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Supporting Young Children to Develop Independent Learning and Literacy Skills through the Use of Pictographed Instructions: The *Moving with Language* Program

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Abstract

This paper describes the intervention program, *Moving with Language*, which was developed at a large rural primary school on the outskirts of Darwin, Northern Territory in Australia. *Moving with Language* is a multidimensional approach to providing learning support for young students who have a range of disabilities. Specifically, this program targeted oral language and motor skill development within a strategy-training context. The program focused on motor planning, self-directed student talk and the use of pictographed instructions to support the development of independent learning and literacy skills.

At the end of a typical preschool year, it is likely that at least two or three students, in a group of twenty-five, will already have been identified, by teachers, as "lagging behind" on the standard developmental continuum (Larkin & Hoare, 1991; Wood & Valdez-Menchaca, 1996). This usually means that, by five years of age, these students are demonstrating considerable delays in one or more areas.

Some of these learning difficulties tend to cluster within receptive and expressive language, perceptual and motor planning, motor and coordination skills and associated learning behaviours such as concentration, screening out unimportant information, memory for instructions and ability to stay on task when compared with their peers (Murphy, 1997). The potential for such difficulties to impinge on present and future learning is well documented. Such developmental delays are often exacerbated unless intervention occurs in the form of specific and supportive teaching.

In the Northern Territory of Australia, there is a strong movement towards a multidimensional approach to designing learning support to meet the needs of the students who demonstrate a cluster of developmental delays (Kruger, Kruger, Hugo, & Campbell, 2001). The benefits of this approach are that several learning difficulties or developmental delays can be addressed through one intervention process. The *Moving with Language* program that is described in this paper is one such

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intervention. The *Moving with Language* program targets oral language and motor skills development within a strategy-training context.

In describing the *Moving with Language* program, this paper begins with an historical review of the development of the *Moving with Language* concept in the Northern Territory (NT). The second section of the paper outlines the theoretical perspective that underpins the program. The third section of the paper describes a typical *Moving with Language* program. Schools implementing *Moving with Language* programs develop their own interventions within the guidelines outlined in the first section of this paper. The final section reports on the program as it was implemented at a large rural primary school in the Northern Territory with a significant number of indigenous students.

Historical Perspective on Moving with Language

The *Moving with Language* concept was first introduced to the Northern Territory (NT) education and family services community at a School and Family Matters conference in the late 1990s by personnel from the NT Department of Education, Employment and Training. It was noted that such programs could be planned to meet very specific needs. Alternatively, general programs could be designed to accommodate a range of difficulties that students have in common. Teachers were encouraged to use general principles related to perceptual motor programs. These principles highlighted the importance of practice and repetition, multisensory input, task analysis, self-talk and cueing using visual symbols such as pictographs. Drawing on Murphy's (1994) work, it was also stressed that "programs must incorporate language to describe and develop spatial and temporal concepts and to enhance visual imagery, anticipation and planning" (p. 245).

During the years following its initial introduction, NT Student Services personnel began recommending that particular students should participate in perceptual motor programs, now renamed *Moving with Language* programs, as an integral part of their Individual Education Plans (IEPs). Subsequently, a number of teachers from a rural school region attended a professional development day held at a centrally located primary school. This in-service was presented by Student Services personnel including an occupational therapist, a speech pathologist and a special education advisory teacher. The presentations and ensuing discussion further developed participants' understandings related to the sensory systems and the processing of information supported by the use of self-talk and pictographed instructions. A framework for developing a school-based perceptual motor program (Sanders, 1995) was also presented. The skill areas targeted in this framework included laterality, eye tracking, balance and posture, body strength, body image and auditory perception. Guidelines for running a successful sensory motor program are outlined in Figure 1.

Guidelines For A Successful *Moving With Language* Program

The students must experience success in the program. Reinforce and reward both physical and language achievements. Change the expectations of the activity if they are too demanding.
Students should enjoy the experience. If it is not fun, change the activities. If this doesn't work get some advice.
The goal is to provide a wide variety of sensory motor experiences integrated with language.
Talk to the students about what they are doing. Language, as a part of modelling and self-instruction, is essential to the success of the program.
The purpose of an activity, e.g., balance beam, is not to learn how to walk across the beam but to provide a movement experience linked to appropriate language concepts/experience. Students should have time to practise each activity 2–3 times in a session but each activity should not be repeated for more than two weeks.
Keep the number of activities to about 5, so that the session runs for about 30 minutes.
Have between 3 and 6 students per station.
Allow the students to talk to one another freely. This is an excellent opportunity for students to practise instructions, self-talk, and use language to interact with others in their group.
Students should complete the activities in barefeet as this provides maximum tactile feedback. It also provides practice taking off and putting on shoes and socks.
The best activities are those that can be made easier or more difficult depending on the student's skill.
More complex tasks or instructions should be alternated with less demanding tasks to allow the student to refresh their attentiveness.
Allow students to wind down by listening to quiet music at the end of the session. Using relaxation tapes or scripts will help develop the students' ability to relax and use their imaginations.

Figure 1. Guidelines for *Moving with Language*.

Special education personnel at a large rural primary school then developed a school-based *Moving with Language* program under the guidance of Student Services personnel. The program was intended to accommodate students with a range of learning difficulties and delays rather than focus on the specific needs of individual students. The difficulties chosen as the foci of the school-based program described in this paper related to oral language concepts and structures, sensory motor skills, temporal sequencing, spatial awareness, motor planning and independent learning. The resulting program was implemented with twenty-two Year 1 and 2 (six- and seven-year-old) students over three school terms.

Theoretical Perspective on Moving with Language

The *Moving with Language* concept is based on the notion that success in academic learning is dependent on the efficient processing of information which comes to the individual from the surrounding environment through the senses (Gabbard, 1992; Iran-Nejad, 1990; Micklo, 1995; Mills, 1998). After processing, the information is then integrated into the student's already existing knowledge to be used as the basis for further learning activity (Biggs & Moore, 1993; Brewer, 2000; Gredler, 1992; Schunk, 2000; Wittrock, 2000). From this perspective, pieces of sensory and perceptual information act as building blocks for all learning.

Proponents of *Moving with Language* contend that it may be possible to improve academic skills by focusing students' attention on the decisions they need to make regarding skill performance. Advocates of sensory and perceptual motor programs do not guarantee that academic improvement will occur (Haig, 1996). What such programs should affect, however, is the ability to organize and interpret sensory information in order to enhance the ability to learn (O'Hara, 1991). For example, the *Moving with Language* program may promote the thinking and language skills that lead to improvement in learning skills and physical ability. This contention reflects the comments of writers such as Schwager and Labate (1993), who state "by

purposefully focusing students' attention on the decisions necessary for successful skill performance, teachers may be able to enhance students' skill learning" (p. 25). Other researchers who support this argument include Anderson (1999), McBride (1992), Notari-Syverson and her colleagues (1996) and Thompson (1997). By extension, more effective learning, in a generalized sense, may also occur through transfer of learning into other areas of schooling. The types of decisions students make in the *Moving with Language* program are reflected in their responses to questions such as "How do you hop, jump etc?" "What are you going to do in this activity?" and "What do you do next?…and next?…and then?" Other questions may require students to be more reflective, for example, "What did you do?" "Did you do that correctly?" or "How can you do that better next time?"

There is evidence that such a specific intervention aimed at thinking and reflection together with speech and language training does benefit children with expressive language difficulties (Daly, 1993; German, 1993; King et al., 1999; Sigafoos, 1997). Further, learning terms and concepts related to sensory motor skills and encouraging conversations during and after motor activities can promote language development (Benelli & Yongue, 1995). At the same time, researchers consider it is more efficacious and practical to employ a cross-paradigmatic or multidimensional intervention approach designed to address a number of learning difficulties (Kruger et al., 2001; Warren & Yoder, 1994). According to NT Department of Education, the *Moving with Language* program attempts to do this through suggesting that children with oral language difficulties should be taught to use self-directing or instructional self-talk to link verbal and motor information (Laine, 1997; Murphy, 1997). Improved language then becomes the link to support the logical thinking that facilitates an improvement in the motor planning and sequencing necessary for the successful performance of routines, tasks and specific movements (Micklo, 1995; Rohrkemper, 1989) that are important to young children's academic learning.

The *Moving with Language* Program

The following description outlines characteristics of what could be termed a typical school-based *Moving with Language* program. Through movement and language, the program aims to develop the oral language concepts and structures, sensory motor skills, temporal sequencing, spatial awareness, motor planning, and independent learning of a group of students. Within any given program, specific sensory motor areas tend to include laterality (differentiating between left and right sides of the body), bilateral integration (using both sides of the body together), balance and posture, body strength, eye tracking (tracking of objects without head movement) and hand-eye coordination.

A typical *Moving with Language* program operates three to five days per week with each session lasting for approximately forty to forty-five minutes. The session starts with a five-minute warm-up session which targets a particular sensory motor skill, e.g., skipping, moving left and right sides of the body, jogging. During the program, the children rotate around a number of sensory motor activity stations. In most cases, four stations tend to be used although this varies from school to school, depending on the personnel available to assist at the stations. The adult station leader models the activity and associated language at each station.

Pictographed instruction cards help to scaffold and support the demonstration of each activity, the sequence of the routines and the oral language associated with the

activities. The number of activities in any given program depends on the available time, the number of weeks allocated to the program and the priority decisions for learning made by the school staff members. The children work their way through the steps of the activity using pictographed instruction cards to self-monitor and self-regulate the sequencing and execution of their movements. The program ends with a five-minute warm-down period during which the children put on their shoes. During this time, the children may be asked to retell an activity they have done during the day's cycle. They may listen to the sounds around them and recount the sequence of the sounds they hear. Alternatively, they may be asked to predict the order and sequence of a routine they will be doing when they return to class. Thus, the children are encouraged to transfer the learning strategy and their use of appropriate language structures from the primary learning contexts to other physical settings and learning activities.

In keeping with the guidelines suggested by Ashman and Conway (1994), each activity within the program is first analyzed and broken down into a number of sequenced steps. The instructions for each part of the sequence are then put on separate cards. Pictographs are used to illustrate the instruction cards. Over time, teachers have developed pictographs, as necessary, to suit the specific language of the activities.

With regard to the *Moving with Language* program, the station leader uses the pictographed instruction cards to supplement verbal instructions and demonstrated actions. The pictographs reinforce the language structures, concepts and sequence of the activity. As the children become familiar with the activity, the pictographed instructions are gradually removed. The students use the pictographed instructions as a cueing system to aid memory and recall of individual actions and the order and sequence of the actions within a given activity**.**

Over the course of the weekly cycle adult leader support is reduced to encourage independent setting up of and working through activities. All children are encouraged to take turns as a station leader. They give instructions to the rest of the group and monitor a peer's progress through the activity using the pictographed cards as cues when necessary. Children are also encouraged to teach other children in their regular classrooms how to do an activity, thus facilitating further transfer of learning.

Throughout the program, the children are encouraged to self-talk or say it out loud while doing the activities. Students verbalize the instructions before they begin the activity. During the activity, they are asked to say what they are doing at any given time. At the end of the activity, they are expected to retell or recount what they have done in the activity. As a result, the children receive and interpret multisensory information, through touch, hearing, sight and speech, as well as proprioception i.e., information from muscles and joints (Laine, 1997).

Self-directed or instructional self-talk or saying it out loud serves a number of purposes in a *Moving with Language* program. It promotes metacognitive processing (Singer & Bashir, 1999) and the use of appropriate oral language structures (Sigafoos, 1997). In addition, the development and use of basic oral language concepts associated with spatial and body awareness, direction, position, time and sequence can be emphasized, practised, monitored and re-taught as necessary (Bos & Vaughn, 1998). Self-instructional self-talk also promotes the development of motor planning skills (Anderson, 1999; Sherrill, 1993; Yang, 2000) and the use of appropriate on-task behaviors (Laine, 1997). It also encourages the rehearsal, execution and recall of the sequence of steps in a task (Kowalski & Sherrill, 1992). As a result, the routines of the task are mediated by the language of the student (Graham, 1998).

It is recognized that, over time, as individuals become familiar with particular processes or activities, self-talk tends to become internalized as inner language (Rohrkemper, 1989; Wragg, 1989). For the purposes of the *Moving with Language* program, children are encouraged to continue with overt self-talk. As noted previously, this practice serves to reinforce language structures and concepts. It also provides a vehicle for assessing students' oral language development, processing of sensory information, motor planning and memory of the sequence of particular activities and movements.

Ongoing assessment is critical to the effectiveness of a *Moving with Language* program. School personnel determine the particular assessment process adopted by their school. Observational and anecdotal records that yield qualitative data are the most common form of assessment. The assessment tools used to gather ongoing assessment data are outlined below as part of the specific description of a *Moving with Language* program implemented at a rural primary school in the Northern Territory, Australia.

Method

A generic *Moving with Language* Program was designed at a primary school in the Northern Territory (NT) where the first author worked as a special education teacher. The program was implemented at the school for twenty weeks from Week 6 of Term 1 to Week 6 of Term 3.

The school draws from a relatively large geographic area and its population consists of students from a range of socioeconomic categories, from families subsisting on government benefits to two-income families with parents in professional occupations. The ethnic backgrounds of the students are diverse and include Australian born students of Aboriginal and nonAboriginal descent as well as migrant and refugee students. The majority of students live on five- to twenty-acre blocks. The school operates within a multilevel and collaborative teaching and learning perspective. The school support team includes two special education teachers, two special education teaching assistants and one English as a Second Language teacher. There are also a number of inclusion support assistants who work with students with high support needs in the classrooms.

The intervention group consisted of twenty-two students, twelve of whom were already being supported through Individual Education Plans. The group was made up of seventeen boys and five girls ranging in age from 5.4 years to 9.6 years. At the beginning of the research period, there were five 5-year-olds, six 6-year-olds, five 7-year-olds, three 8-year-olds and three 9-year-olds. The average age for the group was 7.1 years. The group was initially selected because of their significant learning difficulties and because NT Student Services personnel had already identified these students for inclusion in a sensory motor program. The disabilities represented by students within the group included Rett syndrome, autism, Asperger's syndrome, fetal alcohol syndrome, oral and physical dyspraxia, oral language delay, sensory and perceptual motor problems, motor planning difficulties and personal organizational and behavior problems.

A comparison group of nineteen students who did not participate in the *Moving with Language program* was made up of twelve boys and seven girls ranging in age from 5.3 years to 9.8 years. At the start of the research period, there were four 5-year-olds, five 6-year-olds, five 7-year-olds, two 8-year-olds and three 9-year-olds. The average age of students in this group was 7.2 years. The group that did not take

part in the intervention was labeled as a comparison rather than a control group. The main similarities between the two groups were in terms of gender composition, ages, participation in the same range of classroom-based activities and their relative positions within the overall school community. The students in the comparison group were performing at a higher level of competence than the intervention group, however. For example, over half of the students in the intervention group had individual education plans because of their recognized difficulties in learning.

Results

The following comments relate to the twenty-two students who successfully completed the *Moving with Language* program. Their improvement was investigated using a number of measures including motor skills tests, language assessments, and classroom based checklist assessments. The students' scores from pretest to posttest on these measures are presented in Table 1.

Table 1
Learning Outcomes

Dependent variable	Comparison group *Pre to Post*	Experimental group *Pre to Post*	Experimental group comparative gain/loss
Oral narrative			
Recall of information	+ 4.4	+ 10.3	Parity + 5.9
Average sentence length	+ 0.7	+ 2.8	Parity + 2.1
Subordinate clauses	– 0.1	+ 1.8	Parity + 1.9
Basic concepts			
Direction/position	+ 6.8	+ 5.4	Parity – 1.4
Size	+ 0.6	+ 0.9	Parity + 0.3
Time/sequence	+ 3.1	+ 4.8	Parity + 1.7
Visual-motor integration	+ 5.0	+ 4.8	Parity – 0.2
Body skills			
Body management	+ 0.4	+ 1.7	parity + 1.3
Locomotor	+ 2.1	+ 3.7	parity + 1.6
Body fitness	+ 1.2	+ 1.4	parity + 0.2
Object movement	+ 0.9	+ 3.0	parity + 2.1
Fine motor	+ 1.0	+ 1.9	parity + 0.9
Auditory comprehension	+ 4.9	+ 4.0	parity – 0.9
Expressive communication	+ 4.4	+ 4.6	parity + 0.2
Motor and coordination	+ 5.0	+ 3.5	parity – 1.5
Perceptual and motor planning	+ 4.6	+ 4.5	parity – 0.1
Associated learning behaviors	+ 2.2	+ 3.0	parity + 0.8

The large number of measures investigated in this research indicates the thoroughness of the overall investigation of the effectiveness of the *Moving with Language* program. For the purposes of this summary paper, however, the measures where the average growth of the intervention group exceeded two raw numerical points (>2.0; see shaded area of Table 1) occurred on the *Truck Story Test* (recall of information, average sentence length) and on the object movement skills test. These results are explored in more detail.

The Truck Story Test (TST)

In this study, the construct validity and reliability of the *Truck Story Test*, a widely used language assessment measure, was first established to be within acceptable limits by Pearce (2004). The students listened to an audiotape of the story while looking at a sequence of pictures illustrating the order of the events in the story. They then were asked to recount the story using the pictures as needed to facilitate recall and the sequence of the story. A total of fifty-two items were scored in the recall section of the TST. Subsequently an analysis of the recall of information sub-test was carried out to determine each group's total raw score for recall of information in the TST pre- and posttests. The totals for each group were then averaged and compared. Figure 2 graphically illustrates this information. In the pretest, the experimental group's average recall raw score was 20.3 items out of a possible score of 52 items. The comparison group's average raw score was 26.7 items. In the posttest, the experimental group's average raw score was 30.6 items and the average raw score of the comparison group was 31.1 items.

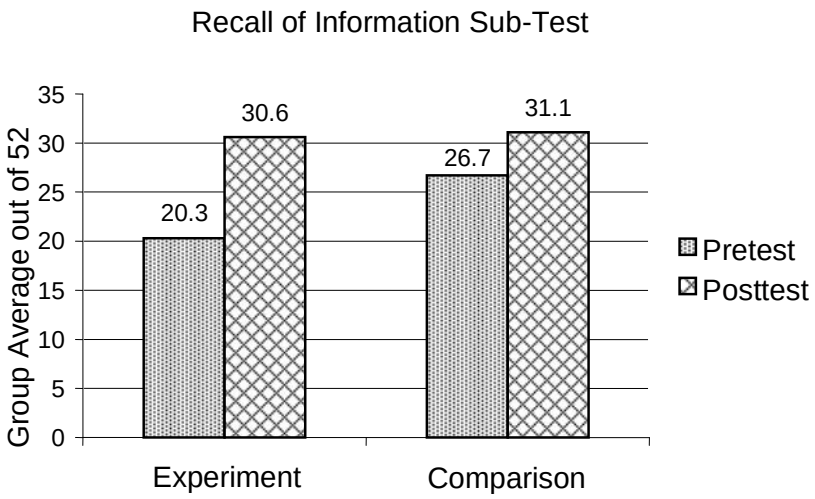

Figure 2. Differences between the experimental and comparison groups' average scores (out of a possible average of 52 items) for recall of information on the pre- and posttests.

The experimental group increased their average raw score for recall of information by 10.3 items. The comparison group's average raw score increased by 4.4 items. It was considered that this level of improvement by the experimental group was of educational importance. Participation in the *Moving with Language* Program appeared to have a considerable influence on the recall of information demonstrated by the experimental group in this section of the TST.

Figure 3 illustrates the results of the initial analysis of the raw scores from *Average number of words in five longest sentences (A5LS) in Truck Story Test (TST).* This investigation showed that the experimental group spoke an average of 8.3 words in their five longest sentences during the oral narrative recount during the pretest TST. This average increased to 11.1 words in the post-test. Analysis of the comparison group's recounts, on the other hand, indicated an average of 10.6 words in the pretest and 11.3 words in the posttest.

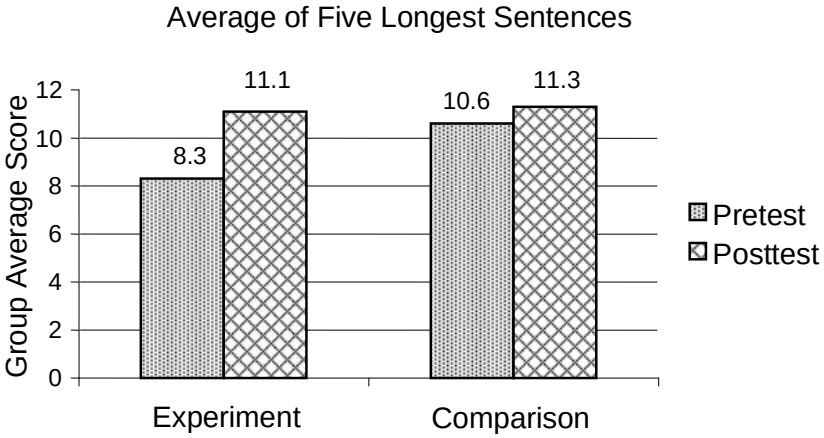

Figure 3. Differences between the average raw scores for the experimental and comparison groups for average of five longest sentences in the pre- and posttests using the Truck Story Test.

The comparison group's post-test score showed a marginal increase on the length of sentences used in the pretest. The experimental group's gain was larger allowing for an average increase of around three words per sentence. As can be seen in Figure 4, this gain brought the experimental group to a similar post-test level as the comparison group. This result was of particular interest given the context of the study. It was seen to be educationally important in the school context because the experimental group as a whole had identifiably more language learning difficulties prior to the intervention period than did the comparison group. The A5LS increase that was demonstrated by the experimental group on this task would probably have been less dramatic if participation in oral language experiences in the regular classroom or the students' natural oral language development were the only factors influencing the results. The outcomes from the descriptive analysis related to the TST were considered to be educationally significant or, at the very least, educationally important from a practitioner's perspective.

To determine whether treatment effects were statistically significant, the data was submitted to a repeated measures multivariate analysis of variance (MANOVA) on the dependent measures associated with the Truck Story: recall of information during an oral recount of the story, the average number of words spoken on the five longest sentences spoken by the student and the number of subordinate clauses used in the recount. Group means and standard deviations for each measure are presented in Table 2. The analysis resulted in a significant time X group interaction, F (4, 36) = 2.58, $p < .05$, *Wilks lambada* = .78). Review of the univariate tests showed that 'use of subordinate clauses' was the only variable to reach statistical significance ($p < .01$). After controlling for pretest group differences, results showed that at post-test, children in the experimental group on average produced sentences with more subordinate clauses than children in the comparison group. The outcomes from this statistical analysis lend support to the claims made in the descriptive analysis that suggest the experimental group's overall oral narrative language development had educational significance in both the context of this study and the school setting.

Table 2
Group Means and Standard Deviations on Dependent Measures

	Experimental		Comparison			
	Pretest mean (SE)	Posttest mean (SE)	Pretest mean (SE)	Posttest mean (SE)	*F*	Significance
Recall	22.59 2.09	26.31 2.25	26.31 2.25	31.15 2.03	1.65	.21
Sentence length	9.26 .64	11.18 .70	10.57 .69	11.33 .75	1.51	.22
Subordinate Clauses	1.11 .35	2.82 .35	2.30 .38	2.35 .38	7.01	.01

Object Movement Skills

Seven sub-skills from the *Motor Skills Inventory* (Werder & Bruininks, 1988) were assessed to comprise a measure of object movement. These skills included the kick, bounce, catch, overhand throw, strike, underhand throw and underhand roll skills. The maximum number of points available was twenty-one.

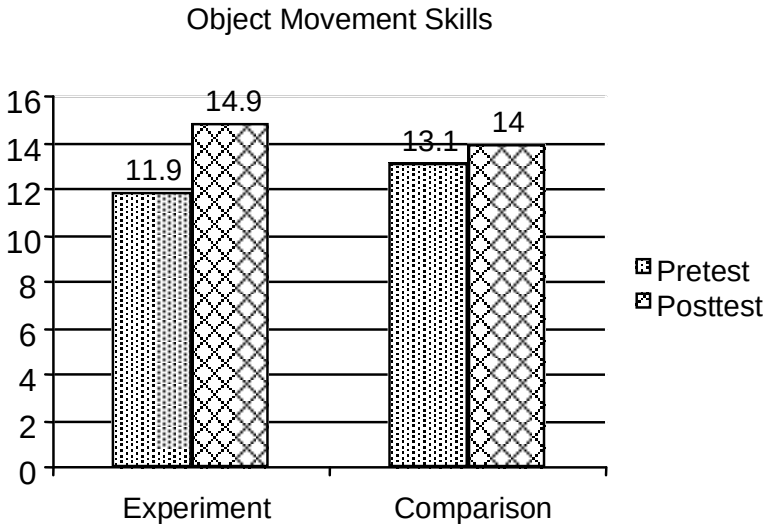

Figure 4. Comparison of the experimental and comparison groups' average scores in the pre- and posttests for object movement skills.

As shown in Figure 4, analysis of the data from the pretest positioned the experimental group at a lower level on the development continuum than the comparison group. Movement along the continuum between pre- and posttest was markedly swifter for the experimental group. The experimental group's improvement from pre- to post-test was 3 points against .9 of a point for the comparison group. While it is recognized that the experimental group's acceleration relative to that of the comparison group may imply that the comparison group was already at an appropriate position on the developmental continuum of movement skills, it is considered that this gain is educationally important within the school context. In addition there is compelling evidence from large-scale state wide surveys within Australia of children's fundamental motor skills, that report the majority of primary school-aged

children are not performing at the expected level of skill performance proficiency (Booth et al., 1997; Walkley, Holland, Treloar & Probyn-Smith 1993). Therefore, the comparison group may still benefit from additional skill instruction, however, not to the same degree as the experimental group. Overall, it seems clear that participation in the *Moving with Language* Program had a positive educational effect on the object control outcomes demonstrated by the intervention group.

General Observations of Student Performance

The following comments are summarized from the observation sheets and anecdotal comments recorded during the Moving with Language intervention. They concern the twenty-two students who successfully completed the *Moving with Language* program.

Firstly, there was an overall improvement in students' performance related to the skills of skipping, jumping, hopping and ball handling. Children who had initially demonstrated poor coordination and lack of confidence presented themselves confidently and attempted all activities with minimal hesitation by the end of the program.

As well as motor skill improvements, there was also a marked increase in the children's demonstration of using appropriate language structures to explain what they had to do, what they were doing and what they had done through self-talk. By the end of the program, the majority of children were able to recount the activities within each weekly cycle without using the pictographed cards to cue their language. It was also noted that all the children were using appropriate temporal, directional and positional words to talk about the activities. By the end of the program, only two children still experienced occasional difficulties with the changes from "you" to "I" and from "your" to "my" in language patterns.

Additionally, all children were able to transfer their developing oral language, sequencing and motor planning skills from activity to activity and to do recounts at the end of the daily cycle. Class teacher feedback and observations of children in their regular classes also indicated a number of instances where the children were beginning to use similar language structures to talk themselves through activities. Of related importance is the fact that three of the children who were included in the program no longer required inclusion support assistance for their classroom-based educational programs in the following year. These children's participation in the *Moving with Language* program was a factor in achieving this outcome.

It is important to acknowledge that the structure of this intervention is heavily reliant on support personnel. While this may not be practical in terms of resources for most school settings, the concept of setting up activities with pictographs which are developmentally and progressively appropriate for a range of students at different skill levels is a key feature of the program that is clearly transferable to a range of teaching settings. The inclusion of language and self-talk clearly integrates the understanding and motor planning aspects of movement with the verbal expressive features of learning. The transfer of such approaches to various classroom settings provides for the consolidation of strategies that have been shown to enhance language and memory skills for young students.

General Discussion

This article has served a number of purposes. Firstly, the *Moving with Language* concept, developed by Student Services personnel in the Northern Territory and implemented at a rural primary school has been outlined in enough detail to allow

practitioners to design similar activities to assist students in their own schools. Secondly, the cohort of students involved in this research exemplifies the heterogenous nature of students with disabilities. Also the multidimensional approach to intervention used in the *Moving with Language* program presents an effective way of addressing a diverse range of learning challenges that routinely present in classrooms all over the world.

Overall, from a research perspective, this intervention program is an investigation of the impact of pictographed instructions and self-directed talk on students' learning in a number of related school contexts. As such, the study extends the general use of self-instruction and adds further evidence to the contention that direct teaching of self-instructional strategies promotes self-regulation and the performance of tasks sharing common features (Grote, Rosales & Baer, 1996; Meichenbaum, 1977).

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