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A Longitudinal Examination of the Contribution of Perceived Motor Competence and Actual Motor Competence to Physical Activity in 6 to 9 Year Old Children

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## CHAPTER SIX

### SUMMARY AND CONCLUSIONS

The dynamic and evolving relationship between perceived motor competence, actual motor competence and physical activity in young children was examined in this study.

#### *Summary*

A total of 201, 6-, 7- and 8-year-old boys and girls living in Perth, Western Australia were assessed on physical activity levels, perceived motor competence and actual motor competence in four data collection cycles across 18 months. The purpose of the mixed-longitudinal study was to investigate the emerging nature of the relationship between perceived motor competence, actual motor competence and physical activity over time in young children. The primary instruments for gathering data for this study were pedometers and physical activity diaries for physical activity, the Self Description Questionnaire - I (Marsh, 1988; 1990) for perceived motor competence and observation records from the Fundamental Movement Skills Teacher Resource Manual (Education Department of Western Australia, 2001) for actual motor competence.

To measure physical activity, participants wore a pedometer for 7 consecutive days. Participants, with assistance from parents, completed the diary at the end of every day over the 7 day period, including participation in any activities before school, recess, lunch, after school, any physical education or fitness classes, and the number of steps recorded. For perceived motor competence, participants answered 5-point Likert scale questions based on a scoring system of 1 (No always) to 5 (Yes always) and a total score out of 120 recorded. Actual motor competence was measured by videoing run, overhand throw, standing broad jump, line walk and scored as the number of skill criteria demonstrated. A total actual motor competence score out of 26 was possible from the combination of criteria for all 4 skills.

### *Key Findings*

1. Boys recorded higher step counts and greater actual motor competence than girls at every age.
2. There were no significant differences between boys and girls in perceived motor competence scores at any age.
3. The relationship between perceived and actual motor competence was weakly correlated in 6-year-olds. The degree of congruency strengthened earlier in boys (7 years) than girls (8 years).
4. Actual motor competence made a greater significant contribution to physical activity levels than perceived motor competence. This was evident at an earlier age in boys (7 years) than girls (9 years).
5. Actual motor competence, gender and school the children attended significantly impacted on physical activity across the 18 month period in young children.

### *Limitations*

The interactions between perceived motor competence, actual motor competence and physical activity in young children will require further investigation as some degree of caution is necessary when interpreting results for a number of reasons. First, the measurement of the variables within this study is one of the key issues and challenges within developmental research of young children. Other limitations relate to specific data on schools that was not collected. School was an important contributor to children's physical activity, affected the sample size, and therefore the generalisation of these findings to other cultures and age groups.

### *Measurement issues*

For each of the three variables measured in the current study, a wide range of assessment tools are available. Many direct, such as accelerometers and pedometers, and indirect, such as self report, measures have been used to examine various aspects of physical activity behavior in young children. The validity and reliability of physical activity measures in young children is still being scrutinised. The decision to use pedometers in this study was based on the established validity and reliability of using these tools with young children (Hands, Parker & Larkin, 2006). The other advantages of low cost, ease of interpretation, and suitability for measuring daily step

counts were also considerations (Bassett et al., 1996; Rowlands, Eston & Ingledew, 1997; Hands, Parker & Larkin, 2001). However, due to a lack of agreement on which measures to use, it is often difficult to compare findings given there is considerable disparity in protocol and methods.

A similar problem exists when measuring actual motor competence given that there are many different measures used to assess motor development, motor ability, motor competency and motor proficiency. Although there are consistencies in findings, researchers must be cautious when making direct inferences across diverse methodologies. Another limitation relates to the use of qualitative observation tools to assess actual motor competence, which, despite being used in various studies of fundamental movement skills in Australia, specific protocols have not been validated.

Furthermore, Stodden et al. (2008) believes meaningful relationships between physical activity and motor competence is not shown in previous work because assessment of this relationship does not consider the developmental nature of actual motor competence. The different approaches for measuring motor competency have focused on scores representative of either “product” (quantitative) as a result of the child’s movement (e.g. number of hits or catches) or “process” (qualitative), a child’s way of moving. Stodden et al. (2008) stated that the problem with studies that have used the process approaches to measuring motor skill competence are that none have related the movement description to a developmental continuum.

A number of previous researchers have proposed different developmental sequences for motor skill mastery and ability (Wickstrom, 1983; Robertson & Halverson, 1984; Seefeldt & Haubenstricker, 1982; Hands & Larkin, 2001). Both Wickstrom (1983) and Seefeldt and Haubenstricker (1982) described developmental sequences for motor skills from a whole body approach, which views developmental change as a process that occurs throughout the whole body simultaneously at given ages. Seefeldt and Haubenstricker (1982) then took into account gender differences and created separate time lines for boys and girls of the developmental levels of eight motor skills between 12 months and 10 years of age. Robertson and Halverson (1984) described developmental sequences for motor skills from a component approach,

which views developmental change as occurring within different parts of the body at different stages from 1 (least proficient) to 3 (most proficient). Hands and Larkin (2001) had also considered gender differences and produced separate developmental scales for boys' and girls' motor ability. Furthermore, Walkley (VICED, 1996) developed an age and acquisition sequence for separate motor skill criteria as part of the Victorian Education Department Manual for Fundamental Movement Skills. Both Hands and Larkin (2001) and Walkley (1996) used the item-response theory to locate motor ability (Hands & Larkin) and skill components (Walkley) on a scale of difficulty. Walkley (1996) then created a developmental continuum for the sequence of mastery of the skill components based on a child's age which was then tabulated for eleven movement skills.

In summary, there have been different approaches in describing developmental sequences for boys and girls and their mastery of skills, the whole body approach (Wickstrom, 1983; Seefeldt & Haubenstricker, 1982) and the component approach (Robertson & Halverson, 1984), whilst there has also been a sequence of acquisition developed by age for mastery of specific skill criteria, however gender difference was not considered (Walkley, 1996). Stodden et al. (2008) also suggested when using criteria in comparison with an "expert" performer, the components in observation checklist used to assess skills can be too simplistic; often resulting in ceiling effects that are unable to differentiate between a child with low level skills and a child who is more skilled. However, the method of constructing a composite score based on criteria mastered within each skill has been used in previous research (for example Okely, 2001a; 2001b). Unfortunately overall, there has been a lack of recent progress on a developmental continuum of actual motor competence. The findings from this study emphasise that boys and girls have different developmental paths of motor competence which need to be acknowledged.

#### *Influence of school*

The study revealed that school was a significant main effect in young children's physical activity levels. A key concern at the beginning of the study was recruitment of individuals rather than the potential of school influence, therefore school characteristics (equipment, play areas, specialist physical education teachers) were

not recorded so plausible explanations of how the school setting might influence physical activity were not possible.

The order in which school visits occurred was replicated through each data collection cycle so the time between each collection was around 6 months. However, at times it was unavoidable for the order to be interrupted as the testing days often had to accommodate things such as school carnivals and school holidays.

The sample for this study was limited to Western Australian children from primary schools in middle socio economic areas, therefore results are not generalisable to other cultures or broader socio demographic areas.

Although it is common for young children to be inconsistent when performing motor skills and performance can be affected by such factors as level of motivation, feeling tired or unwell, and short attention spans, the research design and sample size was calculated to account for any fluctuating performance.

### *Implications*

The implications of these findings are now discussed in relation to three areas: theory, future research and practice.

#### *For Theory*

This study used two sources to develop the foundation for the original conceptual framework, first from the dynamic systems theory related to identifying ‘enablers’ and their dynamic interaction within development of complex behavior i.e. non-linear, changing, and secondly, Welk (1999) and Stodden et al.’s (2008) conceptual models. From previous empirical studies, the current research identified physical activity as the behavior emerging from the influence of interacting control parameters of perceived motor competence, actual motor competence and the individual (age and gender differences). Based on the model developed by Welk (1999), emphasising the importance of perceived competence in influencing physical activity, and the model proposed by Stodden et al. (2008) purporting the value of actual competence, the conceptual framework considered the influence of these two determinants on physical activity in young children. The dynamic systems

theory proposes that whilst development may appear inevitable and pre-ordained, in fact there are no rules of development, only that behavior is emergent (Ulrich, 1997). There is complexity and relationships among behavioural subsystems and from these continuous developing processes children discover the fit between their capabilities and their goals to acquire stable and functioning behaviours.

At the beginning of the study, it was hypothesised that actual motor competence, perceived motor competence, age and gender of the individual would interact and impact to different extents on physical activity. The outcomes of the investigation revealed that in these young children actual motor competence, gender, and school influenced physical activity behaviour. Perceived motor competence however, did not contribute to physical activity in the early primary years. For boys, actual motor competence became more influential on physical activity with age and at an earlier age than girls. These empirical findings allowed for the refinement of the conceptual framework for the study to reflect the transition and changes in these dynamic relationships and the emergence of physical activity specifically for boys and girls at different ages.

This study emphasised gender as a key factor for understanding influences on children's physical activity levels. In the formation of models and frameworks with explanatory power, consideration should be given to boys and girls developing physical activity behaviours differently, with determinants of physical activity having the potential to have differing influences both within the same age for boys and girls and across time.

#### *For Future Research*

Findings for this sample of young Western Australian children reveal the significant impact of key factors of actual motor competence, gender and school on physical activity levels in the early primary years. The fact that school emerged as a factor reveals that in future, closer examination into what school attributes may influence physical activity levels is warranted. Investigations could focus on the influences of features such as the importance of physical education programs, appointment of specialist physical education teachers, and physical environment (playground markings, equipment, ovals, play areas) on physical activity levels in children. Also,

future research may adopt a study design based on a cluster-randomised trial, with schools as the unit of randomisation. This means the variability would be captured both at the level of the cluster and also within clusters (such as students within schools). Therefore, future research of this nature would require an increased time frame for collection of data, a larger sample size and greater number of schools.

Additionally, with actual motor competence, but not perceived motor competence, being established as a significant factor in 6- to 9-year-old boys and girls, future longitudinal research should extend to middle and upper primary age groups to provide information about how the relationships with physical activity change over time. Stodden et al. (2008) proposed that the relationship between motor competence and physical activity will strengthen in late childhood and early adolescence while perceived motor competence will be a mediating variable. The revised conceptual framework illustrates the changing and developing relationship between physical activity, actual and perceived motor competence in younger children. Future research on these relationships focusing on late childhood and adolescence would test Stodden et al.'s (2008) conceptual model and contribute to the knowledge about the dynamics of these relationships.

As mentioned above, in order to advance research into motor competency there is a primary need for further progress on a common motor competence assessment instrument that not only considers the developmental continuum of skill proficiency (Walkley, 1996), but also the different pathways apparent in young boys and girls. The construction of a motor competence assessment tool may also provide concurrence amongst studies measuring motor competence. As stated previously, the pilot project for the development of a Fundamental Movement Skills (FMS) Quotient carried out during the study, attempted to validate and quantify movement observations of motor competence assessment for future research. An FMS quotient score was derived from run, throw and jump skill Z- scores of a small group of children from the current sample. The same children were then assessed using the MAND (McCarron Assessment of Neuromuscular Development). The Z-scores were normed around a mean of 100 and SD of 15 to equate to the NDI from the MAND. Ulrich (TGMD, 1985; 1999) had also developed a Gross Motor Development Quotient around a mean of 100 and SD of 15. In the current pilot, balance was not

included as scores did not differentiate between children this age. For the 10 boys and girls, a mean FMS Quotient for the three skills was 106.54 in comparison to a mean NDI of 105.43. Further expansion on this pilot will endeavor to provide validation for the measurement of AMC through observation of fundamental movement skill components. The emerging relationship between physical activity and actual motor competence in this study and the diversity in motor competence measurement, provide confirmation of the need for further advancement in an assessment tool for motor competence.

The important finding of gender differences raises questions regarding the comparative contributions of biological, environmental, and socio cultural factors in children's development. Greater knowledge regarding both the physical competencies and type of play activities that young boys and girls consider important in their lives may also increase our understanding of why subsequent differences are apparent in the development of motor competencies and also self perceptions in boys and girls. Whilst it may be difficult to extricate the degree to which the influences interrelate and effect children's physical activity levels, studies with older children and other cultures may assist in corroborating and further clarifying their role in development.

#### *For Practice*

The research has application to practice, particularly in the primary school setting and for physical activity interventions.

The emergent behaviour of physical activity over time is affected by gender, actual motor competence, and school. The challenge for teachers and physical education programs is to provide a learning environment which considers the relationship between actual motor competence and physical activity, but which also accounts for developmental gender differences. Again, having valid measures of motor skill competence will be critical to provide teachers with the tools to track the progress of young boys and girls. In addition, the learning environment of schools can provide both the setting and opportunities that can significantly impact children becoming proficient and practiced performers of fundamental skills. Overall, teachers and developers of education initiatives need to understand and provide opportunities that

recognise different developmental patterns of young boys and girls and how these differences impact performance outcomes.

Although perceived competence did not have a significant impact upon physical activity at these young ages, it appeared to have a strengthening relationship with actual motor competence. The extensive literature regarding the importance of perceived competence in motivating the individual and increasing his/her persistence at tasks means that perceived competence plays an important role in encouraging both effort and developing actual competence. Stodden et al. (2008) also proposed the shift from early to late childhood signified a period of vulnerability in which children who have lower actual motor competence will demonstrate lower perceived competence and are less physically active. Therefore, despite the presence of artificially high perceived competence in these younger children, one must question if this is really an important problem when the forthcoming years of middle and upper primary may be critical in fostering affirmative self perceptions. Horn (2004) also reported that the early childhood years are an important period in encouraging positive self perceptions and these perceptions are best facilitated through mastery experiences and provision of clear, consistent and constructive feedback from significant adults.

### *Conclusion*

Finally, the need to comprehend the development of physical activity behaviours in young children was the inspiration for this research. The outcomes of this study provided longitudinal evidence into the impact of both a physiological and psychological determinant on physical activity. The empirically derived models for the study illustrated the important developmental changes of boys and girls across early childhood. If there is an understanding of the interactions and contributions of perceived and actual competence and acknowledgement of the resulting differences that are apparent in boys and girls, then evidence for education and health initiatives on what to base practice and provide direction for interventions, may support and encourage children's lifelong commitment to physical activity and a healthy lifestyle.