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IDENTIFYING PRE-SCHOOL CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER (DCD) - A PILOT STUDY

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Introduction

When children arrive at the formal, government regulated school system in Singapore both the system, and in particular the teachers, have certain expectations. In Singapore, children are expected to work conscientiously at primary school onwards from day one, to respect their teachers and to fit in with the prevailing system. The primary schools are large institutions in comparison to those in developed countries and consist of six-year groups, often with six classes to each year group, and 40-42 children in each class. The six-year-old child is expected to adapt quickly to this densely populated environment. The atmosphere in primary schools is one of enjoyable productivity, and the average Singaporean primary pupil would have a tendency to adopt a serious attitude to their work very early in school life. The kindergarten schools in Singapore represent for most children the first experience of structured schooling although the atmosphere and curriculum content is clearly different from the primary school system. Nevertheless, one clear role of the kindergarten education system would be to prepare the children for their step into primary school education.

In respect to the development of motor skills, teachers in Singapore would expect the primary one entrant (aged 6- years) to be able to cope with their own personal hygiene, hold writing and drawing instruments, join in Physical Education (PE) classes based on fundamental movement skills, and generally have developed their motor skills to work independently on set tasks. As Singaporean teachers have to deal with large classes from primary one onwards, a consequence of this is that many lessons are class based. The children need to have acquired a certain level of independence to be successful within this classroom environment. In the course of the school day, the primary one child could be taught by three different teachers, a Mathematics and Science specialist, an English specialist and another teacher for PE. The child is expected to adapt to this arrangement from the beginning. The kindergarten schools, and their teachers therefore, have a challenging task presented to them in preparing their charges for primary school.

This paper considers the difficulties some children face when they are not progressing as well as their peers with regards to the development of their functional motor skills. In particular this paper considers how these children with motor skill difficulties may, in the first instance, be identified. This condition is known as developmental coordination disorder (DSM-IV, 1994). For a child to be diagnosed as having developmental coordination disorder (DCD), there must be no known medical condition that is contributing to the child's motor difficulties, such as cerebral palsy or muscular

dystrophy, nor any condition demonstrating mental retardation (DSM-IV, 1994). The essential feature of the disorder is a marked impairment in the development of motor coordination. This impairment interferes with academic achievement, as well as the activities of daily life, such as dressing and washing. At school, the child with DCD may be seen to have one or more of the following difficulties or characteristics: an awkward gait, slowness to learn how to hop, run or jump, slow movement up and down stairs, and an inability to tie shoe laces and button shirts. They may also be slow to learn how to throw and catch balls, and generally be considered clumsy and awkward in either or both fine or gross motor skills. The child with DCD has a tendency to drop things, to stumble and bump into other children and classroom furniture. Often the child's handwriting is poor as are their drawing skills and manipulation of jigsaw pieces, constructional toys and models. These children are also rarely good at ball games (Barnett and Henderson, 1992; ICD-10, 1992). Children with DCD demonstrate a range of difficulties, both in degree of severity and in the nature of their difficulties. As research progresses it is clear that children with DCD do not form a homogeneous group. Their difficulties are not always seen across all motor skills and the variation within the so-called DCD grouping is clear (Hoare, 1994; Wright and Sugden, 1996).

Children with DCD may have developed the very basic skills of reaching, grasping, sitting, standing, walking and running, albeit at a rudimentary level, but delays in the acquisition of functional skills which enable children to control their environment effectively are evident (Henderson, 1992). By primary school age, most children are able to dress and feed themselves. They are able to manipulate a pencil and other simple tools for drawing and writing. Children with DCD often lag behind their peers in some or all of these functional skills, resulting in a much reduced level of participation in everyday school activities. As the children mature, the movement difficulties experienced during their early years continue to have an effect into teenage years (Geuze and Börger, 1993; Losse *et al.*, 1991). The features associated with DCD are plentiful and are not confined simply to the more noticeable motor skills. There are also social and affective concomitants, which can combine to detract from the children's academic progress at school (Losse *et al.*, 1991). These children may not be classified as disabled, yet they are not spared from the well-documented social and emotional problems that accompany diagnosed physical or intellectual disability (Henderson *et al.*, 1989).

Children with DCD are constantly being observed by people around them as they fail to cope with the demands of the environment. Many parents are advised that their children will grow out of the problem, and that the physical signs associated with DCD will simply disappear with maturation. However, Losse *et al.*, (1991) have shown that many of the difficulties associated with DCD at age six are still present at age sixteen. Whilst the authors have not claimed a direct causal relationship between the motor difficulties and other academic, social and emotional problems found in children with DCD, they do report a relationship, and note that other studies have demonstrated that having DCD in the early years carries an increased risk of other learning difficulties at school age (Drillien and Drummond 1983; Lyytinien and Ahonen 1989; Silva and Ross 1980). The

children followed in the Losse *et al.*, (1991) study were monitored again after ten years, with almost all of the children who were identified as having motor difficulties soon after primary school began being still in a similar position as teenagers. There is little evidence to support the notion that children simply grow out of DCD as a part of maturation, and the implications from the Losse *et al.*, (1991) study are that without additional support the long-term prognosis for the progress of children with DCD through school is not good.

From the above, it is clear that there are groups of children experiencing difficulties in the motor domain and there may be additional side effects connected with social and emotional variables such as self concept, effects related to academic achievement and distress to the family (Henderson, 1992). Henderson (1992) cites three reasons why clinicians should be concerned about children with DCD. These three reasons can equally be applied to teachers and parents.

They are:

- it can be extremely distressing to the children, and their families.
- it is associated with a high incidence of behavioural and social problems as well as frequent school failure.
- the prognosis is not benign and many children do not spontaneously recover from this difficulty.

For teachers involved with children who have movement difficulties, another reason to be vigilant is the possibility of intervening and managing a programme designed to help the child. The earlier that a programme of intervention can be organised for a child with movement difficulties, the greater the positive effect of that treatment. This is because generalization of treatment effects is more likely to occur with young children when the differentiation process has only just started (Schoemaker, Hijlkema & Kalverboer, 1994), differentiation being a developmental process in which motor skills gradually become more task specific, rather than the earlier nature of the motor movements using more general underlying abilities (Keogh and Sugden, 1985).

In summary, the effects of having DCD are not confined only to poor motor skills. Often these effects also include associated behavioural difficulties resulting from the frustrations of not having developed the necessary functional skills required to profit from classroom activities.

The priority of all teachers is to assist children to reach their potential and therefore identifying difficulties at an early stage in their educational life can only be regarded as positive. The identification of DCD earlier rather than later will, it is hoped, be of educational value to the child, their teachers and their parents.

Purpose of Pilot Study

The objective of this pilot study is to assess the workability of a proposed method for identifying pre-school children with movement skill problems within their everyday functional environment at kindergarten. This is the first study in Singapore to consider pre-school children with DCD using the newly developed Early Years Movement Skills (EYMS) Checklist developed by Chambers and Sugden (1999).

This pilot study will also examine the preschool teachers results from the EYMS checklist with an established norm referenced test called the Movement Assessment Battery for Children (Henderson and Sugden, 1992), in an attempt to offer validation data of a confirmatory nature. In other words the results gained from the kindergarten teachers' assessment of the children's movement difficulties will be compared to the assessment of a recognised norm referenced test.

The null hypothesis is that Singaporean kindergarten teachers do not observe differences in motor development of the children in their classes. And that Singaporean kindergarten teachers are unable to distinguish between children with poor motor skills that affect their progress in school compared to those children unaffected.

Method

In the first instance expert advice was sought to verify that the language and the instructions used in the EYMS checklist suited the local context and was clearly understandable. Thirty preschool teachers were then briefed as the nature of DCD. They were asked to read the EYMS Checklist with a view to offering feedback as to their understanding of the instructions and content of the EYMS checklist.

The EYMS Checklist contains the following sections (see also appendix 1):

Section 1 : Self Help Skills

Section 2 : Table Skills

Section 3 : General Classroom Skills

Section 4 : Games / Playground Skills

Section 5 : Behavioural Problems Related to Movement Difficulties

This Checklist is an instrument that has been designed to be used flexibly by teachers, parents and other professionals involved with children showing movement difficulties. It is a functional Checklist that is intended to be completed as part of the teacher's daily routine, obtaining a measure of the child's typical patterns of functioning in familiar and representative environments, such as home and school.

The EYMS Checklist is a criterion referenced assessment instrument and for each of the task included in Sections 1 to 4 there are four alternative responses which describe how well the child deals with the task.

Can Do		Cannot Do	
Well	Just	Almost	Not Close
1	2	3	4

The purpose of Section 5 is to describe behaviour associated with the execution of movement that is characteristic of each child, and which may influence performance on Checklist tasks. Section 5 has three response alternatives referring to the frequency with which the child displays the behaviour described in each item:

Rarely	Occasionally	Often
0	1	2

All the previous research on DCD concentrated upon children 6 years and above. This checklist has been developed for use with children 4 to 5 years of age. The rationale for examining younger children is because the motor development literature suggests that by the age of 6 years the vast majority of children have learnt the fundamental movements necessary to control their environment and are involved in refining their already learnt fundamental movements for greater control.

Children aged 4 to 5 years are still acquiring these fundamental movements and have less of a background refining them so making it theoretically possible to alter any poor movement functions they may be developing. In other words, the earlier the children are identified as having difficulties, the easier it should be to help them manage and change their movement patterns.

Five preschool centres from different districts in Singapore, and five preschool teachers from the centres volunteered to assist in administering the EYMS checklist. The five preschool teachers were then further briefed on the methods of identifying the children with DCD using the EYMS checklist.

The teachers selected two children from their class; one child who they perceived to have the most movement difficulties in their class and the other child with no apparent difficulties, making a total of ten children in this pilot study.

After the teachers' completed EYMS checklists were returned, appointments were made to conduct the normative referenced assessment, the Movement Assessment Battery for Children (ABC) (Henderson and Sugden, 1992) on the said ten children.

The ABC test is a normative assessment instrument that has been developed from the first revision of the Test of Motor Impairment (TOMI) devised by Stott *et al* (1984), which in turn evolved from the TOMI developed in 1972. It encompasses the original purpose to identify children with movement difficulties, and in addition, includes an emphasis on practical applications and intervention, through the use of qualitative statements recorded alongside the objective scores on each motor task. The ABC performance test is divided

into three sections, and contains eight performance tests in total. The three sections deal with manual dexterity, ball skills, and static and dynamic balance. It caters to three age bands with appropriate functional skills being tested for the three age bands. The age bands are band 1 : 4 to 6 years; age band 2 : 7 to 8 years; age band 3 : 9 to 10 years. With each task in each respective section and age group, the activity is tailored to the age of the child, and scores are related to the norms for that age group. For example, in age band 1 (4-6years old) the first manual dexterity task is to place coins into a 'piggy bank' as quickly as possible, for age band 2 (7-8 years old) the first task is to place pegs into a peg board as quickly as possible.

Results

All the 30 teachers who read the EYMS Checklist could comprehend the instructions with ease and felt it unnecessary to make any amendments. Table 1 shows the results of the children's total scores on the two assessment instruments.

Table 1
Children's Total Scores for the EYMS checklist and the ABC test

Schools	EYMS checklist		ABC test	
	DCD	Non-DCD	DCD	Non-DCD
1	30	23	16.5	7
2	61	40	22	8
3	51	23	25	0
4	42	23	22.5	3
5	31	25	2.5	0.5
Mean	43	26.8	17.7	3.7

The mean age of the children is 4.75 years old and the age range is 4 to 5.5 years old. The mean scores for EYMS Checklist and the ABC test are also recorded in Table 1.

The results from the two independent groups of children, namely the children the teachers selected as having movement difficulties (DCD group) and those children considered to have no difficulties (non DCD group), were analysed using the Mann-Whitney U test. A significant difference was revealed between the two groups of children as measured by the EYMS checklist ($p=0.008$). In addition, a significant difference was also found between the two groups of children when tested on the second step procedure, the Movement ABC test ($p=0.008$).

The null hypothesis, that Singaporean teachers are unable to differentiate children with movement difficulties from those without difficulties, is rejected.

Discussion

The results appear to indicate that:

1. Teachers are able to use the EYMS checklist. They understand the content and find the content material applicable to the Singapore kindergarten environment.

2. The children selected by their teachers as having movement skill difficulties were also the children that had the higher scores on the EYMS. The EYMS checklist appears to be selecting children the teachers think have difficulties and the teachers appear to be aware and capable of using this tool to identify children with difficulties.
3. The results of the criterion referenced EYMS checklist were confirmed by the norm referenced ABC test, see table 1. The high scores on EYMS checklist were also seen in the high scores on ABC test and vice versa.

Conclusion

From the results obtained, it is clear that there are significant differences between the two groups of children as measured by the EYMS checklist, which assesses functional difficulties, and as measured by the ABC test, which measures more serious motor difficulties. From these results, it would be premature to believe that this study represents the "gold standard" for the assessment and identification of pre-school children with DCD in Singapore. However the results are sufficiently substantive to continue to use the EYMS checklist as a workable tool in Singaporean preschools in our efforts to identify children with DCD. This pilot study offers the empirical evidence to move one further step forward and consider further findings from these instruments with a large randomly selected sample.

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