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Can't Catch, Can't Throw! Assessment of Primary School-aged Children's Fundamental Motor Skills and Coordination Levels

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Dr Judith Miller has been teaching at the primary, secondary and tertiary level since 1984. Her career began in Oregon where she was employed as a physical education specialist in a primary school. Teaching in schools located in western New South Wales and the Northern Tablelands were the contexts that inspired the research interests of primary school-aged children. Judith has been teaching in the Health and Physical Education and Sports Studies team in the School of Education at UNE since 1993. Her concern and passion for the crucial primary school Physical Education experience has been guiding her teaching and research at the pre-service and postgraduate levels.

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Abstract

This research is based on the comparisons of primary school-aged children's coordination level to their performance of a fundamental motor skill. Coordination was measured using both fine and gross motor skills and the tee-ball strike was the fundamental motor skill. How children positioned their body while hitting the ball from the tee-ball stand formed the basis of the 'process performance' measure. The significant relationship between coordination and the process performances allows for various considerations for primary school-aged children. Teachers may identify with the implications such as, how skills are assessed, the manner in which sports carnivals are structured, some children's reaction to competitive games in physical education and the self esteem of children with poor coordination.

Introduction

Recent large-scale studies of the performance of Australian children have alerted many teachers in primary and secondary schools to deficiencies in the motor skill performance of students. Fundamental motor skill proficiency of school-aged children in Victoria (Walkley et al., 1993) and New South Wales (Booth et al., 1997) is a concern to teachers, parents and students as these skills are not performed at the expected level of efficiency. The reason for concern over the skill performance rests with the notion that proficiency in a range of fundamental motor skills (i.e., running, jumping, catching, throwing, kicking and striking) is a precursor to successful application to a range of sport-specific contexts (Gallahue & Ozmun, 2002). For example, the fundamental motor skill of the overarm throw is applicable (and transferable) to sport specific skills such as the javelin throw, the overhead slam of badminton, the volleyball spike, and the tennis serve. All fundamental motor skills can be applied in a range of sporting contexts.

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Children with inadequate fundamental motor skill levels are known to withdraw from sporting participation and as a consequence, may be susceptible to a range of health related problems linked to low physical activity levels. In addition, children with poor coordination tend to be socially isolated and have poor self-esteem as well as being the 'last ones chosen' in social sporting contexts (Larkin & Hoare, 1991). With skill proficiency important to the social, emotional and physical development of children, how do children with inefficient movement and delayed neuromuscular development fare when it comes to the fundamental movement skills which we accept are precursors to the sport specific applications? If there is a relationship between these two constructs, what is the implication for teaching Physical Education in the primary schools?

These questions were investigated in a study based in a large rural NSW primary school. One hundred and sixty one children ranging in age from six-to-nine years were assessed using the McCarron Assessment of Neuromuscular Development (MAND, McCarron 1997) to determine their coordination level. Within two weeks they were measured on the skill of the tee-ball strike. The tee-ball strike was selected as it is considered a fundamental skill and it is a 'closed' skill, i.e., the ball is stationary and therefore the environment is considered to be predictable. Selection of this skill was based on a pilot study which explored versions of the strike and found that the tee-ball version of the skill of striking catered for the children with the lowest MAND or Neuromuscular Development Index (NDI) scores. As such, the emotional inadequacy felt by some children with coordination difficulties performing an 'open' skill i.e., having the ball pitched, was minimised through employing a closed skill.

The performance of each child for six trials of the tee-ball strike was video recorded. The performances were subsequently assessed using a process instrument that was amalgamated from a range of process instruments. This approach allowed for greater in-depth assessment of the children's developmental levels (Miller, 2004). In summary, the process measure was concerned with 'how' the children performed the skill, in contrast to how far or how accurately they hit the ball. The video recordings allowed for slow motion viewing and repeated assessment of the performances of the children. Following the analysis of the process data, comparisons were made of these data with the coordination score of each child. The key findings are outlined next with the suggested implications for teachers in the following section.

Key Findings:

1. Fundamental motor skill proficiency can be measured using an in-depth process style amalgamated instrument.

2. Fundamental motor skill proficiency is important to a child's view of their ability to play a range of sports.

3. Girls as a group, were outperformed when compared to boys.

4. Coordination levels of the children are significanly correlated with their process performance of the tee-ball strike.

5. Children with inadequate levels of coordination benefit from skill based interventions which focus on one-to-one instruction in non-competitive environments.

1. Measurement Issues

Assessment of fundamental motor skill proficiency has predominantly been based on process measures. These measures are used to compare students' performances with how closely they compare to the most efficient form of the skill. Large-scale studies in New South Wales (Booth et al., 1997) and Victoria (Walkley et al., 1993) using this approach reported a high failure rate for the participants. One disadvantage of this approach is that students and teachers gain minimal information for the majority of performances because only those childrens' performances at the top of the scale are reported. All other participants are considered to have 'failed'. This study explored a more comprehensive measure of skill performance and allowed for children to be placed on a continuum of skill development rather than reporting only those students who were at the most efficient level (Miller, 2001; 2004). This approach provides students and teachers with greater information for subsequent educational approaches to improving motor skills.

2. Sporting Choices and Physical Activity

What is the connection between the coordination level of primary school-aged children and their performances on fundamental motor skills? If children were encouraged to enter remediation movement programs designed to increase their coordination levels, what would the resultant implication be for other skills? The second finding alerts researchers and teachers to the complex interaction of physical competence (coordination) and its relationship to fundamental motor skill efficiency. Greater efficiency and skill performances could be the outcome for children included in movement remediation programs.

3. Gender Considerations

Baseline assessment of children's coordination levels indicates that there are no gender differences in the incidence of children with poor or inadequate development. There are, however, on average, between three to five children in each classroom identified as having Developmental Coordination Disorder (DCD) (Larkin & Hoare, 1991). DCD is indicative of poor coordination levels and is typically the basis for inclusion in movement remediation programs (Larkin & Hoare, 1991). Results from this study showed that girls were less efficient when compared to the boys in terms of their proficiency in the skill of striking. General trends showed older girls (8-9 years of age) were at the same process performance level as the younger boys (6-7 years of age). This finding highlights the powerful effect of socialisation and opportunities to learn and practice fundamental motor skills, in this case, the tee-ball strike. Clearly, girls require additional encouragement and opportunities to be more skilled in the tee-ball strike.

4. Coordination and Skill Performances

The NDI has been used widely in movement remediation programs designed to assist children (and adults) with Developmental Coordination Disorder (DCD). The exploration of this construct coordination in concert with the proficiency of a fundamental motor skill is a new facet of research currently being undertaken at the University of New England. Motor developmentalists consider coordination to be an underlying construct and fundamental motor skills to be 'learned'. As such, the outcomes of this study provide new ways to look at the important role of learning and opportunities to perform skills to their most efficient level and to achieve the associated changes in coordination. Similarly, educators could pursue the issue of increasing coordination and look for changes in efficiency of skill performances.

5. Pedagogical Implications

Children with inadequate levels of coordination are experiencing a range of psycho-social implications. Social isolation, low self-esteem, poor handwriting, some with learning difficulties and others with high academic achievement, may already show evidence of withdrawal from P.E. and/or sport (Rose, Larkin & Berger, 1997). The latter point indicates that children with DCD will avoid any public displays that may lead to failure in the physical domain. Athletic carnivals may induce psychosomatic illnesses, 'injuries' etc to avoid being last in the age race once again! To assist children with poor levels of coordination, non-competitive, non-public performances help to alleviate the social embarrassment of being an inefficient mover. The interplay between both high and low coordination levels and the relationship found with the fundamental movement skill of the two handed sidearm strike has been empirically established.

Summary

This research was designed to explore the measurement issues associated with primary school-aged children in their performance of a fundamental motor skill. Special concerns for children with Developmental Coordination Disorder underpinned the research design. The results presented provide a sound case for teachers to consider the importance of the learning environment that can promote the development of children's specific competence in fundamental motor skills and can also affect their coordination level. Ideally, the learning of motor skills in a non-competitive environment with productive feedback for the learner will assist children to achieve adequate levels of performance on various fundamental motor skills. As a consequence, skill efficiency can lead to various options to participate in many sports.

Please contact Dr Judith Miller if you are interested in any aspect of this research and/or the use of the McCarron Assessment of Neuromuscular Development.

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