboer (1994) reported that children with DCD had fewer playmates and were less often asked to play with other children than well-coordinated children.

There were inverse relationships between time spent in large groups involved in physical activity (both structured and unstructured) and loneliness. Conversely, high loneliness was associated with time spent in structured social non-physical activities, such as choir, science club or band. Low participation in all social-physical activities for boys with DCD may reduce opportunities for developing affiliation with peers and contribute to perceptions of loneliness. However, it might be thought that boys with DCD who participate in other social groups, such as choir, would have similar opportunities for developing social networks. The finding that loneliness was experienced by boys who had opportunities to develop friendships in social non-physical groups suggests that something to do with the physical activity aspect of large groups is important in influencing loneliness perceptions. Whether this is related to the physical nature of these contexts, including physical exertion and often physical contact, or socio-cultural
expectations and widespread support for these activities for boys in many Australian settings, is unknown. Future research to explore pathways of influence is warranted.
Chapter 9: Results of Mediation Analyses

To investigate the psychological mechanisms influencing physical activity leisure-time participation and energy expenditure, and the impact of participation in different contexts on general self-concept, global life satisfaction and loneliness, a series of mediation analyses was conducted. The results of these analyses are summarised in Figures 9.1-9.4. Mediation analysis has been recommended as an analytic strategy useful when investigating variables that impact upon relationships identified using explanatory models, such as SCOPE-IT (King et al., 2004). A mediator is the mechanism through which a predictor or independent variable influences an outcome/dependent/criterion variable.

A series of mediation analyses were planned to explore relationships between leisure-time activity participation and quality-of-life related outcomes that were identified in literature searches. Moderation effects were also investigated by exploring interactions between target variables and group (DCD/non-DCD) membership. Unlike previous investigations (for example Piek et al., 2000; 2006), tests of parallelism did not reveal different processes operating in the two groups, therefore they were not considered separate populations. The reasons for differences between Piek and colleagues’ (2000) findings of different processes operating in DCD and non-DCD groups, and findings in the current study probably relate to methodological differences between studies. Piek and colleagues (2000) allocated children to the DCD group based on scores <15th percentile MABC, while participants in the non-DCD group comprised children with scores >50th percentile MABC. Children with scores in the percentile band ≥ 15 to ≤ 50 were not included in the study. In contrast, this study included boys with scores from 0 to 99th percentile on the MABC and children with scores in the percentile band ≥ 15 to ≤ 50 were not excluded from analyses. This is a strength of the current study as participants at the lower end of the non-DCD physical coordination ability range were included in all analyses.

Research questions for mediation analyses

Four research questions were formulated to investigate mediation processes acting on significant relationships between physical coordination and both leisure-time physical activity participation and quality of life-related outcomes.

1. What psychological mechanisms (i.e. academic and non-academic self-concept perceptions, perceived freedom in leisure and dispositional goal orientations)
significantly mediate relationships between physical coordination ability and leisure-time activity participation contexts?

2. Do self-concept perceptions act as mediators of a relationship between physical coordination ability and physical activity energy expenditure?

3. Are relationships between physical coordination and two quality of life-related outcomes (global life satisfaction and general self-concept) mediated by psychological mechanisms (self-concept perceptions, dispositional goal orientations and perceived freedom in leisure) or leisure-time activity participation?

4. Do any leisure-time activity participation contexts (social/non-social, physical/non-physical and structured/non-structured) act as mediators of relationships between physical coordination ability and three outcomes; global life satisfaction, general self-concept and total loneliness?

The results of the mediation analyses reported in Chapters 4 to 7 are reproduced diagrammatically for convenience in this chapter as Figures 9.1 to 9.4. It was found that two psychological mechanisms significantly mediated relationships between physical coordination ability and the following physical activity outcomes; social-physical leisure-time participation and low energy expenditure. Specifically, it was found that Peer Relations self-concept perceptions influenced the inverse relationship between physical coordination ability and low patterns of energy expenditure during leisure (Figure 9.1). Perceived freedom in leisure mediated positive physical coordination ability-team sports participation and physical coordination ability-global life satisfaction links (Figure 9.2).

In addition, it was found that all non-academic self-concept perceptions (physical ability and appearance, parent and peer relations) and task goal orientation also partially mediated the relationships between physical coordination ability and both general self-concept and global life satisfaction (see Figure 9.3).

Significant but partial mediation was found for team sport participation acting on relationships between physical coordination ability and two outcomes: global life satisfaction and total loneliness (see Figure 9.4).
**Figure 9.1** Partial mediation by Peer Relations self-concept on relationship between physical coordination ability and low physical activity expenditure.

*LPA – Low physical activity energy expenditure

**Figure 9.2** Partial mediation by perceived freedom in leisure on relationship between physical coordination ability and team sport participation.

**Figure 9.3** Partial mediation by self-concept perceptions and task goal orientations on relationships between physical coordination ability and both general self-concept and global life satisfaction.
Predictor Variable: Physical Coordination

+ve relationship

Outcome Variables:

Total Loneliness

Global Life Satisfaction

Mediating Variable:
Team sport participation

+ve relationship

Figure 9.4  Partial mediation by team sport participation on relationship between physical coordination ability and global life satisfaction, as well as total loneliness.

Low physical activity energy expenditure: Changing a hibernation culture

The costs of low participation in moderate to vigorous physical sports and physical activities have been documented in the literature (see Chapters 2 and 3). A range of adverse physical and mental health outcomes following the adoption of sedentary lifestyles are likely for children with physical coordination difficulties. The data presented in this thesis indicate the potential vulnerability of boys with DCD who are at-risk of physical health problems associated with spending substantial proportions of time out-of-school in activities of low physical activity energy expenditure.

The SCOPE-IT model guided research in suggesting an ecological systems framework composed of multiple interacting factors from child- and environment-level variables influencing physical activity participation and health-related outcomes. Perceived physical ability self-concept was explored as a mediator of the relationship between physical coordination ability and energy expenditure. Previous research has identified a related construct, generalised physical self-efficacy, as being linked with physical activity recreational patterns (Cairney et al., 2005). A research question was formulated to investigate mediating effects by physical ability self-concept perceptions on participation in leisure-time physical activity contexts and on physical activity energy expenditure. In addition to examining the mediating effect of physical ability self-concept, other domain-specific self-concept perceptions were investigated as mediators.

No mediation effects were found for self-concept perceptions acting on relationships between physical coordination ability and participation in any physical activity leisure-time context. However, peer relations self-concept was identified as a significant
mediator of the relationship between physical coordination ability and low energy expenditure. The mediation effects of peer relations self-concept perceptions on time in sedentary activities requiring low levels of energy expenditure were consistent with previous qualitative research about socially evaluative physical activity contexts. Low perceptions of peer support and possession of discrediting characteristics such as poor physical coordination ability may impact on peer relations self-concept and can lead to stigmatisation in some contexts (Segal et al., 2002).

The activity-deficit hypothesis (Bouffard, Watkinson, Thompson, Causgrove Dunn, & Romanow, 1996) proposes that there is a reciprocal interaction between poor motor performance ability, low effort and sustained practice during physical activities which then contributes to low self-concept perceptions, poor physical fitness and less time spent in public performance of physical activities. This then leads to further reduction in opportunities to practise skills, a situation described as a developmental skill-learning gap (Wall, 2004). The socially evaluative context of performance in many physical activities may be important, partially explaining the contribution of peer relations self-concept perceptions to energy expenditure patterns.

This finding confirms descriptions of the importance of peer relations in determining physical activity participation of boys (Evans & Roberts, 1987). Sport and sport celebrities receive much media attention and are admired in Australian culture. Sport competence, physicality and athleticism are the dominant criteria used to determine social status for adolescent males (Gilbert & Gilbert, 1998). Working on developing peer networks and social support for boys with DCD would, therefore, appear to be a clinical priority, particularly in relation to preventing the attendant negative consequences of adopting a sedentary lifestyle. Perceiving that one has supportive peer relations means having friends or siblings with whom one can go outside and play, and having peers who are accepting and supportive when playing sports. Building peer networks is therefore seen as a potential mechanism for protection against low levels of physical activity energy expenditure outside school for boys with DCD.

Life satisfaction and general self-concept: Positive pathways of influence

The processes acting on relationships between physical coordination ability and global life satisfaction, general self-concept were explored. It was found that self-concept perceptions of physical ability, physical appearance, peer and parent relations, and adoption of high task goal orientations each significantly mediated relationships with global life satisfaction and general self-concept (see Figure 9.3). Academic self-concept perceptions and ego-oriented goal dispositions had no mediation effects.
In previous studies of children with DCD, physical ability self-concept has not been shown to contribute a statistically significant proportion of predictive variance in global self-worth (Francis & Piek, 2003; Piek et al., 2000). Physical appearance self-concept and scholastic competence self-perceptions have been found to predict global self-worth for children with DCD (Skinner & Piek, 2001). In the current study, non-academic self-concept domains, including physical ability and physical appearance self-concept, peer and parent relations, were found to mediate relationships between physical coordination ability and both general self-concept and global life satisfaction, but academic self-concept perceptions did not have an effect.

The differences between these earlier studies and the current study may relate to methodological differences, including participant characteristics, such as gender and physical coordination ability differences, as well as the use of different instruments and data analytic approaches. The current study was restricted to boys only, while Piek and colleagues’ (2000) researched children of both genders. Non-academic self-concept perceptions or physical ability and appearance, and peer relations are considered to be more important factors contributing to general self-concept and global life satisfaction for boys than girls (Evans & Roberts, 1987). In particular, athletic ability is more highly valued than academic ability by boys (Eccles & Harold, 1991).

Another difference between the two studies relates to the data analysis plan. Piek and colleagues (2000) investigated processes in DCD and non-DCD groups separately, having identified the role of DCD as a moderating effect on the self-concept variables under investigation. In the current study, group by self-concept and life satisfaction interactions were not significant. Therefore, the two groups were not considered separate populations. However, the inclusion of participants with all levels of physical coordination ability was a strength of the current study, allowing for mediation analyses to be conducted. As discussed earlier, Piek et al.’s (2000) study did not include any participants with MABC scores in the 15th to 50th percentile range. Mediation effects on relationships between the continuous variable of physical coordination ability and both general self-concept and global life satisfaction by self-concept perceptions were found to be significant but partial mediators of these links in this study.

In addition, the role of dispositional goal orientations as mediators of these same relationships was found to act in a similar way. This is not surprising, given that dispositional goals have been posited to act at a similar level to domain-specific self-concept perceptions in a hierarchical model where cognitive motivational factors contribute to more global self-esteem or self-concept. According to achievement goal
theory (Nicholls, 1989), dispositional goal orientations may impact on outcomes such as cognitions about subjective well-being and general self-concept. These influences are understood to occur through experiences of flow, task satisfaction, persistence and effort in pursuing goal-directed pursuits. There is evidence that task-oriented goals are associated with adaptive patterns of learning, striving to increase understanding and skill and with positive feelings about one’s self and one’s world (Midgley, Kaplan, Middleton, & Maehr, 1998). Adoption of task goals is associated with perceptions of success measured in self-referential terms where hard work and cooperation, rather than competition with peers, is the goal in working towards task mastery and competence (Fry & Duda, 1997).

Task goals positively predict all measures of well-being (Kaplan & Maehr, 1999). In task-oriented individuals the major goal is to achieve incremental progress in working towards mastery, therefore, high self-esteem is more easily maintained than in the case of ego-orientations (Kavussanu & Harnisch, 2000). High ego-orientations and low perceived ability result in low self-esteem (Gibbons et al., 1997). Task-orientations are associated with increased effort, enjoyment and involvement, even when accompanied by low perceived ability (Fry & Duda, 1997). In the current study it was found that task- but not ego-goal orientations acted on relationships between physical coordination ability and both general self-concept and global life satisfaction.

**Leisure participation: Do self-concept perceptions and goal orientations make a difference?**

No self-concept perceptions (academic, non-academic or general), and no dispositional goal orientations were found to mediate the relationships between physical coordination ability and participation in any leisure-time activity context. This was an unexpected finding, as a direct link between DCD, generalised physical self-efficacy - which is a related but conceptually distinct construct from physical ability self-concept - and actual participation in physical activities has been previously demonstrated (Cairney et al., 2005). Methodological differences between measurement of constructs exploring self-perceptions of physical competence and study participant characteristics, with both males and females included in the analyses, may have contributed to the different mediating effect results for physical ability self-concept.

In Cairney and colleagues’ (2005) study, generalised physical self-efficacy toward physical activity incorporating self-perceptions of adequacy in, and predilection for, physical activity was measured using the Children’s Self-Perceptions of Adequacy in and Predilection for Physical Activity (CSAPPA; Hay, 1992). The CSAPPA measures
additional psychological constructs to the SDQ-I (Marsh, 1990) which was used in this study. Enjoyment of physical education, confidence and preference for physical activity were tapped by the CSAPPA and was described as measuring physical self-efficacy rather than physical ability self-concept. This construct shares similarities with physical ability self-concept but also includes aspects of the perceived freedom in leisure (PFL) construct. These conceptual differences between constructs under investigation were likely to have contributed to the different results. The inclusion of a measure of enjoyment in the CSAPPA is considered to be an important factor contributing to the significant pathways demonstrated in earlier research between physical coordination ability and recreational physical activity participation. Enjoyment of physical activity participation has been identified as a determinant of physical activity participation in other research with school-age children (Brustad, 1993), and is an important component of PFL (Ellis and Witt, 1994).

**Perceived freedom in leisure: A mechanism influencing team sport participation**

Mediation analyses were planned to investigate PFL as a mediator of the relationship between physical coordination ability and team sport participation. PFL-Factor 1 comprising self-perceptions of leisure competence overall and self appraisals of internal control over leisure experiences and outcomes was a significant mediator. A second PFL factor, comprising deep involvement in leisure activities and high perceptions of satisfaction with leisure needs, was also significant in positively influencing team sport participation for all the boys in the study (see Figure 9.2). Total PFL was a significant mediator of the physical coordination ability-team sport participation link. Other mediating mechanisms (individual self-concept perceptions and dispositional goal orientations) were also investigated but no mediation was found.

**Perceived freedom in leisure – Factor 1**

Low perceptions of leisure competence and control over the outcome of the leisure experience can act as a personal constraint to participation in leisure activities of one’s own choosing (Witt & Ellis, 1989). Participation in sports is partly related to competence perceptions, but is also influenced by enjoyment, task motivations, feelings of efficacy and actual performance (Eccles, 2005). The very structure of many team sports entails the demonstration of collective competence with performance outcomes defined in relation to group comparisons (Duda, 1987). One boy with DCD commented on the anxiety he felt during the selection processes for team sports, the disappointment he
experienced when he failed to “make the cut”, and the resignation that “it was probably the best thing that could happen, because otherwise I would have been the splinter on the team … you know, sitting on the bench the whole time”.

Team characteristics also influence perceived control, with adult leaders having the capacity to make decisions restricting playing opportunities in team sports where players are substituted at different times of the game. Boys with DCD also report feelings of failure despite their best efforts. There is an integral relationship between perceptions of competence and control during team sports participation.

**Perceived freedom in leisure – Factor 2**

In accordance with flow theory (Csikszentmihalyi, 1990), participation in team sports where participants perceive their skills are sufficient to meet the challenges of the activity can lead to deep involvement and satisfaction. Underlying factors potentially contributing to higher leisure satisfaction for boys who participate in team sports include opportunities for concerted engagement directed toward a goal, challenge-skill balance, deep attention, decision-making, assertiveness and cooperation, emotional release and physical pleasure (Larson, 2000). These factors are also related to high perceived quality of life (Csikszentmihalyi, 1990).

A small number of boys with DCD who were all physically strong, tall and large described flow experiences while playing football. These boys described enjoyment and intense absorption during physical contact with other players when strength, courage and “physical presence” were required over speed or ball-handling dexterity.

Leisure needs satisfaction for catharsis, stimulation and socialisation, occurs in team sport when this is associated with personal choice and intrinsic motivation to persist in the particular activity context (Neulinger, 1974). Socialisation needs were met when playing in a team sport helped create social ties for boys with DCD not only with other team members but also indirectly through extended social networks forged between parents of team players. Exceptions to this were parents of boys with DCD who described fear and dissociation from the competitive experience. One father described the feelings of humiliation he felt when watching his son sitting at the far end of the field picking dandelions while the rest of the game took place at the other end of the field. He also commented how he remembered similar experiences in his youth where he avoided team sports because of difficulties with running, catching and kicking balls. Another father reported a sense of despair at having to go to games to see his son “stuff up once again, in front of all the other parents and boys”.

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An example of dissatisfaction with the leisure experience was poignantly reported by one boy with DCD who described a practice session at the end of the football season where the coach, who was also a father of one of the boys on the team, organised a ball-passing and catching activity. Boys were required to quickly pass a football to another team member, identified by a game-related characteristic. When the coach yelled out, “Pass the ball to the worst player in the team”, this boy decided to never play football again.

It is not difficult to understand how low satisfaction, competence and control over leisure experiences can contribute to low participation in leisure pursuits, such as team sports, where involvement is closely related to physical coordination ability.

Team sports participation: How does it influence life satisfaction and loneliness?

Team sports were identified as the only significant leisure-time activity context that acted as a mediator between physical coordination ability and global life satisfaction. It was also a significant mechanism indirectly influencing the link between physical coordination ability and loneliness (see Figure 9.4).

The finding that participation in team sports influenced loneliness and subjective quality of life has implications for clinical practice, preventive community-based initiatives and future research investigating processes leading to positive health-related outcomes for boys with DCD. Experienced practitioners working with boys with DCD have traditionally voiced concerns about the implications of engaging in team sports and highly competitive sporting environments for individuals with poor physical coordination (see, for example Missiuna, 2003; Evans & Roberts, 1987). In Chapters 2 and 3 it was advocated that participation in non-competitive, life style activities had the potential to increase physical fitness and ongoing participation of individuals with DCD, while competitive team sports were often associated with negative experiences, including stigmatisation. These negative experiences contributed to decisions to avoid team sports for many poorly coordinated individuals and this was potentially associated with decreased physical activity participation, lower levels of physical fitness and reduced socialisation opportunities in structured social-physical contexts.

In this study it was found that, for the small number of boys with DCD who participated in team sports, life satisfaction was higher and loneliness was lower, irrespective of the level of physical coordination ability. The physical and social environmental characteristics of the team sports, the family expectations and support provided to
participate in different team sports, and the prior experience and psychological characteristics of the boys with DCD who participated in these activities are unknown. The physical skill requirements of different team sports and the match between this and the child’s unique physical and psychological characteristics are also unknown. Therefore it is difficult to determine what factors supported participation and enhanced a child-, activity-, environment fit. What is known is that the boys with DCD who participated in these team sports reported positive quality of life outcomes.

An ongoing debate exists about whether clinicians or parents should encourage or protect a child from team sport participation: how to determine which team sport contexts are likely to be detrimental; whether to persist in team sports that offer opportunities for skill acquisition but are unsupportive; and what the likely costs are to the child. Many boys with DCD in the study who had sought occupational therapy services had avoided these competitive team sports environments and participated in non-competitive, individual or dual-person physical activities. Perceived freedom in leisure to choose activities such as team sports was low, and was associated with low participation in all physical activity contexts except solitary physically active play, such as jumping on the trampoline or shooting basketballs in the backyard. As one boy with DCD commented about jumping on the trampoline, “I get in my moment, and I drift away when I bounce. It’s so good to be in my own space, just going up and down and no one bothers me”.

If perceived freedom in leisure to participate in physical activities is low, then non-physical leisure-time pursuits drawing on skills and talents in other areas may occur. Alternatively, time might be directed towards passive non-physical activities such as electronic media use and hibernation in the bedroom or in front of a television screen. As one boy with DCD commented, “I just like to lie on my bed and get away from it all”. Perceived freedom in leisure was negatively, weakly associated with time spent in two non-physical leisure-time contexts; structured social and unstructured non-social. Thus time spent in activities such as choir, youth groups or science clubs was associated with low PFL. Spending time on one’s own in electronic media use, reading or other sedentary activities inside the house was also associated with self-perceptions of low leisure competence and leisure control, low enjoyment and depth of involvement and low leisure needs satisfaction. This contrasts the finding of moderate, positive relationships between PFL and participation in social-physical activities such as team sports.

While low participation in team sports is frequent for children with DCD (Christiansen, 2000; Cohn, 2001); a small number of individuals with DCD are active members of sports teams (Cantell et al., 1994). The pathways involved are not clear. Perceived freedom in
leisure was found to be one psychological mechanism facilitating active participation in team sports, however, barriers to may occur. In therapy settings, children with DCD who are encouraged to identify their own goals may identify skill acquisitions to enable participation in popular activities such as team sports. This is frequently accompanied by discussions of the perceived social climate and evaluations about whether participation may involve disclosure of discrediting attributes which may incur stigmatisation (Segal et al., 2002).

Team sports participation is a particularly emotion-laden context for many individuals with physical coordination difficulties (Fitzpatrick & Watkinson, 2003). Parents of children with DCD have described the restricted social worlds of their children as inextricably tied-in with experiences of rejection in social-physical contexts, such as team sports (Segal et al., 2002). Indeed, some practitioners have identified team sports participation as one of the hardest physical activities for children with DCD, particularly during the school years.

Participants in a retrospective study of individuals who described themselves as physically awkward, mentioned feelings of failure, hurt and humiliation in public displays of awkwardness (Fitzpatrick & Watkinson, 2003). Anxiety about performing in front of others can lead to avoidance, pretence about playing team sports and becoming skilled at not demonstrating poor sports skills (Ahern, 2002). Thus, the finding that participation in team sports was moderately, inversely associated with social dissatisfaction and loneliness and mediated the relationship between physical coordination and these variables was supported. Social satisfaction may occur through team membership benefits where processes of secondary socialisation lead to internalisation of an identity associated with that group and expansion of peer networks through friendships made during sports participation (Eccles & Barber, 1999).

This study provided an example of one boy with DCD who described strategies whereby he was able to be a part of several football teams by attending training sessions but not participating in competitive meets. He was also the water carrier for an older team and was an assistant coach of a younger team. In this way, he was able to increase opportunities to acquire friends within and outside the team context, and in time, to internalise an identity associated with group membership. Formation of relationships with team members and adult leaders provided social capital through parent networks and material resources by virtue of relationships.

Structured social-physical activity contexts may provide participants with sources of social support (Schneider et al., 1998). Exposure to socialisation experiences where there are opportunities for turn-taking and leadership, learning how to interact with
others, to deal with team successes and losses, relying on others and developing trust are other features of team settings. Members of teams experience a collective identity and sense of belonging in the collaborative pursuit of common goals. In mastery-oriented climates where there is an emphasis on personal improvement, learning and mastery, rather than social comparison or normative referencing of ability, enjoyment, ongoing participation and life satisfaction are greater (Spray, 2000). Unfortunately, by their very nature, team sports are frequently ego-involving contexts where social evaluation of process and performance outcomes is public and witnessed by peer and adult observers. The importance of fostering fun and enjoyment in mastery, rather than ego-oriented climates, is essential if continued involvement and satisfaction of leisure needs, social and life satisfaction are to be promoted (Spray, 2000).

Degree of structure, composition of the team, level of competition and situational motivational climate within the team may all influence team-based mediation processes acting on loneliness and social dissatisfaction as well as global life satisfaction. These variables have the potential to influence intensity and extent of social networks, social status, and enjoyment and participation opportunities. In early and mid-adolescence, team sports participation may contribute to identification with the “leading crowd” (Broh, 2002), defined as popular students with high social status (Chase & Dummer, 1992). This is another social process theoretically linking participation in team sport with outcomes such as social satisfaction.

It is important to note that no other activity contexts mediated between physical coordination ability and perceptions of loneliness or life satisfaction for the boys in this study. According to behavioural setting theory (Barker, 1968) each behavioural setting comes with a specific set of time, place and object props, as well as an attached, interdependent standing pattern of behaviour. Different socialisation experiences are associated with both the physical and social context (large group versus dyads/individual activities), and in sedentary versus physically active pursuits. Individual, heterogenous experiences within different settings may mask important processes operating within these different settings.

The fundamental skills for many team activities require a complex integration of postural control with timing and force demands for coordinated activities, such as hitting, kicking or throwing balls. Boys who do not have these skills may become less involved in these social physical activities, becoming isolated and solitary on the school playground (Smyth & Anderson, 2001), unable to participate in team sports or physically active games such as hopscotch (Missiuna, Moll, Law et al., 2006). Conversely, boys who are
able to participate in team sports may become determined athletes although causal pathways are unknown and are likely to include interactive relationships between biopsychological and social environmental variables (Cantell et al., 1994). The underlying psychological mechanisms contributing to team sport participation by these determined athletes have provided inspiration for identifying adaptive pathways. Perceived freedom in leisure to pursue active and intense team sport involvement was one process deemed worthy of further investigation. The qualities of PFL; perceived competence and control over process and outcomes, deep involvement and leisure needs satisfaction, appeared to embody the characteristics of the active team participants described by Cantell and colleagues (1994). Perceived freedom in leisure was identified as a mediator between physical coordination ability and team sport participation, global life satisfaction and loneliness. The relationships between these variables require verification but offer a promising avenue for future research leading to clinical intervention initiatives.

**Putting it all together: a proposed model with perceived freedom in leisure as a pivotal process**

A hypothetical model linking the demonstrated processes was constructed (see Figure 9.5). In this model, the processes proposed as influencing team sports participation, life satisfaction and loneliness are suggested in a unidirectional manner to guide clinical interventions. However, although this model is intended for intervention, the theoretical underpinnings of this study, based on literature reviews and the over-riding SCOPE-IT model, suggest that processes are likely to be reciprocal and cyclical. Replication of the results of this study with more representative populations using longitudinal or experimental designs will enable investigation of causal direction and reciprocity of processes.

Participation in team sports may be influenced by other factors, not explored in this study, given that only partial mediation effects were demonstrated. In line with SCOPE-IT, social environmental influences are likely to interact with individual psychological and physical factors to influence both team sport participation and quality of life outcomes. These aspects require further examination.

The relationships between physical coordination ability and both global life satisfaction and loneliness have been proposed as being direct pathways in this model. A direct relationship between physical coordination ability and team sports participation is also suggested. Indirect relationships, influencing these direct pathways are presented based on the findings of the mediation analyses in this study. These results showed that boys
who were well coordinated were more likely to have high PFL and to have higher rates of participation in team sports. High participation in team sports participation was linked with high perceptions of global life satisfaction and low loneliness. On the other hand, boys who had low physical coordination ability were more likely to have low PFL, to participate less in team sports and to report more loneliness and low global life satisfaction.

**Figure 9.5** Pathways linking physical coordination ability with life satisfaction and loneliness: Mediating effects of team sports participation and perceived freedom in leisure

If the model holds true, and directional influences can be demonstrated there are several points where these relationships can be potentially altered. For example, increasing PFL could facilitate participation in team sports which could then influence perceptions of loneliness and life satisfaction. Increasing PFL may occur through up-skilling in specific desirable activities, providing opportunities for skills acquisition in skill-aligned teams to equalise competition, playing times and opportunities to play in all positions in teams.
where the emphasis is on participation rather than win-lose. One child with DCD commented that he enjoyed playing new sports where nobody in the team had any prior experience. Another boy with DCD commented on the importance of attending a large school where a large number of teams were fielded and ability-graded, as then “you might find someone else, just the same, that could be a friend on the team, and you wouldn’t stand out”. In contrast, another boy with DCD commented on adverse team sports experiences at a small school that only fielded one rugby team, where he was told he could join in the girls’ netball team if he really wanted to play a team sport.

Having a sense of internal control over the process and outcomes can be facilitated through child-centred therapy interventions where child-identified goals and child-activity-environment fit are identified and facilitated. Matching individual competencies with characteristics required for different team sports may enable participation in some supportive environments. For example, one child with poor balance participated in water polo, where the water provided a stable support. Rowing as part of a team was identified as a sport where the repetitive and largely predictable skills required for participation could be learned, physical fitness could be acquired using land-based ergo machines and the bonding between team members during early morning practices and competitive meets was a feature.

The physicality of contact sports such as water polo was missing from rowing, but focused, deep involvement were reported by the few boys with DCD who participated in rowing. The exhilaration associated with physical activity participation and a sense of flow associated with depth of experience in team sports may be a critical factor determining on-going participation. As one boy with DCD commented, “I’m not very good at rugby but I focus and work hard and I block out everything else when I’m playing so I don’t notice anything but the ball and where I should be”. Increased levels of fitness following cross-training in distance running and swimming was also perceived by this child as contributing to his ability to stay on-task and participate in a team sport.

Participation in team sports may be influenced by other factors, not explored in this study, given that only partial mediation effects were demonstrated. In line with SCOPE-IT, social environmental influences are likely to interact with individual psychological and physical factors to influence both team sport participation and quality of life outcomes. These aspects require further examination.
Team sport participation, a challenging and emotion-laden activity context for boys with DCD, was identified as significantly contributing to global life satisfaction for all boys, including those with DCD in this study. In addition, team sport participation mediated the inverse relationship between physical coordination ability and loneliness. These two findings signify that greater attention should be given to team sports participation by clinicians, educators and researchers when exploring mechanisms to enhance life satisfaction and decrease loneliness for preadolescent boys whether they have DCD or not. This needs however, to be explored with caution given the evidence that boys with DCD were found to have low participation in these activities in the current study. If participation in team sports was associated with such strong indicators of enhanced subjective quality of life, why didn’t all boys with DCD participate in these leisure pursuits? Were these boys excluded from team sports or did they choose not to participate based on negative experiences, perceived low competence, or because their leisure needs were met in other ways? There is evidence that negative experiences in team sports and low perceived physical competence influence participation decisions for many boys with DCD (Ahern, 2000; Christiansen, 2000; Fitzpatrick & Watkinson, 2003; Mandich et al., 2003; Missiuna, Moll, Law et al., 2006; Segal et al. 2002). These factors may be internal constraints to team sports participation, but external barriers may also be present.

Parents of boys with DCD described participation constraints for their sons who attempted team sports, including discriminatory team selection processes, unequal allocation of playing time, divisive coaching practices and peer rejection. Boys with DCD, themselves, described team sports participation in terms of “trying to make it through the whole season”. One boy with DCD commented that he was so glad that the rugby teams went down to the D level, and that they usually took all applicants. In contrast, boys without DCD frequently described personal goals that included representing Australia in a particular team sport when they grew up. This is not unusual for Australian schoolboys (Gilbert & Gilbert, 1998).

In keeping with the tenets of the SCOPE-IT model, the factors that must be considered when evaluating the interface between the social environment, the physical and mental demands of each team sport, and each child’s unique psychological and physical characteristics are multidimensional and reciprocally interactive. Bio-ecological
considerations about choice, time and effort in activity engagement must be taken into account when clinicians, children and their families evaluate team sport participation.

**Team sports for boys with DCD: To encourage or not to encourage?**

An important caveat to consider by clinicians when evaluating the child-team sport-environment fit is that social environmental processes were not explored in this study. This aspect should be taken into account when interpreting the current research findings. Speculations about possible social environmental influences will be discussed later in this chapter.

The significant findings of higher global life satisfaction, general self-concept and lower loneliness in active team sports participants, some of whom were boys with DCD, are exciting. A potential pathway influencing quality of life for preadolescent boys, using the vehicle of team sport participation, a common and accessible leisure pursuit for many upper primary school-aged children, needs further exploration. In this study team sport participation was shown to mediate relationships between physical coordination ability and both global life satisfaction and loneliness, however, causality could not be determined given the cross-sectional nature of the research. Therefore, longitudinal or experimental research is necessary before encouraging boys with DCD to engage in these pursuits, albeit in a supportive environment.

For the small number of boys with DCD who were active participants in team sports, the positive relationship between participation and global life satisfaction, and the negative association between spending time in these activities and loneliness, points towards the observation that, at least in some team environments, for some boys, participation may be associated with positive outcomes. While social environmental processes were not explored for their influence on team sport participation, child-level motivational processes were identified that influenced team sports participation. Perceived freedom in leisure (PFL) as a motivational process was found to be a significant mediator between physical coordination ability and participation in team sports. Thus, for the boys with DCD who were active participants in team sports, high PFL underpinned their greater involvement in these social-physical activities. The finding that PFL was one process mediating the physical coordination ability-team sport link also has implications for understanding the psychological processes contributing to higher participation rates in these activities that are popular and socially sanctioned for all Australian schoolboys (Gilbert & Gilbert, 1998).
Enabling participation in team sports: The role of perceived freedom in leisure

Perceived freedom in leisure was identified as an active ingredient of team sports participation and one that contributed to greater life satisfaction. This information suggests that increased participation in team sports is likely when programs are planned to deliberately incorporate and promote each element of PFL elements. The four components of PFL; competence, perceived control over outcomes, depth of involvement and leisure-needs satisfaction were shown to influence team sport participation. Practitioners would be advised to consider all these elements, as no single factor was found to contribute more than another. Interventions focusing on one component over another may be less effective than programs that are more comprehensive in scope.

While no individual PFL factor stood out above the other in mediation analyses, a closer analysis of PFL components may guide clinical planning. For example, identifying which leisure needs are more important than others, how deeply satisfying and enjoyable this activity is for the child, will provide information to assist in planning programs that will meet the individual needs of each child, but also help explain attrition. There is potential for broader application of this knowledge to ensure provision of programs that emphasise positive affective experiences and promote greater life satisfaction.

Evaluations of PFL of boys with DCD can underpin directives to remediate or improve team sports participation, and contribute to a fuller understanding of the meaning and experience of leisure in the lives of these boys. While the Leisure Diagnostic Battery (Witt & Ellis, 1989) short form was used in the current study to quickly appraise PFL, the long form, including in-depth evaluations of the four previously described leisure components, and also measuring playfulness and perceived barriers to participation is recommended for the additional information it can provide for practitioners. Contextual conflicts with leisure descriptions and barriers in different settings exist, however, and adaptation for non-American populations is recommended using guidelines for modifications of clinical measures (Hanna, Russell, Bartlett, Kertoy, Rosenbaum, & Swinton, 2005).

In addition, client-centred tools such as Personal Projects Analysis (PPA) (Little, 1989) can be adapted to tap salient leisure goals, experiences and motivations of boys with DCD. During the course of this study, two measures were published to explore leisure preferences, diversity, frequency, enjoyment and social context of activity participation;
The Children’s Assessment of Participation and Enjoyment and Preferences for Activities of Children (King et al., 2004). These tools expand the information obtained from the Leisure Diagnostic Battery, particularly in relation to measuring enjoyable participation experiences for boys with DCD. Enjoyment has consistently been identified as a central element determining ongoing physical activity participation (Brustad, 1993; Kimiecik & Harris, 1996).

**Recognising loneliness in boys with DCD**

Diary measures and other time-use tools quantify the intensity, range, frequency and contextual aspect of leisure behaviour. This information can act as a means of alerting service providers, parents and others involved in the care of boys with DCD about individuals who spend large amounts of time alone and have low participation in any social leisure pursuits. Early identification of leisure limitations and concerns about potential areas of imbalance in social/non-social leisure pursuits emerge during the collation of information about daily patterns of time use. Priority should be given to the identification of boys whose social worlds may be restricted. Quantitative information about time-use patterns obtained from diaries or interviews provides a clue about social participation patterns but must be supplemented with subjective evaluations of the experience of loneliness and social dissatisfaction to enable the development of intervention and prevention programs. It must be stressed that subjective evaluations of loneliness are a stronger diagnostic sign of potential mental health issues than low participation in social activities during leisure-time (Asher & Paquette, 2003). Rather, this information may contextualise and support information obtained from self-reported loneliness, as well as providing a starting point for intervention-based programs in the child’s everyday environment.

A cued-recall process where time-use for the previous 24 hours is recorded in an interview with the child and family members is recommended over the seven-day diary used in this study. Parents cited high response burden associated with completion of a diary measure for an entire week. Cued-recall time-use data can provide a rich insight into the social contextual features of time-use and energy expenditure, albeit over a short time frame. Probing of ecological and psychosocial issues, historical antecedents of leisure behaviours and future time-use predictions with seasonally-adjusted projections is possible. The Canadian Occupational Performance Measure (Law, Baptiste, Carswell, McColl, Polatajko & Pollock, 1998), a client-centred measure detecting changes in the child's self-perception of occupational performance over time, has been shown to measure the impact of interventions as well as providing diagnostic information (Kaiser,
Given the findings of greater loneliness and social dissatisfaction, as well as lower global life satisfaction reported by the boys with DCD compared to boys without DCD, it is also imperative that community education programs more strongly address the warning signs for social withdrawal, rejection or loneliness associated with mental health issues for children and adolescents (Asher & Paquette, 2003). Social withdrawal, peer rejection and the quality of children’s friendships at school and home are a logical focus for school or family-centred mental health programs aimed at identifying those at risk of loneliness. The co-existence of low participation in social-physical activities with indicators of psychosocial dissatisfaction including low global life satisfaction and low general self-concept for boys with DCD suggests that low participation in team sports, in itself, may be an early warning marker for socio-emotional distress.

Creating supportive team sport environments

The findings of this study provide support for the importance of team sports in the lives of preadolescent and early adolescent boys for social and global life satisfaction. It is, therefore, incumbent on clinicians to investigate processes to intervene in a negative social spiral experienced by many boys with DCD where low team sport participation has been associated with loneliness and low perceived subjective quality of life.

This leads to conjecture, based on theoretical assumptions from achievement goal theory (Nicholls, 1989), about competitive team sport contexts and the situational climates that support or detract from positive outcomes. In making recommendations about how to create supportive team environments, the findings of this study in relation to the links between task goal orientations, self-concept perceptions and team sport participation will be discussed against a backdrop of previous research linking individual dispositional goal orientations, self-concept perceptions and the situational motivational climate.

Self-concept perceptions across four domains and task goal orientations were found to contribute to the relationships between physical coordination ability and both general self-concept and global life satisfaction for the boys in this study. Mediation effects were not demonstrated for self-concept perceptions or task goal orientations on relationships between physical coordination ability and any activity participation contexts. More complex pathways are likely, with the situational motivational climate having a probable influence on relationships.

A hypothetical pathway linking physical coordination ability, physical ability self-
concept/peer relations self-concept, task-oriented dispositional goals and perceptions of a mastery-oriented situational climate is proposed. These pathways are part of a social constructive process potentially influencing team sport participation (Kaplan & Maehr, 1999). The social context of environments has been shown to exert a powerful influence on children’s dispositional achievement-related goal appraisals of success in different settings (Smiley & Dweck, 1994). There is a close link between individual goal dispositions and self-concept perceptions of children with movement difficulties, and these self-perceptions are also associated with the situational motivational climate (Causgrove Dunn, 2000). The finding that situational motivational climates can be altered over relatively short time frames (Kavussanu & Harnisch, 2000) is promising for intervention programs. For example, if several situational cues are present, then an individual can be oriented towards task-oriented rather than ego-oriented or highly competitive goals (Mangos & Steele-Johnson, 2001). This is encouraging for clinicians, coaches and physical education teachers who have the opportunity and the responsibility of facilitating optimal participation in team sports. Highly competitive, ego-involving motivational climates are associated with helplessness for low ability children (Hokoda & Fincham, 1995). Mastery climates, irrespective of whether children are high or low in their perception of normative ability, are associated with all measures of well-being (Kaplan & Maehr, 1999).

From a clinical point of view, it is encouraging that the situational motivational climate may only have a temporary effect on individual goal orientations unless it is regularly emphasised (Kaplan & Maehr, 1999). Therefore, the negative effects of highly competitive team sports environments, for some boys with DCD, can be short-lived if parents decide to explore more supportive contexts. Also, the situational motivational cues from parents who regularly attend team sport events can over-ride the coaching climate depending on the salience, frequency and intensity of the situational cues (Mangos & Steele-Johnson, 2001). If several situational cues are regularly emphasised then the child can be oriented towards a mastery- rather than ego-involving competitive framework.

In this study, only task-, and not ego-oriented goals were positively associated with both general self-concept and global life satisfaction. Boys with DCD have significantly lower task-oriented goal dispositions than boys without DCD, therefore models of intervention that aim to encourage self-referenced personal goal-setting, problem-solving and evaluative feedback, such as CO-OP (Polatajko & Mandich, 2004), are mastery-oriented interventions likely to enhance adoption of task goals while simultaneously increasing self-concept perceptions of ability.
Situational motivational climates of specific team sports were not evaluated in the study. However, clinicians are advised to consider whether performance or mastery goals dominate in team sports being considered by boys with DCD. Parents face difficult decisions about whether to encourage their son to persist in, or discontinue team sports (Missiuna, 2003). However, knowledge of situational motivational climates and adoption of task-oriented over ego-oriented goals will empower children and parents to make educated decisions.

**Strengthening coaching practices**

Coaching practices that shape a motivational climate through goal setting, recognition and evaluation of players, structuring of sessions and autonomy-influencing practices, social support and perceptions of competence positively influence team sport participation (Boone & Leadbeater, 2006). Perceptions of a competitive performance or ego-oriented climate that emphasise normative ability have been found to have a negative effect on perceived competence for children with DCD (Causgrove Dunn, 2000). Therefore, initiatives aimed at strengthening coaching practices need to be explored through community partnerships aimed at building healthy public policies to train and inform youth leaders and coaches.

Rose and colleagues (1997; 1999) have highlighted the potentially negative consequences for boys with DCD who encounter a mentality that “red-blooded Australian boys” are expected to thrive in competitive sports settings. Clinicians and researchers have a social responsibility to interact with an interdisciplinary network of service providers in disseminating information about cooperative rather than competitive team sports, where task-oriented goals are facilitated over ego-orientations.

Unqualified leadership by community leaders of organised team sports may be associated with psychological stress for many team participants, irrespective of the level of physical coordination ability, but may be particularly damaging for boys with poor movement skills (Micheli, 1984). Parents of boys with DCD in this study gave examples of taunting and public disclosure of physical weaknesses alongside divisionary coaching practices that had been experienced by their sons. One parent, however, described relief when she came across a coach with a relaxed approach, who calmly gave specific feedback to her son and explored different ways to learn the motor skills necessary for cricket. This mother commented that the coach’s “main goal” was to look after the boys, have fun and get everyone working together as a team. His kindness made me stop and wonder why it couldn’t always be this way. However, even coaches described as “considerate” by parents of boys with DCD, sometimes appeared poorly informed about
the physical and psychosocial implications of DCD, describing a child as “lazy”, “inconsistent – plays well only when it suits him” or “could try harder”, in team sports.

**Informing communities, families and practitioners**

General educational aims include informing the community at large about this poorly understood disorder. Initiatives such as CanChild (Missiuna, 2003) are blueprints for community education and interdisciplinary service delivery aimed at enhancing and exchanging knowledge with physicians, teachers and parents through provision of evidence-based materials. For example, a fact sheet addressing low levels of physical activity, or the “couch potato” problem, have been devised for children with DCD, their parents and other community members involved in the care of these children (Rivard & Missiuna, 2004).

Similar programs using internet resources do not appear to be available in Australia. Teachers and parents involved in the study frequently requested information about issues related to assessment, intervention and developmental outcomes for children with DCD. Information about leisure participation options including community clubs and activities suitable for boys with DCD was not widely available or perceived to be readily accessible, but was dependent on individual clinicians’ initiatives and the resourcefulness of parents of boys with DCD in locating services. This is consistent with evidence from previous studies which have detailed the confusion in service provision and the “run around” in trying to identify “what was wrong with my child” for children with DCD (Ahern, 2000; Mandich et al., 2003; Missiuna, 2003; Missiuna, Moll, King et al., 2006).

**Physical health initiatives: Attacking a hibernation culture**

The finding that boys with DCD had lower participation in unstructured as well as structured social-physical contexts, and lower energy expenditure than boys without DCD has potential implications for physical (Cairney, Hay, Faught, & Hawes, 2005) as well as mental health (Missiuna, Moll, Law et al., 2006). Evidence that physical activity patterns established in childhood carry through into later life (Janz, Dawson, & Mahoney, 2000) means that intervening before life-long patterns of sedentary behaviours are established must be a clinical priority.

It was found that low energy expenditure associated with poor physical coordination ability was significantly mediated by positive self-perceptions of peer relations. For preadolescent and adolescent males, it is the self-perception of negative peer relations
that influences decisions to spend more time indoors than go outside and play. Once again, these findings point to the importance of considering the social context of physical activity participation for boys with DCD.

There was evidence that boys with DCD spent more time sitting indoors pursuing sedentary, electronic media-oriented activities either alone or connected to a computer than boys without DCD. Thus, they may become immersed in a “hibernation culture”. Several boys with DCD mentioned having a large number of on-line friends, thus suggesting that “hibernation” may be of a physical rather than social nature. However, research with adolescent males has found that greater loneliness and lower general self-concept are associated with internet friendship (even extensive internet friendships), as opposed to peer friendships that are face-to-face (Donchi & Moore, 2004). In contrast, participation in structured extracurricular activities outside the home facilitates relationship formation with peers and provides a source of self-competence evaluation in alternative spheres to school (Marsh, 1992).

Scheduled physical activity engagements, parental interference or discovery of a new talent or valued leisure pursuit that may expose a child to new social networks or physical activity opportunities are ways of disengaging boys with DCD from physical and/or social hibernation. The strongest benefit of extracurricular activities during early adolescence is the fostering of relationships with peers (Larson, 2000).

**Advocating for alternative social leisure pursuits to team sports**

There is a need to explore avenues for increasing social networks in group physical activities for boys with DCD through formation of clubs or social groups for walking, cycling, canoeing or callisthenics/resistance training. In these and other largely non-competitive physical activities, skills can be acquired at the child’s own pace and social evaluation from peers may be more readily managed. These physical activities can also be carried on into later life, thus extending the physical health benefits of adopting a physically active lifestyle. Progress can be supported, often with specific, individualised direct intervention to meet child-determined goals.

For the boys in this study, participation in structured group activities of a non-physical nature was not positively related to peer relations self-concept perceptions. Rather, positive relationships between participation in these activities and loneliness and social dissatisfaction were found. Only speculative suggestions are proposed to account for the findings of potentially adverse psychosocial associations with structured social non-physical activity participation found in the current study.
Relationships between the child and the immediate social environment may be influenced by other interactions between structures within this social environment, by school and community policies and practices that are embedded in broader social systems and cultural expectations. Thus, in Australia, and particularly within the independent boys’ schools attended by the majority of study participants, beliefs about the importance of team sports may have influenced activity participation in school-promoted team sports, such as rugby, over non-physical activities, such as choir. Opportunities to participate in a different set of options to team sports are inextricably tied in with family and community resources as well as to broad cultural values.

Meanings and practices associated with the construction of masculinity within different school environments may restrict participation in social non-physical activities and subjective quality of life (Swain, 2004). There is a need, therefore, for adoption of equal practices for scheduling of organised musical and sporting events, increasing public exposure for robotics, science or hobby clubs, and encouraging peer attendance and communal support at musical concerts as well as at football matches.

In this study boys with DCD who attended co-educational schools mentioned the support they received from girls who also participated in non-physical activities such as choir. One boy also described the advantages of attending a larger school where opportunities to participate in a wider range of extracurricular activities, and to find friends with similar leisure interests was more likely than in small schools.

It must be stressed once again, that the social and cultural webs of influence on leisure participation are complex. Pending further research in this area, however, clinicians must be wary of recommending higher participation in structured social non-physical activities for boys with DCD over participation in social-physical contexts. In therapy, informed decisions about team sport participation must include consideration of child-centred goals and collaborative collection of information about factors contributing to an optimal child-activity-environment fit. This view is supported by evidence that children with physical coordination difficulties can follow positive pathways through resolution of physical and psychosocial issues (Fitzpatrick & Watkinson, 2003), specific interventions devised by occupational therapists (Missiuna, Mandich, Polatajko, & Malloy-Miller, 2001), teachers who make a difference (Missiuna, Moll, Law et al., 2006), and optimal child-activity-environment fit utilising individual- and environment-level adaptive strategies (Missiuna, 2003), maturational changes and activity participation in social/non-social and physical/non-physical activities (Cantell et al., 2003).
Implications for research

Explaining and understanding relationships between variables influencing physical activity participation in health-enhancing leisure-time pursuits requires further investigation for individuals with DCD. Studying mechanisms can assist in the development of effective interventions and contribute to theory development. This study represents a starting point for investigating mediation effects that are likely to occur through multiple child-, environment-, and activity-related processes. Future studies with larger populations are recommended, using more complex models and data analytic strategies.

Establishing causal direction

The direction of causality between predictor, mediator and outcome variables cannot be determined using cross-sectional research. Longitudinal and experimental designs are required to more fully investigate directional effects. It is postulated however, based on predictions of an open systems theory framework, such as SCOPE-IT, that pathways are reciprocal and cyclical with varying levels of impact from different child- and environment- and occupation participation-level factors.

The Kazdin-Nock illusion (Kazdin & Nock, 2003) whereby the direction of arrows pointing in a particular direction gives the illusion that there is a time line, i.e. a predictor comes before an outcome, is an illusion in cross-sectional research as one construct doesn’t necessarily lead to another. Cross-sectional research could be seen as hypothesis-generating. Causal relationships include temporal direction – proximal or distal relationships. Mode of operation – direct or indirect may also be important.

Specifying child-level effects: Gender and intellectual ability

Future studies investigating gender effects as moderators of the relationships tested in this study, would provide additional information about child-level differences. Examination of moderated mediation effects, whereby mediation may vary across the levels of a moderator variable, such as gender, school type or socioeconomic background, is also recommended as a future research direction. For example, the mediational relationship between physical coordination ability and loneliness by team sport participation may only hold up for males not females. Alternatively, mediated moderation effects may be explored. It would be informative to explore the mediational role of IQ test scores, using a broader range of intellectual ability than in the current study, on leisure participation.
Investigating social effects: Motivational climate and social status

The finding that mastery-oriented social motivational climates are associated with adoption of task-oriented goals and positive self-concept perceptions indicates that this aspect of the social environment, particularly in structured leisure-time contexts, can potentially be manipulated to achieve adaptive outcomes for boys with DCD. Research investigating motivational climates would be informative, particularly in relation to adoption of mastery- over ego-oriented motivational climates.

Peer social status associated with different activities may be a mediating variable acting between physical coordination ability and outcomes, including activity participation, general self-concept, global life satisfaction and loneliness. In male students there is evidence that peer social status influences both participation and general self-concept. Position on a specific team and participation in activities that bring boys public acclaim increases general self-esteem (Holland & Andre, 1987). Cross-cultural investigations of social status associated with collectivist versus individualistic cultures, may be revealing.

Mental health implications: Life satisfaction, depression and anxiety

This study has raised questions about whether low social-physical activity participation and low global life satisfaction contribute to mental health problems such as anxiety (Sigurdsson et al., 2002) and depressive symptomatology (Francis & Piek, 2003) for boys with DCD. The situational motivational climate in predominantly ego-involving climates may also be important to evaluate in relation to these outcomes. Highly competitive, ego-enhancing environments in team sports are associated with low general self-concept, physical exhaustion and symptomatology that are potentially damaging to well-being (Reinboth & Duda, 2004).

It would also be beneficial to explore enjoyment, general self-concept and absence of anxiety or physical symptomatology associated with participation in unstructured as well as structured activity settings and the mechanisms, personal and environmental, that are health promotive. It has been suggested that only longitudinal research can disentangle the issue of primary versus secondary impairments in children with DCD (Sigurdsson et al., 2002).

Family, socioeconomic and racial background influences

The influence of socioeconomic background may also be important in considering developmental pathways for boys with DCD as boys from higher socioeconomic backgrounds have more economic resources to enrol in different structured team sport
activities and may have more alternative options if participation experiences are unsatisfactory in one context over another. The power of socioeconomic status in predicting social interactions in out-of-school settings has been described as impressive (Schneider et al., 1998). Children from higher socioeconomic backgrounds spend larger amounts of time in leisure organisations and sports clubs where large-group participatory behaviour is frequent and influenced by formal structures. A strength of the current study was the limited range of socioeconomic backgrounds of participating boys as this allowed comparisons between leisure-time participation in a relatively homogenous sample. At the same time, this was a limitation in relation to applicability of findings to children with DCD from different backgrounds, socioeconomic and racial backgrounds. Future research with participants from a wider and more representative family and ethnic backgrounds is recommended.

In addition to understanding mechanisms of influence from a child-level and activity-level perspective, future research needs to investigate environmental factors such as family values and functioning. Missisuna and colleagues (2006: 54) have suggested that “a research approach is needed which considers the individual nature of each child and the context within which he or she lives” using qualitative, phenomenological approaches which enable exploration of the meaning of experiences within different environments.

**Considering Criterion B – Functional impairments**

Obtaining detailed information about functional impairments in either academic achievement or activities of daily living would contribute to understanding about the relationships between psychosocial and motor variables. Functional difficulties with handwriting or personal grooming may not impact on life satisfaction or other quality-of-life indicators for some boys with DCD as much as having low sports participation. Cantell and colleagues (1994; 2003) found, for example, that boys with fine motor and visual perceptual difficulties did not differ from boys with no motor impairments on social participation and general self-concept evaluations. A retrospective study of adults described as physically awkward noted that having problems in sports or physical education contexts was associated with poorer emotional and social outcomes than handwriting difficulties (Fitzpatrick & Watkinson, 2003).

In several studies, the consideration of diagnostic Criterion B (American Psychiatric Association, 2000) where motor coordination difficulties significantly interfere with academic achievement or activities of daily living for determining DCD was rejected and motor coordination impairment below that expected for age (Criterion A) was used as the chief criterion for allocation to DCD or non-DCD groups. It has been argued that
functional impairment is difficult to operationalise (Piek et al., 2006). Therefore, inclusion of this criterion was deemed to detract from the importance of investigating motor competence in its own right (Henderson & Barnett, 1998).

Severity of functional impairments may, however, be an important consideration in relation to outcomes such as general self-concept, life satisfaction and social dissatisfaction/loneliness. Significant interference with everyday functioning may be a key issue prompting procurement of therapy services. Studies using participants who have been recruited from therapy clinics may have different outcomes from population-based studies where participants are screened for motor performance difficulties alone.

The issue of functional impairments for children with movement difficulties has been seen to be a diagnostic confound by some researchers (Henderson & Barnett, 1998; Piek et al., 2006). This has prompted several researchers to use more generic terms, rather than DCD, to describe children with movement difficulties (Wall, 2004) or to use the term DCD but to acknowledge that Criterion B – functional impairment – was not evaluated (Cairney, Hay, Faught, Mandigo et al., 2005; Fitzpatrick & Watkinson, 2003). This issue must be resolved if the field is to continue to develop a soundly-based, shared understanding of the issues and outcomes.

**Establishing functional performance indicators (FPI)**

It is recommended that research into the operationalisation of Criterion B be prioritised with the aim of identifying key Functional Performance Indicators (FPI). This study has strongly pointed to the importance of including low social-physical activity participation as an early alerting sign for consideration of DCD. During the interviews, parents of boys with DCD consistently identified perceived social-participation restrictions, or low participation in team sports and group physical play as being a problem. Low participation in social-physical activities was associated with a wide range of negative outcomes for pre- and early adolescent boys. Low social participation, loneliness and social dissatisfaction may be markers for social withdrawal. One boy with DCD described his mother’s attempts to get him to play with other neighbourhood children in the following way, “Mum makes me go to my next door neighbour’s place to play with the other kids … it’s such a chore”. Another boy with DCD mentioned his concerns about a proposed camping trip with another family where he would have to share a tent with two other children as, “I’ll just have to make the best of camping in a confined space”.

Other FPIs described by parents of boys with DCD included handwriting difficulties, organisational problems, dressing and toileting concerns. Five of the 60 boys with DCD...
had significant toileting concerns requiring intervention by private physiotherapists specialising in female incontinence and pelvic floor problems. Future research investigating key Functional Performance Indicators is imperative to establish incidence, prevalence and influence of functional performance deficits and to operationalise Criterion B of the DSM-IV.

Limitations and recommendations

1. Life satisfaction was measured as a one-dimensional rather than a multi-dimensional construct. Exploring construct-specific appraisals of life satisfaction may reveal more specific information about hypothesised relationships than global self-report measures. Assessing life satisfaction across a variety of domains and longitudinally may lead to targeted development of strategies to promote well-being.

2. In accordance with Cantell and colleagues (2003) it is recommended that longitudinal studies pay particular attention to children who were diagnosed as having DCD at an early age, and who appear to have had partial resolution of motor difficulties. The developmental trajectories of these children who appear to have “caught up” may be informative regarding possible physical activity participation mechanisms contributing to improved physical ability and psychosocial outcomes. Variability in physical coordination ability through exposure to different movement experiences, along with different experiences associated with social environmental features (e.g. social support and situational motivational climates) contribute to the lack of uniformity in patterns of developmental progression for children with DCD (Cantell et al., 2003).

3. There were limitations associated with the measures of physical activity time-use and energy expenditure employed in this study. The principal advantages of the seven-day diary were unobtrusiveness and low reactivity, evidence that parent-completed proxy reports are less biased and subjective than child-generated measures, and low cost and convenience for the researcher (Paluch, Coleman, Vito, & Anderson, 1996). Parental concerns about filling in the diary included difficulties gauging intensity level of activities when they were not able to observe the child’s performance, and response burden in completing the diary each night. Inconsistencies were noted in parents’ determination of what physical activities constituted vigorous versus moderate levels of energy expenditure, and there was also confusion about activities that were classified as rest or light energy expenditure. Over-estimation of moderate to vigorous energy expenditure was
suspected, which is consistent with other studies reporting incompatible results from heart rate monitoring and diary data (Anderson, Hagstromer, & Yngve, 2005).

Heart rate monitoring may be included as part of a multi-method strategy to record physical activity energy expenditure. It received minor criticism as being unreliable because of interactions with fitness levels and medications which affect readings (Eston, Rowlands, & Inglede, 1998). It is also intrusive and costly.

Other methods, such as motion-measuring devices may be better suited to record physical activity measurement, as they are less costly, more user-friendly and can quantify even low levels of physical activity (Steele, Belza, Cain, Warms, Coppersmith, & Howard, 2003). Using motion sensors would therefore be recommended in future studies, using two full 24-hour periods of monitoring over a representative period (one weekday and one weekend day). This would also allow comparisons to be made between energy expenditure during the school hours as well as out-of-school.

It is recommended that a parent-completed questionnaire of past-year leisure-time activities supplements information obtained about energy expenditure to allow for information about social and structural elements of leisure-time behaviour, as well as to provide data about seasonal fluctuations in physical activity participation patterns.

4. There was a bias towards independent schools sample used in the study, particularly for the non-DCD group. When socioeconomic background differences were examined, using parents’ occupational grouping, there were no significant between-group differences and participants from both groups were predominantly white, Caucasian males. Cultural values about activity participation, particularly in relation to structured activity participation, may have influenced leisure-time distribution patterns. However, future research with more representative populations from a wider range of schools, including small/large, co-educational/ single gender, and independent/state schools, and with participants from a wider range of cultural and socioeconomic backgrounds would help partial out effects impacting on child-activity-behaviour-adjustment links. The inclusion of a wider distribution of participants from different geographical regions, including coastal, rural and urban environments would improve applicability of findings more generally.

5. It would be beneficial in future studies to obtain a full IQ score for both groups as
IQ is recognised as a diagnostic confound in children with DCD (Hellgren, Gillberg, Gillberg, & Enerskog, 1993).

6. This study focused on a narrow age band, however, at this time of life some boys may be moving into early adolescence, while other boys are preadolescent. Pubertal changes may influence participation decisions because of physical changes in strength and coordination (Cantell et al., 2003). Evaluation of pubescent changes using Tanner’s scales (Marshall & Tanner, 1970) may represent a study design improvement, however, collecting personal data requiring observation of body development may prove difficult outside a medical setting.

7. Problems were identified with the measurement of PFL using the Leisure Diagnostic Battery (Witt & Ellis, 1989). Boys commented on the difficulty of evaluating “recreation” as a broad and generic concept, and required further information defining recreation in culturally and age-appropriate terms. It is also recommended that the long forms of the Leisure Diagnostic Battery be included in future research, with preliminary establishment of culturally appropriate language and descriptions of leisure activities.

Conclusions

Leisure-time activity participation was viewed from an ecological framework as being influenced by complex, interactive processes occurring at child-, activity-, and environment-related levels. While recognising the importance of multiple factors influencing participation levels of boys with DCD, the focus in this investigation was on child-level psychological factors explored as mediators of relationships between physical coordination ability and a range of outcomes; activity participation, global life satisfaction and general self-concept. In addition, characteristics of the leisure-time social and physical activity context were explored as mediators of proposed relationships. Although the results obtained were exploratory and must be treated with caution given the cross-sectional nature of the research, they offer encouraging directions for future research endeavours, as well as having clinical implications for practitioners working with boys who have DCD.

The results of descriptive analyses comparing boys with and without DCD found significantly lower general and non-academic self-concept perceptions, global life satisfaction, PFL, task goal orientations, and social-physical leisure participation for boys with DCD. Higher levels of loneliness were reported by boys with DCD compared with
boys without DCD. These results provide evidence of the significant psychosocial impact and physical activity leisure-time participation implications associated with having DCD for 10 to 13-year-old boys.

Mediation analyses were conducted to explore processes influencing relationships between physical coordination ability and a range of psychosocial and activity participation outcomes. Self-concept perceptions (physical ability and appearance, peer and parent relations) and task goal orientations were identified as mediators of relationships between physical coordination ability and both general self-concept and global life satisfaction. Team sport participation acted as a mediator of a link between physical coordination ability and two outcomes; loneliness and global life satisfaction. Thus, team sport participation was found to be a positive mechanism contributing to greater global life satisfaction and less loneliness for the boys in the study, irrespective of the level of physical coordination ability.

Previous research has found that despite low levels of participation in team sports and adverse experiences for some boys with poor physical coordination ability who participate in these structured social-physical activities, there are reports of others who appear to have satisfying and deep involvement in these activities. Thus, the mechanisms contributing to team sport participation were examined. These included self-concept perceptions, individual dispositional goal-orientations and PFL. Significant, but partial mediation was found for PFL, but not for any other psychological mechanism that was investigated.

Boys with DCD were found to participate in fewer team sports than boys without DCD and are also more likely to have lower energy expenditure overall during the out-of-school hours than boys without DCD. It was found that perceived peer relations influenced an inverse relationship between physical coordination ability and low energy expenditure. There was a positive link between low participation in team sports and participation in other informal social-physical activities and combined low participation in both these contexts contributed to the lower energy expenditure levels of boys with DCD compared with boys without DCD.

Team sports participation was identified as an important mediator and an outcome for the boys in this study. A hypothetical model was constructed to explain the potential pathways between physical coordination ability, PFL, team sports participation and both global life satisfaction and loneliness. This model emphasises the centrality of PFL as a construct with the potential to guide clinical practice in decisions about team sports participation. Perceived freedom in leisure was the mechanism that partially explained
the relationships between physical coordination ability and both team sports participation
and global life satisfaction. Low team sports participation accounted, in part, for an
inverse relationship between physical coordination ability and loneliness.

The findings presented in this thesis move beyond a mere description of differences
between boys with and without DCD. The SCOPE-IT model provided a useful framework
for studying the relationships among physical coordination ability, leisure-time
participation and social-psychological factors and the mediating influences on these
relationships. Causal relationships cannot be inferred from mediation analyses, therefore
the direction of these effects is hypothetical. However, PFL was identified as a potential
tool for future clinical and research initiatives to understand the processes contributing to
full participation in health-enhancing leisure-time pursuits. By contributing to
understanding about the mechanisms influencing relationships between physical
coordination ability and activity participation, general self-concept, global life satisfaction
and loneliness, this thesis contributes to theory and is a considered progression towards
the development of effective intervention and prevention programs for boys with DCD.
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Appendices

Appendix 1 – Ethics Approvals

- Ethics Approval from Behavioural & Social Sciences Ethical Review Committee, The University of Queensland
- Ethics Approval from Queensland Health, QEII Jubilee Hospital, Health Service District
- Ethics Approval from Education Queensland, Queensland Government
- Ethics Approval from Catholic Education, Archdiocese of Brisbane

Appendix 2 – Description of Leisure Study

Appendix 3 – Phase One Survey and Parent Consent Forms

- Letter accompanying survey
- The survey: “Profiles of Australian Children’s Leisure”
- Parent consent form

Appendix 4 – Phase Two Diary and Child Consent Forms

- Letter accompanying diary
- Activity codes
- Seven-day leisure-time diary
- Child consent form

Appendix 5 – Correspondence from Journals
Appendix 1: Ethics Approvals

- Ethics Approval from Behavioural & Social Sciences Ethical Review Committee, The University of Queensland
- Ethics Approval from Queensland Health, QEII Jubilee Hospital, Health Service District
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THE UNIVERSITY OF QUEENSLAND

Institutional Approval Form for Experiments on Humans Including Behavioural Research

Chief Investigator: Ann Poulsen

Project Title: Leisure-time personal projects, life satisfaction and participation in physical and social activities for preadolescent boys with developmental coordination disorders

Supervisor(s): Dr Jenny Ziviani, Dr Monica Cuskelley

Department(s): Occupational Therapy

Project Number: 2001002007

Granting Agency/Degree: PhD

Duration: 3 years

Comments:
7 June 2002

Anne Poulson
Department of Occupational Therapy
School of Health and Rehabilitation Sciences
University of Queensland
ST LUCIA QLD 4072

Dear Mrs Poulson

RE: Approval to Approach Education Queensland Schools

Thank you for your application to undertake the research titled “Leisure-time, personal projects, life satisfaction and participation in physical and social activities for preadolescent boys with developmental coordination disorders (DCD)” in Queensland State schools and other Units. I wish to advise that your application to approach Education Queensland schools for the conduct of this research study has been approved, pending the receipt of schools to be approached.

Although the department has granted approval for the research, you are reminded that there is no obligation on the part of individual school principals to participate in the research study.

It is at the discretion of the Principal whether or not research studies are undertaken in their school. Their decisions may be influenced by the appropriateness of the research for the particular site and the capacity of the school to become involved given other commitments.

It is also a condition of approval that Principals of schools targeted for research studies must be contacted in the first instance, and their approval granted, before individual teachers, other staff or students can be approached, and their cooperation sought to participate in research studies.

Education Queensland is interested in the research work, which is undertaken within schools. At the completion of your project, it would be appreciated if you would provide this office with a copy of your findings. The Department is currently exploring options for promoting research and disseminating findings. You are asked to notify the Department should the findings of the research be published following completion of your study.

Should you have any questions about the research approval process please do not hesitate to contact me on (07) 3237 1120. Please quote your file number 550/27(282) in future correspondence.

I wish you well with your research endeavours.

Yours sincerely

[Signature]

REBECCA NGUYEN
A34.046.1 DJH:le
2 October 2002

Mrs Anne Poulsen
Department of Occupational Therapy
The University of Queensland
St Lucia Qld 4072

Dear Anne

Thank you for your letter regarding permission to approach a school for your research on 'Leisure-time personal projects, life satisfaction and participation in physical and social activities for preadolescent boys with developmental coordination disorders'. Permission is granted to approach a Brisbane Catholic Education school within the Archdiocese of Brisbane.

I would ask you to contact the principal of St Joseph's School, Corinda seeking his involvement in the project.

Please note that participation in your study is at the discretion of the principal.

If you have any further queries, please contact our Research Coordinator, Lisa Eastment, on (07) 3840 0427.

Yours sincerely

(D) Goosem
(Mrs) Dianne Goosem
Acting Executive Director of Catholic Education
Archdiocese of Brisbane
Appendix 2: Description of Study

LEISURE STUDY

Senior Project Officer - Anne Poulsen
(Ph 3379 9760 or 041 773 2462)

PHASE ONE: SURVEY

Permission will be sought from school principals and classroom teachers to conduct the study within their schools.

- A survey “Profiles of Australian Children’s Leisure” will be sent home to each child in the identified classes.
- Parents who sign the consent form on the last page of the survey will be included in Phase 2.

PHASE TWO: INDIVIDUAL ASSESSMENTS AND DIARY

- The families who agree to participate in Phase Two will complete a seven-day diary and their sons will be individually assessed at school in one period of approximately an hour.
- A report of each child’s results on the Movement ABC Test will be sent home immediately following the assessment.
- A complete report of the study findings will be sent to the schools involved at the end of the data analysis and finalisation of results.
- A presentation of books for the school library will be made at the completion of the data collection to thank the school for supporting this project.
Appendix 3: Phase One Measures

- Letter accompanying survey
- The Survey: “Profiles of Australian Children’s Leisure”
Profiles of Australian Children’s Leisure

A Survey of Leisure-Time Activities of Primary School-aged Children

Anne Poulsen ©
Why is the study being done?

In this project we are aiming to increase our understanding of the nature and extent of leisure-time activity participation in young Brisbane children. We want to find out how children spend their time during out-of-school hours and the reasons why children choose some activities over others. The positive effects of spending time relaxing with family members and friends and the benefits of being involved in different activities after school or on the weekends are poorly understood. Identifying activities that contribute to life satisfaction, enjoyment and the development of healthy lifestyles may help our children achieve a balanced life of work, rest and play, both now and in the future.

Who is doing the study?

The study is being conducted by members of The University of Queensland, Department of Occupational Therapy.

What would be required of me?

If you would like to be involved all that is required is that you complete the attached questionnaire. It is anticipated that it will take approximately 20 minutes to complete. Other schools in the Brisbane area will also be involved. The more questionnaires completed the more effective the research will be.

Can I refuse to complete the questionnaire?

We would like you to take part in the project but of course it is completely up to you. If you decide to participate, your privacy will be protected and all information gathered will be kept in strict confidence and will only be used for the purposes of the study. Each returned survey will be assigned a code and all personal details (name, address, and school) will be removed prior to data analysis.

Who can I contact if I have any questions?

If you have any questions please don’t hesitate to contact project staff (Anne Poulsen on 3379 9760 or 041 773 2462 OR Jenny Ziviani on 3365 3008).

If you would like to speak to an independent officer from the university you may contact the Ethics officer on 3365 3924.
Information about your child

**Code Number** ________ (A code number will be given to each child so that the information from this survey is COMPLETELY anonymous).

- **Child’s name** __________________________
- **Date of Birth** ___ / ___ / ___
- **Child’s school** ________________________
- **Address** ______________________________
- **Post Code** __________

1. **Gender?** (circle appropriate answer)
   - male
   - female

2. Is this child affected by any of the following problems? (you may circle more than one)
   - intellectual disability
   - sensory loss (hearing/sight)
   - chronic medical condition (eg asthma, arthritis, cystic fibrosis)
   - physical coordination difficulties
   - attention deficit
   - Other conditions (specify)

3. Specify the number of people who live in your house (Circle the correct number for each age group)
   - *children 5 years and under* 0 1 2 3 4
   - *children between 6 & 12 years* 0 1 2 3 4
   - *children between 13 & 17 years* 0 1 2 3 4
   - *number of adults over 18 yrs (include yourself)* 0 1 2 3 4
4. Could you please circle any activities that your child has tried in his/her life so far and done at least 10 times outside school? List any extra activities under “Other”.

<table>
<thead>
<tr>
<th>NATURE/OUTDOORS</th>
<th>MUSIC &amp; DRAMA</th>
<th>INDOOR/MENTAL</th>
<th>FIELD SPORTS</th>
<th>WATER SPORTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camping</td>
<td>Orchestra or band</td>
<td>Reading</td>
<td>Soccer</td>
<td>Swimming</td>
</tr>
<tr>
<td>Picnics</td>
<td>Speech &amp; Drama</td>
<td>Watching TV</td>
<td>Cricket</td>
<td>Water-skiing</td>
</tr>
<tr>
<td>Hiking</td>
<td>Stage performance</td>
<td>Homework</td>
<td>Hockey</td>
<td>Canoeing</td>
</tr>
<tr>
<td>Climbing outdoors</td>
<td>Singing</td>
<td>Computer</td>
<td>T ball</td>
<td>Kayaking</td>
</tr>
<tr>
<td>Environmental club</td>
<td>Debating</td>
<td>Chatting on phone</td>
<td>Softball</td>
<td>Sailing</td>
</tr>
<tr>
<td>Gardening</td>
<td>Practicing musical instruments</td>
<td>Relaxing/thinking</td>
<td>Rugby League</td>
<td>Boating</td>
</tr>
<tr>
<td>Fishing</td>
<td>Practicing musical instruments</td>
<td>Emailing friends</td>
<td>Rugby Union</td>
<td>Windsurfing</td>
</tr>
<tr>
<td>Playing with pets</td>
<td>LIST ..........</td>
<td>Internet use</td>
<td>AFL</td>
<td>Rowing</td>
</tr>
<tr>
<td>Walk in the park</td>
<td>..................................</td>
<td>Chatrooms</td>
<td>Baseball</td>
<td>Diving</td>
</tr>
<tr>
<td>Cubs, scouts, Guides</td>
<td>.....................</td>
<td>Listening to music</td>
<td>Lacrosse</td>
<td>Surfing</td>
</tr>
<tr>
<td>Other ..............</td>
<td>Other ..........</td>
<td>Other ..........</td>
<td>Athletics</td>
<td>Water polo</td>
</tr>
<tr>
<td>EVENTS</td>
<td>ARTS &amp; HOBBIES</td>
<td>INDOOR (or undercover)</td>
<td>LIFESTYLE</td>
<td>COURT SPORTS</td>
</tr>
<tr>
<td>Go to concerts</td>
<td>Collecting</td>
<td>GAMES</td>
<td>PHYSICAL (special facility)</td>
<td></td>
</tr>
<tr>
<td>Visit museums</td>
<td>Writing stories</td>
<td>Warhammers</td>
<td>Tennis</td>
<td></td>
</tr>
<tr>
<td>Visit art gallery</td>
<td>Pottery, ceramics</td>
<td>Darts</td>
<td>Indoor rockclimbing</td>
<td></td>
</tr>
<tr>
<td>Visit science centre</td>
<td>Robotics or electronics</td>
<td>Billiards or pool</td>
<td>Netball</td>
<td></td>
</tr>
<tr>
<td>Shop with friend/s</td>
<td>Making jewelry, kites, candles etc</td>
<td>Table tennis</td>
<td>Ice Skating</td>
<td></td>
</tr>
<tr>
<td>Go to fete/fair</td>
<td>Woodwork</td>
<td>Quoits</td>
<td>Golf</td>
<td></td>
</tr>
<tr>
<td>Go to church</td>
<td>..................................</td>
<td>Play card or board games</td>
<td>Miniature golf</td>
<td></td>
</tr>
<tr>
<td>Go to Youth group</td>
<td>Learning a foreign language</td>
<td>Chess</td>
<td>Volleyball</td>
<td></td>
</tr>
<tr>
<td>Go to sport events</td>
<td>Photography</td>
<td>Chess</td>
<td>Basketball</td>
<td></td>
</tr>
<tr>
<td>Go to theme park</td>
<td>..................................</td>
<td>Playing hand held electronic games</td>
<td>10-pin bowling</td>
<td></td>
</tr>
<tr>
<td>Going to movies</td>
<td>Drawing, painting or cartooning</td>
<td>Playing electronic games on television</td>
<td>Badminton</td>
<td></td>
</tr>
<tr>
<td>Go to the zoo or animal sanctuary</td>
<td>Sewing</td>
<td>Playing electronic games on computer</td>
<td>Gymnastics</td>
<td></td>
</tr>
<tr>
<td>Visit neighbours</td>
<td>Origami</td>
<td>Checkers</td>
<td>Archery</td>
<td></td>
</tr>
<tr>
<td>Visit relatives</td>
<td>Lego</td>
<td>Pinball</td>
<td>Fencing</td>
<td></td>
</tr>
<tr>
<td>Voluntary work</td>
<td>Cooking</td>
<td>Puzzles</td>
<td>Badminton</td>
<td></td>
</tr>
<tr>
<td>Work for parents</td>
<td>Model building</td>
<td>Air hockey</td>
<td>Shooting</td>
<td></td>
</tr>
<tr>
<td>Other ..............</td>
<td>Other ..................</td>
<td>Other ..........</td>
<td>Croquet</td>
<td></td>
</tr>
</tbody>
</table>

Other ................ Other ................ Other ................ Other ................ Other .................
What does your child do now outside school?

5. What are the three things your child does the most now? (Please select three activities from the list on the previous page)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
</tbody>
</table>

😊😊😊
Organised leisure activities are regular weekly commitments outside of school that usually take place in a setting away from home (like a sports ground or a community hall) and are under adult supervision.

How much do you agree with the following statements about the amount of time your child is committed to organised leisure activities at the moment? (Please √)

<table>
<thead>
<tr>
<th></th>
<th>NO strongly disagree</th>
<th>NO somewhat disagree</th>
<th>Neutral</th>
<th>YES somewhat agree</th>
<th>YES strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>This child has a great deal of spare time that is not regularly committed to doing organised activities outside school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>At times our household can be quite stressed by the number of activities that need to be fitted into our weekly schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Our household spends time every week planning the out of school activities that need to be fitted into this child's daily schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. What does your child regularly do away from home each week?

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TIME</th>
<th>SKILL</th>
<th>ENJOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write down any activities that are regularly scheduled for your child away from home every week (outside school)</td>
<td>How many sessions or appointments are scheduled for this activity/week? (Write the number)</td>
<td>How would you rate his/her skill level? (✓ one box)</td>
<td>How much does he/she enjoy it? (✓ one box)</td>
</tr>
<tr>
<td>Lessons or Classes</td>
<td>Low Med High</td>
<td>Low Med High</td>
<td></td>
</tr>
<tr>
<td>Sports or Social Clubs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Associations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Care</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Examples of Organised Activities:
- Lessons or Classes: e.g. music lessons, tutoring, arts & crafts classes, swimming, tennis lessons, coaching sessions & matches
- Sports or Social Clubs: e.g. cubs, brownies, guides, scouts, PCYC, church groups, science or computer club, cultural associations, etc
- Associations: e.g. organised activities in a supervised child care facility

Code No_____
Some of the reasons for stopping an activity are listed below. Please add in any other reasons your child may have had for discontinuing the activity.

<table>
<thead>
<tr>
<th>ENVIRONMENTAL REASONS</th>
<th>CHILD’S REASONS</th>
<th>SOCIAL REASONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Activity not offered any more</td>
<td>1. Wanted to try something new</td>
<td>15. Other children didn’t think it was “cool”</td>
</tr>
<tr>
<td>2. Not the right season</td>
<td>2. Child didn’t enjoy activity</td>
<td>16. Other children were unkind</td>
</tr>
<tr>
<td>3. No way to get there</td>
<td>3. Child didn’t have the right skills</td>
<td>17. Friends dropped out</td>
</tr>
<tr>
<td>5. Cost too much</td>
<td>5. Child had no friends doing it</td>
<td>19. Coach/leader not supportive</td>
</tr>
<tr>
<td>6. We moved</td>
<td>6. Child didn’t like the rules</td>
<td>20. Other parents unfriendly</td>
</tr>
<tr>
<td>7. Activity was at the wrong time of day</td>
<td>14. Child was doing too many other activities</td>
<td>21. Other ................................</td>
</tr>
</tbody>
</table>

10. What clubs or organisations has your child joined in the past and why did they stop?

<table>
<thead>
<tr>
<th>LIST OF PAST ORGANISATIONS OR CLUBS</th>
<th>REASONS FOR STOPPING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Please write the number or numbers from the above table</td>
</tr>
</tbody>
</table>
Leisure at Home

Please write down the main activities your child usually does at home or near home. Don’t write down the activities that are too far away from home but do include things like playing with neighbours, riding to the shops around the corner, or going to play in the park. For example, this is one child’s list of the main activities done at home each week.

<table>
<thead>
<tr>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Watching TV</td>
</tr>
<tr>
<td>2. Playing Sony Playstation</td>
</tr>
<tr>
<td>3. Homework</td>
</tr>
<tr>
<td>4. Ride bike</td>
</tr>
<tr>
<td>5. Practice shooting basketballs</td>
</tr>
<tr>
<td>6. Doing chores</td>
</tr>
<tr>
<td>7. Listening to music</td>
</tr>
<tr>
<td>8. Painting model figures</td>
</tr>
</tbody>
</table>

11. How does your child spend their time at home?

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>TIME</th>
<th>ENJOYMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write down the main activities your child usually does at home</td>
<td>How much time does your child spend doing it?</td>
<td>How much does he/she enjoy it? (Tick one box)</td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>Almost daily</td>
</tr>
<tr>
<td></td>
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12. With whom does this child spend his/her leisure?

How often is he:

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<th>Never</th>
<th>Hardly ever</th>
<th>Sometimes</th>
<th>Often</th>
<th>Not applicable</th>
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<td><strong>RELATIVES</strong></td>
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<td>With parent/s</td>
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<td>With brother/s or sister/s</td>
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<td>Other relatives</td>
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<td><strong>FRIENDSHIP GROUPS</strong></td>
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<td>With local children</td>
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<td>With a steady group of friends</td>
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<td>With children that he meets at a leisure activity (e.g. a sports team, youth group, choir, science club etc)</td>
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<td><strong>INDIVIDUAL / PAIRS</strong></td>
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<td>With best friend</td>
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<td>Alone</td>
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In which country were you and the other members of your household born? (circle appropriate answers for each person)

13. You
   - Australia
   - Other English speaking country
   - European non-English speaking country
   - Asian non-English speaking country
   - Other (specify)

14. Partner (if applicable)
   - Australia
   - Other English speaking country
   - European non-English speaking country
   - Asian non-English speaking country
   - Other (specify)

15. Child in this study
   - Australia
   - Other English speaking country
   - European non-English speaking country
   - Asian non-English speaking country
   - Other (specify)

16. What is your occupation?

17. How many hours/week do you work in this occupation? (Please circle one)
   1. 0-10 hrs/wk
   2. 11-20 hrs/wk
   3. 21-30 hrs/wk
   4. 31 or more hrs/wk

18. What is your age?

19. What is your highest level of formal education? (circle one choice)
   - completed primary school
   - completed high school
   - did not complete high school
   - completed post-secondary education (TAFE, trade, University)
   - completed post-graduate degree

20. If applicable, what is your partner's occupation?

21. How many hours/week does your partner work in this occupation? (Please circle one)
   1. 0-10 hrs/wk
   2. 11-20 hrs/wk
   3. 21-30 hrs/wk
   4. 31 or more hrs/wk

22. If applicable, what is your partner's age?

23. If applicable, what is your partner's highest level of formal education?
   1. completed primary school
   2. completed high school
   3. did not complete high school
   4. completed post-secondary education (TAFE, trade, University)
   5. completed post-graduate degree
Thank you for taking the time to fill out this questionnaire!

😊 Please now send the completed forms, sealed in the envelope provided, back to school with your child.

If you have any questions, regarding the questionnaire please don’t hesitate to contact Anne Poulsen ph 3379 9760
Would you and your child be interested in participating in the next stage of this research investigating the leisure-time pursuits of different groups of children?

**YES.** I give consent for my son to be involved in the next phase of the leisure-time study. This will mean that my son will complete the Movement ABC (which is an evaluation of fine and gross motor skills), and some questionnaires on what he likes to do in his spare time and how he feels about these activities.

I would like a brief report of his current skills on the Movement ABC. I understand that he will be seen at school by an experienced occupational therapist, and the assessments will take approximately an hour to complete.

I also agree to fill out an activity diary briefly describing what my child does out of school over a week.

I understand that our participation in this project is completely voluntary and we can withdraw at any time without penalty. I have explained the study to my child and he agrees to participate.

CHILD’S NAME: ___________________________ Date of birth: ____/____/____

PARENT’S NAME: ___________________________

PARENT’S SIGNATURE: ___________________________ Date: ____/____/____

ADDRESS: ___________________________ Phone: ___________________________

TEACHER’S NAME: ___________________________ Class: ___________________________

**YES** I would like the classroom teacher to receive a copy of the OT report

**NO** I would prefer that the classroom teacher does not receive a copy of the OT report

This study has been approved by the Behavioural and Social Science Ethical Review Committee of The University of Queensland in accordance with the National Health and Medical Research Council’s guidelines. Whilst you are free to discuss your participation in the study with the project staff, if you would rather speak to an officer of the university not involved in the study, you may contact the Ethics Officer on 3365 3924.
Appendix 4: Phase Two Measures

- Letter accompanying diary
- Activity codes
- Seven-day leisure-time diary
- Child consent form
## Activity Codes

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<tr>
<th>ACTIVITY LEVELS</th>
<th>DEFINITION</th>
<th>EXAMPLES</th>
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<tbody>
<tr>
<td><strong>Rest</strong></td>
<td>Means totally inactive and not moving around</td>
<td>Sleeping, reading a book, watching TV, eating a meal, driving in the car, sitting still doing homework</td>
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<tr>
<td><strong>Light</strong></td>
<td>Activities where you are moving around but heart rate and breathing are not increased very much</td>
<td>Getting dressed slowly, gentle walking, cooking, doing light chores</td>
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<tr>
<td><strong>Moderate</strong></td>
<td>Activities where breathing and heart rate increase, there may be sweating and a feeling of being somewhat tired at completion</td>
<td>Jogging, swimming, cycling, tennis, continuous rapid walking, lively basketball practice in backyard</td>
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<tr>
<td><strong>Vigorous</strong></td>
<td>Activities where there is rapid heartbeat and heavy breathing, accompanied by sweating and a feeling of total exhaustion at completion</td>
<td>Running very fast, cycling fast, football, basketball match, kayaking competition</td>
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PROFILES OF AUSTRALIAN CHILDREN’S LEISURE

7-DAY DIARY

PLEASE RETURN TO: Anne Poulsen
Department of Occupational Therapy
The University of Queensland 4072
(Ph 3379 9760 or 041 773 2462)

This study has been approved by the Behavioural and Social Science Ethical Review Committee of The University of Queensland in accordance with the National Health and Medical Research Council’s guidelines. Whilst you are free to discuss your participation in the study with the project staff, if you would rather speak to an officer of the university not involved in the study, you may contact the Ethics Officer on 3365 3924.
<table>
<thead>
<tr>
<th>Time</th>
<th>Main Activity</th>
<th>Intensity Level (please tick appropriate level)</th>
<th>Who was there doing the activity with the child?</th>
<th>Where did the activity take place?</th>
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<td>(What activity took up most of the time in each half hour block?)</td>
<td>(please tick appropriate level)</td>
<td>Adults (e.g. mum/dad)</td>
<td>Children (e.g. local children - how many?)</td>
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I, ________________________, (Please print your name here) understand that I have been asked to be in a project looking at how children spend their time outside of school hours. If I agree to be in this project, I will be asked questions about how I feel about myself and about the things I like to do in my spare time. I will not have to answer any questions I don’t want to and I can stop being in the project at any time.

I will also be asked to do some pencil and paper tasks and to participate in a series of motor activities like catching and throwing balls, balancing and jumping or hopping. I have talked this over with my parents and I have decided to volunteer to be in this project.

Child’s signature: ____________________________ Date: ___/___/___

(Your signature is the way that you like to sign your name - using printing or cursive. You can write your whole name, part of your name, or just your initials).

School: ____________________________ Class: ______________

Teacher: ____________________________ Date of Birth: ___/___/___

CHILD CONSENT FORM
Appendix 5: Correspondence from Journals
Dear Ms. Poulsen,

It is a pleasure to accept your manuscript entitled "Perceived freedom in leisure and physical coordination ability: Impact on out-of-school activity participation and life satisfaction" in its current form for publication in Child: Care, Health & Development.

Thank you for your contribution. On behalf of Child: Care, Health & Development, we look forward to your continued contributions to the Journal.

NOTE: for information on services provided to authors by the publisher, please see the attached file.

Yours sincerely,

Prof. Stuart Logan
Editor, Child: Care, Health & Development stuart.logan@pms.ac.uk

End forwarded message ----