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This study compared the effects of two conditions on the motor development of preschool children and investigated the relationship between preschool children's motor development and perceived competence. Specifically, it provided information for discerning: a) the relative effects of a sensory-motor condition and an unstructured activities condition on the motor development of preschool children immediately following the 20-week intervention; and b) whether perceived competence was related to motor development in the preschool children following termination of the treatment. Additionally, a teacher survey which addressed the teacher-consultant relationship was developed and piloted within the context of the study for use in future research.

Subjects were 31 children enrolled in two preschool programs including: a) the curriculum group (N=16), and

b) the non-curriculum group (N=15). The Peabody Motor Developmental Scales and the Pictorial Scale of Perceived Competence and Social Acceptance were used to assess the children's motor development and perceived competence, respectively. All subjects were tested prior to the 20-week intervention period and immediately following the intervention.

A series of 2 (group) X 2 (testing time) repeated measures analyses of variance were used to analyze the impact of the two conditions. Results revealed that the motor development of subjects in both groups changed significantly over time; however, there were no differences between groups.

Product-moment correlations and linear regression analyses were used to assess the relationship between preschool children's motor development and perceived competence. Results revealed that perceived competence relative to motor development did not change over time; however a reciprocal relationship between motor development and perceived competence in preschool children was found.

The piloted teacher survey showed potential for evaluation of service delivery models and as a tool for teacher-consultant communication in future studies.

Preschool Children's Motor Development and Perceived Competence

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INTRODUCTION

Motor and physical activities are considered an important component of early education. Motor activities provide exercise, and are believed to be important in enhancing academic and social skills and developing skilled movement (Bossenmeyer, 1988; Day, 1988; Flinchum, 1975; Kogan, 1982). Developing skilled movement is facilitated through the integration of sensory input (experience) (Kleinman, 1983).

Ayres' (1973) theory of sensory integration, developed from her work with learning disabled children and from advanced studies in neurophysiology, provides an explanation for the process of motor development through integration of the senses. This theory is based on the belief that skilled motor ability is dependent on the integration of the sensory and motor portions of the nervous system. Central to the application of sensory integrative activity is the provision of planned and controlled sensory experience for the purpose of eliciting an adaptive (motor) response (Ayres, 1973). This type of activity is believed to enhance the organization of brain mechanisms. Normal neuromotor maturation is dependent on accurate sensory perception of the environment and

integration of sensory and motor information (Ottenbacher, 1983).

Ayres' (1973) theory and work, and subsequent research related to her theory, have focused on populations considered to be deficient in sensory and motor function (Arnold, Clark, Sacks, Jakim, & Smithies, 1985; Clark, Miller, Thomas, Kucherawy, & Azen, 1978; Kantner, Clark, Atkinson, & Paulson, 1982; Sellick & Over, 1980). However, sensory integration potentially provides a theoretical base for exploring differences in motor ability among non-impaired or "normal" children. Some normal children appear more capable in motor tasks than others, and their early skill levels are used to predict later development. Children who perform poorly on early motor tasks will typically have difficulty learning more difficult tasks (Seefeldt & Haubenstricker, 1982). If children's motor abilities are based on sensory integrative functioning, it might be questioned whether all children could benefit from specially designed sensory activities to enhance motor development.

In addition, proponents of motor programs in preschool education frequently claim benefits of improved self-concept or body image as a result of structured activity programs (Bossenmeyer, 1988; Day, 1988; Flinchum, 1975; Kogan, 1982). However, in the past, limited

research has supported the idea that motor activities enhance development of skilled movement and social skills in preschool children. Smoll (1982) calls for research to provide evidence on when new skills should be learned, which conditions promote the acquisition of specific skills, and for exploration of the relationship between motor and psychosocial development.

The relationship between motor and psychosocial development has lacked the definition necessary for evaluation. Harter (1982) has stated:

> Concepts such as "self-esteem," "self-concept," and "perceived competence" have become central to formulations merging from social learning theory, self-perception theory, social cognition, and theories of competence and intrinsic motivation. At a more applied level, the assessment and enhancement of an individual's self-esteem is critical to clinicians, educators and program-evaluation researchers. (p. 87)

Definition of a component of self-concept - a person's perceived competence has been suggested (Harter, 1982). Harter's (1982) Perceived Competence Scale for Children has offered the means to examine the relationship between perception of competence and actual ability.

Of equal theoretical importance to motor activities in preschool education is the practical application or service

delivery of the activities. Most often, a teacher directs the children in motor activities as part of a whole curriculum. However in some circumstances, another professional or specialist may be employed to direct the motor activities or to consult with the teacher regarding these activities. Consultant service delivery was the model used in this study. A teacher survey was developed in the context of this study to evaluate the consultant service delivery model for use in future studies.

With respect to previously mentioned considerations, this study included preschool-aged children who had not been identified for developmental problems (e.g. "normal" children). Some of the children were offered a sensory-motor curriculum and some were not. Therefore, this study empirically tested whether a) a specifically structured sensory-motor curriculum enhanced the motor development of normal preschool children versus a matched group of children who were not provided the curriculum; and b) there was a relationship between preschool children's motor development and their perceived competence.

Over a 7 month period, one group of children participated in a sensory-motor curriculum while the other group received a non-curriculum condition. All children were evaluated on their level of motor development and perceived competence before and after the treatment period.

The curriculum and non-curriculum conditions were implemented by the preschool teachers with consultation from a specialist in motor development. In addition, the teachers responded to a survey evaluating the skill of the specialist and the teachers' perceptions of their own competencies.

REVIEW OF LITERATURE

Philosophies of childhood education have frequently included developmental concerns. Beyond academics, societal values have dictated that the educational system promote physical and social health and growth. It is generally believed that the different domains in child development are interactive. This study provided information regarding: a) the enhancement of motor development through programming; and b) the interaction of the domains of motor development and self-concept.

Early Motor Development

From birth, a child is constantly putting together sensations and movements to form more organized sensations and movements. Organization of sensations and movements is most pronounced during an adaptive response to sensations. An **adaptive** response (usually seen as a movement) is a response in which a person uses his or her body and the environment in a creative or useful manner. An example of an early adaptive response is when an infant laying prone lifts and turns his or her head to breathe more easily. Later in childhood, activities such as putting on clothes, playing with toys, or riding a bicycle require many adaptive responses (Ayres, 1979).

Restating the above, humans adapt to sensations (Ayres,

1979). Adaptive responses are dependent upon organized sensations, and therefore, are an indicator that the brain is organizing sensations efficiently. Additionally, adaptive responses facilitate further integration of sensations experienced from making that response (movement). This is exemplified by a child on a swing. The child moves his or her body (adaptive response) in response to the sensation of gravity (a sensation which changes with the movement of the swing). That is, the movements promote organization of those sensations in the brain (Ayres, 1979).

The third through seventh years are an important period for the integration of sensations, formation of adaptive responses, and, therefore, motor development (Ayres, 1979). According to Ayres (1979), the higher intellectual functions which develop after 7 years of age will develop better if sensory-motor integration is in place. Therefore, this study included children who were within the age range of 3- to 5-years-old when important aspects of motor development were taking place.

Motor Development Theory

The importance of motor development is evidenced in the role given motor or physical activities within the educational system. Within our society, exercise and coordinated movement in sports and recreational activities

are valued sufficiently for them to be included in the early education of children. Additionally, exercise and movement activities are believed to influence development in the social and cognitive domains (Bossenmeyer, 1988; Day, 1988; Flinchum, 1975; Kogan, 1982). Implementation of these values and beliefs are dependent upon a theoretical base which explains how motor development occurs. However, there is not a consensus of theory. Theories differ in their premise for how motor development occurs and why it occurs as it does. Some theories denote a behavioral perspective while others purport natural or physiological reasoning.

Many have agreed that motor development and sensory perception are interdependent. Agreement on this singular concept has been criticized, however, as being too general (Jones, 1982). The difficulty in isolating sensory and motor responses for research purposes has led Jones (1982) to suggest that all skills may not necessarily have something in common. Jones (1982) and Rarick (1982) appear to promote a behavioral perspective of motor development. By measuring motor behaviors, especially in very young children, only then can the process of, or influences on, motor development be inferred (Rarick, 1982).

Another perspective, which focuses on the physiological processes involved in motor development, has been proposed

by Greenough, Black, and Wallace (1987). Based on a comprehensive review of the research, these authors have suggested two mechanisms for explaining development (including motor development): a) congenital neural synapses are preserved through use in processing sensory information; or b) synapses are developed in response to experience after birth. In a review of Greenough et al.'s (1987) work, Bertenthal and Campos (1987) illustrated that sensory or motor behaviors better fit the model than do more complex aspects of behavior. The example used by these authors to depict more complex aspects of behavior was psychosexual development.

The model of neural development suggested by Greenough et al. (1987) potentially adds meaning to the theory of motor development offered by Ayres (1979). This theory states that neural organization of sensations is critical to normal motor development. That is, the brain organizes or integrates the many sensations received by the body in order to formulate appropriate and useful motor responses. Relating this to Greenough et al.'s (1987) model, sensory induced neural organization may result in either selectively preserved synapses or synapse production.

Analogies have been used to explain this theory of sensory integration. The many types of sensations - gustatory (taste), olfactory (smell), vision, hearing,

tactile (touch), vestibular (balance), and proprio-kinesthetic (knowledge of body parts) - "flow into the brain like streams flowing into a lake" (Ayres, 1979, p. 5). The brain then acts as a police officer directing heavy traffic by locating, sorting, and sequencing sensations. When the traffic is well directed, the brain can depend on the sensations for learning and forming behaviors and perceptions.

The literature on motor development theory suggested several considerations for this investigation. Sensory integration theory (Ayres, 1973; 1979; 1979) and subsequent research related to this theory (Arnold et al., 1985; Clark et al., 1978; Kanter et al., 1982; Sellick & Over, 1980), have been focused on populations considered to be deficient in sensory and motor function. From a meta-analysis of eight studies, Ottenbacher (1982) concluded there was empirical support for the effect of sensory integration programs on certain populations. The reviewed studies included subjects who were either a) mentally retarded, b) learning disabled, or c) "at risk" for learning disorder or aphasic. It was reported in this meta-analysis that the performance of subjects receiving sensory integration therapy was better than 78.8 percent of the subjects not receiving sensory integration therapy. That is, using a combined probability analysis, results revealed a

significant effect for groups receiving sensory integrative therapy over groups not receiving therapy.

Although the enhancement of motor development appears to be an essential component of early childhood education, and is suggested by the theoretical base, the effects of a sensory integration-based program on a normal sample apparently needed to be investigated. This study provided information regarding an enhancement effect of a sensory-integration based program on normal preschool children's motor development.

Influences on Motor Development

Gender and Age

Generally, certain motor milestones are consistent across large numbers of people (e.g. most children learn to walk at approximately 1 year of age). However, males and females appear to mature at different rates depending on age. Therefore, it is important to consider gender and age as potential influences when evaluating motor development.

Research regarding the influence of gender and age on motor development has been inconclusive. In one study, Zemke (1981) examined the effects of gender and age on a measure of motor maturity in normal preschool children (3- and 5-years-old). Integration of the asymmetrical tonic neck reflex was measured, and no significant gender or age

differences were revealed.

In another study, Sellers (1988) tested 107 children (52 male, 55 female) for quality of static balance and antigravity control. Sellers found girls to rank slightly higher than boys on two of five measures, which indicated a level of motor development. The subjects were 50 to 66 months in age, and included 79 Black children, 22 Hispanic children, and 6 Caucasian children. Non-standardized measures which were devised specifically for this study were used, and test-retest reliability was not determined for the tasks measured. It was recommended that generalizations of this study be made cautiously. In addition, it would be inappropriate to interpret this study as indicating significant gender differences for overall motor development in preschool children.

Additional research has used a meta-analysis method to draw conclusions about childhood gender differences in motor performance (Eaton, 1989). Gender differences in body magnitude, body composition, and activity (possible variables in motor performance) are typically less than one standard deviation in size. Differences of this size are potentially more influential than may be assumed. However, when reporting on differences on motor performance tasks from ages 3 to 20 years, Eaton (1989) is not specific as to when (at what age) gender differences may appear on 20

measures of motor performance. Four of the tasks measured showed no gender differences before puberty. In eight of the 20 measured tasks, age was unrelated to the size of the gender differences. Six of the 20 measures showed small gender differences initially, with differences increasing with age. Only 2 of 20 tasks (throw for distance and throwing velocity) initially showed large gender differences. This research does not appear conclusive in supporting significant gender differences in motor development for children ages 3-to-5 years. Some direction for research which might point to explanations for gender differences (biological versus experiential) is provided, however, this issue also appears to be more critical for post-pubertal ages.

Although the literature was not conclusive in suggesting that significant gender and age differences for motor development in preschool children existed, age and gender were accounted for in the design of this study. Gender was controlled for by assigning equal numbers of each gender to the two treatment groups. To eliminate age as a confound, the two treatment groups in the study were matched according to age in months.

Socioeconomic Status

A number of studies have explored the relationship between motor development and family socioeconomic status

(Capute, Shapiro, Palmer, Ross, & Wachtel, 1985; Churton, 1983; Gottfried, 1984; Poresky & Henderson, 1982; Silva, McGee, & Williams, 1985). The relationship between these two factors is alluded to by Gottfried (1984). Studies were summarized by means of meta-analysis and results revealed a correlation between environmental variables in the home and the cognitive development of children. Socioeconomic status was a variable considered in these reviewed studies. Typically, assessment of early cognitive development has included criterion referenced motor behavior, which therefore alluded to the relationship between socioeconomic status and motor development. That is, if motor behaviors determined cognitive function, and this has been related to environmental variables, then a relationship between motor development and socioeconomic status may have been implied.

In another study, Churton (1983) used canonical correlation to determine predictability of several factors for perceptual-motor performance in nine hyperkinetic children. The factors were hyperkinesis, educational placement, drug utilization, socioeconomic status, and age. These variables were found to predict perceptual-motor performance in a poor to moderate range. Socioeconomic status was identified as one of the three factors which significantly related to perceptual-motor scores. The brief methodological description made it difficult to fully

evaluate the determinants of perceptual-motor performance in relation to the results; however, it appeared that among other factors contributing to perceptual motor performance, socioeconomic status was not discounted.

Further research compared three groups of 9-year-old children on reading ability, intelligence, motor development, and family/maternal characteristics (Silva et al., 1985). From a sample of 952 children followed from birth and evaluated at age 9 years, the groups of children compared were a) those identified as having general reading backwardness (GRB); b) those determined to have specific reading retardation (SRR); and c) the remainder of the sample. Socioeconomic status was included among the family/maternal characteristics. The researchers found the GRB group differed significantly from both the SRR group and the remainder of the sample in motor performance and in socioeconomic status. The GRB group scored lower on motor performance and was more economically disadvantaged than either of the other two groups studied. It appeared that, at least for some children, socioeconomic status may have been a factor influencing motor performance.

In another study, Poresky and Henderson (1982) examined the effects of home environment, maternal attitudes, marital adjustment, and socioeconomic status on infant mental and motor development. Twenty-seven (non-welfare) mother-child

dyads were studied, and results revealed that a measure of motor development was significantly correlated with socioeconomic status in 2-year-old children. Socioeconomic status was "based upon father's education, mother's education, family income, and father's occupation" (p. 697). However, the researchers aptly pointed out that the influence of socioeconomic status on an infant was mediated by the parental care provided to the infant. In this study, the authors demonstrated an association between infant motor development and both the quality of the home environment and family socioeconomic status.

Capute et al. (1985) directly assessed normal gross motor development in relation to gender, race, and socioeconomic status. These researchers assigned gross motor scores for 284 children based on parental report. They found that males and females advanced faster for different portions of development. Generally, Blacks achieved motor milestones at earlier ages. This difference was present across many milestones, and "while statistically significant, ... of small magnitude: less than one month difference on average for milestones prior to walking" (p. 641). It was reported that after the effect of race was accounted for, the effect of socioeconomic status was negligible. In addition, not enough evidence existed to support a general statement regarding gender, race, and

motor development.

Review of the above mentioned studies suggested the existence of a relationship between socioeconomic status and motor development, especially when combined with certain other factors. This investigation, therefore, was designed to control for socioeconomic status for comparisons between groups on motor performance. Equal numbers of children from low and high socioeconomic backgrounds were randomly assigned to each of the treatment groups.

The Relationship Between Motor Development and Self-Concept

Theory regarding self-concept suggests broad implications for behavior. Children with a positive self-concept are characteristically self-confident, social, successful, able to cope with failure, persistent and exploratory (Lynch, Norem-Hebeisen, & Gergen, 1981). The importance of self-concept is an incentive for studying the process by which it is developed in greater detail. Within this study the relationship between an aspect of self-concept, (more specifically - perceived competence), and motor development was examined. It was first determined if these two factors were correlated. Changes in the relationship between motor development and perceived competence were also explored.

Early Development of Self-Concept

The development of a sense of self, or one's self concept, in childhood has been discussed by various experts. According to Maccoby (1981), three distinct early childhood behaviors concerning the self include: a) self-recognition in a mirror (typical of 18-month-old children); b) understanding that one's thoughts are private (achieved by approximately 3 years of age); and c) definition of self based on external characteristics such as color of hair, address, and play preferences (evident in 4- and 5-year-old children).

At about 7 years of age, children are able to describe themselves abstractly and with some evaluation of self by determining "good me" and "bad me" (Maccoby, 1980, p. 266). Children begin to recognize themselves as having certain skills and not having other skills. During the 6- to 8-year-old age range, children form an ideal self-image and respond strongly for the protection of that self-image (Maccoby, 1980). Studies by Harter (1982) and Harter and Pike (1984) confirm that "approximately 8 years is the typical age when children become capable of making judgements about their worth as persons" (p. 1970).

Measurement of Motor Development and Self-Concept

It is frequently assumed that self-concept and motor

development are related. Many experts believe that engaging in appropriate motor activities will result in improved self-concept (Bossenmeyer, 1988; Day, 1988; Flinchum, 1975; Kogan, 1982). These experts unquestioningly state that motor activities are vital to social and emotional growth. However, only questionable empirical support for this belief exists. Of the studies reviewed, none were designed to control possible confounds and most did not rely on reliable, objective measures.

In one study, Flinchum (1975) provided limited evidence supporting the relationship between motor development and self-concept. Results were reported on a three-week "experiment" in which perceptual motor activities were provided to children in the second grade. Comparisons were made of three children's self drawings before and after the three week program. There were no reports of a control group, randomized assignment nor use of an objective scoring system in her evaluation of the children's drawings in this research. It was concluded that the pictures drawn by the children after the program showed an improved idea of their body image. This conclusion was drawn from a study which did not control for many potentially influential factors on the results, and which did not use an objective, valid nor reliable measure for the outcome.

In an additional study where 4- and 5-year-old children

were provided a perceptual motor training program, improved self-concept was reported for children receiving the treatment compared to a randomly assigned control group of children (Platzer, 1976). The Goodenough House, Tree, Person Projective Test (Harris, 1963) was used to evaluate self-concept in both groups after the perceptual motor training program. A possible confound not accounted for was the relationship between IQ scores and figure drawing ability (Pikulski, 1972). Potentially the significant improvement in projective test scores in the experimental group may have resulted from a sampling error in which children with higher IQ scores were more often assigned to that group.

Another consideration is worth mentioning in evaluating the study by Platzer (1976). Goodenough's (Harris, 1963) projective test required a motor response (drawing) in order to evaluate self-concept. Potentially children with positive self-concepts but poor motor abilities may have been disproportionately assigned to the control group. This possibility suggested problems associated with the evaluation of self-concept in young children.

An additional issue associated with the evaluation of self-concept in young children is related to the scoring of projective evaluations. Platzer (1976) inferred that only persons experienced in the interpretation of projective

tests could score such tests. In Platzer's (1976) study, the drawings were rated by an experienced expert in projective evaluations. The interpretation and scoring for the data were not given nor tested for reliability with other testers. Therefore, reliability for scoring may have been questionable in this study.

Within the literature concerning the development of self-concept, additional problems with assessment of this domain were mentioned. Samuels (1977) stated "self-concept inferred from behaviors seems to be a better method to evaluate young children's feelings" (p. 85). Guidance as to how one might infer self-concept from behaviors was provided by Lynch, Norem-Hebeisen, and Gergen (1981). It was recommended that behaviors which may be expressive of some aspects of self be operationalized. This sage advice may yet be problematic for assessing self-concept in young children due to the paucity of accepted milestones in the early development of self-concept.

Work by Harter and Pike (1984) has offered the potential for evaluating two aspects of the developing self-concept in preschool children. Harter and Pike developed the Pictorial Scale of Perceived Competence and Social Acceptance (PSPC) to assess perceived competence (for cognitive and physical abilities) and social acceptance (maternal and peer) in children aged 4 to 7 years. In

related work, Silon and Harter (1985) concluded that learning disabled children are as capable of making the necessary distinctions for assessment of perceived competence as normal IQ children, whereas retarded children are not. Subjects in this study were 9 to 12 years old (as opposed to preschool-aged children), and the Perceived Competence Scale for Children (Harter, 1982) (verbal as opposed to pictorial) was used. It appeared that for making self-evaluating judgments as required by the PSPC, IQ was not a likely confound within the range of learning disabled and normal scores.

A few studies have demonstrated an association between sensory and motor deficits and poor self-concept (Stott & Moyes, 1985; Watson, Ottenbacher, Short, Kittrell, & Workman, 1982). According to this research, children with deficits in sensory-motor abilities often have poor self-concepts. However, whether enhancement of motor function in non-impaired preschool children affects development of self-concept remains without strong empirical support. In this study, evaluations of motor development and a portion of self-concept, perceived competence, were completed with preschool children before and following a treatment period. The treatment consisted of two conditions for distinguishing whether one condition provided enhancement effects on the children's motor development and self-concept.

Evaluating the Consultation Process

Societal values have dictated that the education system promote physical and social health and growth. In some circumstances, another professional or specialist may be employed to direct a motor activities program or consult with the teacher regarding these activities for the purpose of promoting growth in these areas.

The teacher-consultant relationship is a frequent topic of concern in education (Aloia, 1983; Bossard & Gutkin, 1983; Cipani, 1985; Friend, 1984; Idol & West, 1987; Idol-Maestas & Ritter, 1985; West & Idol, 1987). The consultation relationship has particular meaning for the delivery of special education services such as occupational and physical therapy in educational settings (Giangreco, 1986; Shilling & Siepp, 1978; Woodruff, 1980).

Physical and/or occupational therapists (motor specialists) might provide service delivery to a preschool in a manner very similar to that in this study. Yet no evaluative measure of the teacher-consultant relationship exists for this situation. Therefore, a survey was developed in conjunction with this study for the purpose of evaluating the relationship between a therapist and teacher in an educational setting. The survey was given to the four preschool teachers at the end of the intervention, and constituted a pilot study of the survey. (An N of four

teachers would not merit a quantitative study.)

Several previously designed scales served as a basis for the survey which was developed. Bossard and Gutkin (1983) used the Consultant Observational Assessment Form (COAF: Curtis & Anderson, 1975) in their study assessing the impact of consultant skills on teachers' use of school-based consultation services. The Educators' Ratings of Resource Teacher Consultation Proficiency questionnaire was used by Friend (1984) to identify skills teachers expect consultants to have. Idol-Maestas and Ritter (1985) listed 34 skills which are important for consulting teachers. From these resources and others similar to them (Conoley & Conoley, 1982; Heron & Harris, 1987), the survey in this study was designed to evaluate consultant skill, teacher competencies, and teacher perceptions of the consultation process.

Purpose of Study

The purposes of this study were to evaluate enhancement effects of an intervention on preschool children's motor development and to investigate the relationship between preschool children's motor development and perceived competence. The pretest-post test design involved a group of preschool children exposed to a structured sensory-motor curriculum and a group of preschool children who were provided unstructured activities (a non-curriculum

condition). Preschool teachers implemented the two conditions with consultation from a specialist in motor activities. Also within this study, a survey was developed to evaluate the teacher-consultant relationship.

METHOD

Subjects

The sample for this study consisted of 31 preschool children (16 males and 15 females) enrolled in two university child development laboratory programs. One preschool program was offered in the morning and one was offered in the afternoon at the same location, and each program was directed by a head teacher and an assistant teacher. There were different teachers for each program; however, the teaching philosophies were similar. The sample was drawn from 41 available children in the programs. Two children were not tested because they did not meet the sample criteria developmentally (e.g. they did not score within the range of the other children but were allowed to attend the preschool program anyway). Six children withdrew from the preschool programs after the pretest. Two children were dropped by the investigator after the pretest because they could not be maintained in their assigned conditions for the study.

Subjects ranged in age from 38 to 61 months at the beginning of the study. An equal number of boys and girls were represented in each treatment group. All subjects scored in the range of low normal to high normal intelligence as measured by the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981). The subjects came from families

of various ethnic backgrounds. There were seven subjects of Asian/Pacific ethnic origin in the study. Five of the subjects had Hispanic ethnic origins, and the 19 remaining subjects were Caucasian. The Hollingshead (1975) Four Factor Index of Social Position was used to determine the socioeconomic status of the subjects' families. The subjects' families ranged on the full scale of socioeconomic status from low to high.

Treatment

Prior to the initiation of the study, parents of all children in the preschool programs received a letter (See Appendix A) briefly explaining the intent of the study and soliciting their cooperation in allowing their children to participate in the research. All parents agreed to allow their children to participate in the study. The principal investigator and the program director were available for questions from the parents throughout the study.

The preschool teachers and assistant teachers were oriented by the principal investigator prior to the initiation of the intervention. During the teacher orientation the purpose of the study, the theory underlying the study, and the design and implementation of the study were explained. An outline of the teacher orientation presentation is included in Appendix B. One assistant

teacher left the program after the first 5 weeks of the study. The assistant teacher who replaced her was equivalent in terms of characteristics necessary for the job. She was provided a complete orientation to the study similar to the orientation received by the other teachers prior to implementing the curriculum. The teachers were allowed to call on the principal investigator with questions at any time during the study.

The university child development laboratory programs included teacher training experience for undergraduate students. These students were supervised by the head and assistant teachers and participated in formulating the daily activities. A variable number (two to six) of undergraduate student teachers were present each day. Typically, one student teacher attended every day of a particular university term, and each of the other student teachers attended for one day a week during the term. The student teachers were given a brief orientation to the study, and were present during the implementation of the study conditions. While they were not responsible for implementing the study conditions, they did, however, assist in managing the children during the implementation of the study conditions. The sensory-motor curriculum and the non-curriculum conditions were implemented by the preschool teachers four days a week for 20 weeks - coinciding with a

regular school year. For each of the morning and afternoon preschool programs, the head teacher and assistant teacher alternated with implementing the sensory-motor curriculum and monitoring the non-curriculum condition on a weekly basis.

Sensory-Motor Curriculum

The sensory-motor curriculum used in this study was Movement is Fun (Young & Keplinger, 1988). This curriculum provided detailed instructions for 26 lesson plans for group activities. The curriculum was designed for preschool children who were not designated as having developmental delays ('normal'). This curriculum was developed to enhance normal motor development and was based on sensory integration theory. The curriculum was divided into seven units titled: a) introduction, b) tactile system, c) vestibular system, d) proprioceptive system, e) postural responses, f) bilaterality, and g) motor skills. There were two to seven lessons per unit. The lessons were arranged to build on each previous lesson, and were developmentally sequenced. See Appendix C for an example of a lesson plan from the curriculum.

The preschool teachers had access to the published curriculum throughout the study. In addition to the curriculum, the teachers met with the principal investigator

on a variable schedule to discuss each lesson plan prior to its implementation. In effect, the principal investigator acted as a consultant to the teachers for planning and implementing the sensory-motor curriculum. The principal investigator assisted the teachers in understanding how to implement the activities, answered questions about the theoretical base or objectives for the activities, and ensured that the necessary equipment was available. One or two lessons from the curriculum were implemented during each four-day-week for 20 weeks. The principal investigator also assisted the teachers in modifying the curriculum lesson plans appropriately within each week to provide novelty for the children while maintaining consistency with the curriculum objectives for that week.

The frequency (daily) and length (7 months) for implementing the sensory-motor curriculum were necessary and important for consistency with sensory integration theory (Ayres, 1973) and to follow precedent set by previous studies (Ayres, 1977). According to Ayres (1973), daily activities are more effective than weekly for obtaining lasting changes in neural organization. Additionally, Ayres stated that five or six months of programming are required to consolidate gains made. Finally, other researchers have conjectured that intervention programs of three months or less may be reason for lack of significant results

(Ottenbacher, Short, & Watson, 1981; Platzer, 1976).

Non-Curriculum Condition

Children in the non-curriculum group were with the other teacher in a room separate from the curriculum group while the curriculum was implemented. This room had furniture and books, puzzles, and materials for drawing. Recorded music and computer keyboard games were also available. Activities for the non-curriculum group were not structured during this time period. The availability of, and access to, a teacher by the non-curriculum group was not similar to the structured direction of activities which was employed with the curriculum group. That is, the children in the non-curriculum group were allowed to select and interact with the available materials in the room. The types of materials available to the non-curriculum group did not vary during the course of the 7 month intervention, although the specific materials changed periodically. In contrast, the curriculum group participated in structured activities which changed at least weekly.

Instruments

The instruments used in this study were carefully selected from available and known scales as being the most appropriate for this study. Both instruments are referenced in the literature for validity and reliability.

Peabody Developmental Motor Scales

The Peabody Developmental Motor Scales (PDMS: Folio & Fewell, 1983) was used to assess the children's motor development. The PDMS provided a description of motor behaviors of children from birth to 7 years of age and an age range for which each particular behavior is normally accomplished. For example, according to the PDMS, a child between 36 and 41 months is able to stand on one foot for five seconds with hands on hips. A child the same age would be expected to ascend and descend four steps alternating feet on the steps and without support (of another person or hand rail). Among fine motor skills expected of a 36 to 41 month old child is the ability to cut with scissors within one-half inch of a line within fifteen seconds.

The PDMS provides an expression of how a particular child functions in motor tasks as compared to a group of chronological peers. Age equivalent scores, developmental motor quotients, percentile rankings, and standardized Z or T scores are also provided. As reviewed by King-Thomas and Hacker (1987), the PDMS is appropriate for reevaluating children's motor abilities and measuring progress as a result of specific treatment interventions. The PDMS is also appropriate for use in research in which motor development is compared to other skill areas.

The PDMS was examined for content, construct, and

concurrent validity, and was found to be acceptable in all three types. Construct validity for both Fine Motor and Gross Motor Scales was determined by obtaining significant improvements in scores as a function of age (King-Thomas & Hacker, 1987). King-Thomas and Hacker (1987) do not report coefficients for correlations between the PDMS and the Bayley Motor and Mental Scales. However, they state there were significant correlations between the PDMS Gross Motor Scale and the Bayley Motor Scale, and between the PDMS Fine Motor Scale and the Bayley Mental and Motor scale. It was concluded that the high correlations provide content validity for the PDMS test items. Concurrent validity was established by comparing scores of children with developmental motor problems with those of normal peers. Scores from the delayed group were significantly lower than scores from the normal peers except in the birth to 5 month age group (King-Thomas & Hacker, 1987). The test-retest reliability coefficients were r=.95 for the Gross Motor Scale and r=.80 for the Fine Motor Scale for the same child. Interrater reliability for the Gross Motor Scale and the Fine Motor Scale were r=.97 and r=.94, respectively.

In this study, the PDMS was used as directed for group instruction in the procedural manual. As recommended by Palisano (1986), age equivalent scores were calculated for statistical analysis in this study. Good to high

correlations between the Bayley motor and the PDMS gross motor scales (r=.78 to r=.96) for age equivalent scores were found. Also, the two assessment tools did not differ significantly on mean age equivalent scores. However, when data were based on standardized quotients there were problems in interpreting the developmental motor quotients. These problems were evidenced by significant differences between standardized scores for the PDMS compared to the Bayley standardized psychomotor developmental index.

Raw scores for PDMS fine and gross motor subscales were converted to age equivalent scores (in months). Then the mean age equivalent score was calculated by adding the two age equivalent scores and dividing by two (as directed in the PDMS manual). The mean age equivalent score (motor age) was used for the statistical analyses.

The principal investigator acquired additional information in the use and interpretation of this scale prior to collecting data for this study. She attended a presentation on the PDMS as part of the conference "Comprehensive Assessment and Treatment of Children" in Milwaukee, Wisconsin, July 17-20, 1989. The principal investigator also used the rental videotape "A Guide to Administering the Peabody Developmental Motor Scales," produced by the Child Development and Mental Retardation Center at the University of Washington, Seattle.

Pictorial Scale of Perceived Competence and Social Acceptance

The Pictorial Scale of Perceived Competence and Social Acceptance (PSPC: Harter & Pike, 1984) was used as a measure of perceived competence. Although the PSPC was organized into subscales for assessing cognitive and physical competence and peer and maternal acceptance, a factorial analysis of the PSPC has revealed that

> young children do not make a clear distinction between what we [the researchers] identified as cognitive and physical domains. Competence at one type of skill is associated with competence at the other. One is either "good at doing things" or one is not. These skill domains, however are distinguished from social acceptance by peers and by mother. (p. 1980).

That is, for this age group, the scale offers two measures - those of perceived competence and social acceptance. That is, although the perceived competence scale contains both cognitive and physical domain questions, preschool-aged children do not distinguish between these domains for reliable subscale scores. The same is true for differences between peer and maternal acceptance at this age. Therefore, in this study, scores for the cognitive and physical domain questions were not used as separate subscale scores. The physical and cognitive scores were averaged to

produce one perceived competence score.

The PSPC (Harter & Pike, 1984) was administered as directed in the manual by showing a child (subject) two different pictures of a child engaged in a particular activity (e.g., assembling a puzzle). The evaluator explained that one pictured child was good at the activity while the child in the other picture was not very good at the activity. The evaluator then asked the subject which pictured child was most like him or her. The subject's response was further refined by asking if the selected child was a lot like him or her or a little like him or her.

The PSPC was scored based on the subject's responses as directed in the manual. Scores of one to four were assigned with four indicating the perception of most competence or social acceptance, and one indicating the perception of least competence or social acceptance. A total score for either perceived competence or social acceptance could have been used; however, only the perceived competence scores of the PSPC were used in this study.

Harter and Pike (1984) tested the PSPC for convergent and discriminant validity. The authors concluded that their data depicted convergence between perceived competence judgements and the reasons given for those perceptions. Discriminant validity in the cognitive domain was tested by comparison of scores of children who were held back in the

first grade for academic reasons with a sample of children matched on age and gender who had not been held back. The cognitive competence scores of the group held back were significantly lower than the matched group. Discriminant validity in the physical domain was tested similarly between a group of children known to have been born prematurely, and a group known to have been born at term. Physical competence scores of the pre-term children were significantly lower than the full-term children.

Reliabilities for the subscales were determined by using an index of internal consistency, a coefficient alpha. Coefficients for the cognitive and physical subscales for preschool and kindergarten children were r=.67 and r=.62, respectively. Combining the cognitive and physical subscales (according to the factorial analysis) the coefficient for perceived competence was r=.76.

Test-retest reliability for the PSPC was not available in the literature. Therefore, a reliability estimate was conducted with four randomly-selected subjects in this study. The subjects were retested using the PSPC six weeks after the initial testing. Comparison of pre- and re-test scores of the four subjects revealed a product-moment correlation of r=.88.

The PSPC (Harter & Pike, 1984) appeared to provide a valid, reliable, non-motor method of evaluating perceived

competence in preschool children. The PSPC was administered according to instructions in the manual (Harter & Pike, 1984).

Procedure

The preschool teachers and assistant teachers were oriented to the study by the principal investigator prior to the pretest. In addition, the parents of the children were contacted and gave permission for the children to participate prior to the initiation of the study. Participating children in each of the university preschool programs (morning and afternoon) were matched for age, gender, and socioeconomic status and then were randomly assigned to participate in one of the two treatment groups by the preschool program director.

After the pretest, the study conditions were implemented each day of the four school days for 20 weeks and constituted approximately 20 minutes each day of the two and one half hour preschool program. The consultant met with the teachers to review each lesson plan from the curriculum and the status of the non-curriculum condition on a variable basis. All lesson plans were reviewed prior to implementation. The post test was conducted immediately after the termination of 20 week intervention.

Data Collection

The children were evaluated according to the PDMS and PSPC prior to the initiation and after the completion of the treatment period. The principal investigator (blind as to subject assignment to groups) administered both scales to all subjects individually before and after the 20 week treatment period. The PDMS was administered according to group instructions (Folio & Fewell, 1983). All testing was administered at the preschool and during the hours of the preschool program. The pretest and the post test were each completed within a 3 week period before and after the intervention, respectively. During the pretest, the PSPC and the gross motor subscale were counter-balanced; then all fine motor subscales were administered. During the post test, all fine motor subscales were administered initially; then the PSPC was again counter-balanced with the gross motor subscale. Children were selected for testing in a random order.

Additional data, if not "a measure", were kept on the children. Attendance records were kept by the teachers to document the children's participation in the program. Appendix D is an example of a record the teachers kept on each child participating in the sensory-motor curriculum. The participation scale indicated the percentage of time the child participated in an activity, excluding any amount of

time when the child was expected to wait for a turn. This information was obtained to make individual comparisons of children's participation and the outcome measures. That is, if a particular child's score was significantly different from the rest of the group, the percentage of participation was reviewed to determine possible cause for the difference.

A survey was developed during the treatment period and given to the four preschool teachers at the end of the treatment period. The survey was titled "Consultant Evaluation Summary" and is in Appendix E. The teachers were asked to respond to the survey with reference to their involvement in the study, and, on a second copy, to act as editors by providing feedback on the readability and understandability of the survey items. A modified version of this survey may be used in future studies.

Finally, the parents were asked to respond to a questionnaire (see Appendix F) regarding their specific influences on the motor development of their children. This was obtained in order to explain a score which was extremely larger or smaller compared to the rest of the data.

RESULTS

This study compared the impact of a structured sensory-motor curriculum and a non-curriculum condition on preschool children's motor development and perceived competence. Additionally, it examined the relationship between motor development and perceived competence among preschool children following termination of the treatment period.

Preliminary Analysis

The review of literature indicated that controlling for age, gender, and socioeconomic status might have been appropriate. Therefore, preliminary analyses were done to provide information on which factors might have needed to be included in later regression analyses. Initially, motor age scores were used to estimate the degree to which subjects differed with respect to age, gender, and socioeconomic status for control purposes and for consideration in subject assignment to the treatment groups. Additionally, these analyses were done to ensure the group assignment method produced equal groups at the beginning of the study. All analyses were done using the BMDP Statistical Software (1985).

A median split for age (months) was used to divide the sample into two groups. T tests were conducted with

the median pretest motor age score (50) in both the older group and the younger group. In both analyses, the motor age for younger subjects was significantly different from that of older subjects ($p<.01$). These analyses confirmed that age should have been controlled for in assignment to treatment groups.

Gender groups (male n=16, female n=15) were compared based on pretest motor age. A *t* test revealed no significant differences between male and female subjects' motor development at the time of the pretest. A median split for socioeconomic status (scores per Hollingshead, 1974) was used to divide the subjects in two groups. *T* tests were conducted with the median score (59) into both the lower and upper socioeconomic groups. In both analyses, the motor age for subjects with lower socioeconomic scores was not significantly different from that of subjects with high socioeconomic scores.

Despite the homogeneity of pretest motor age scores among both genders and all socioeconomic levels in this sample, equal numbers of subjects from each group (male, female, high socioeconomic scores, low socioeconomic scores) were assigned to treatment groups.

Finally, comparisons were made to determine differences in age, socioeconomic status, and motor age between the treatment groups at the time of the pretest.

A *t* test resulted in no significant difference between the curriculum group and the non-curriculum group based on age at the time of the pretest. Also, a *t* test revealed no significant difference between the two groups based on socioeconomic status. Group assignments which controlled for age and socioeconomic status were shown to be valid. Finally, the treatment groups were shown to be equal in motor age at time of the pretest.

Program Effects on Motor Development and Perceived Competence

To determine the effects of the curriculum condition and the non-curriculum condition on preschool children's motor age and perceived competence, a series of 2(group) X 2(testing time) repeated measures analyses of variance were employed. Together, this series of analyses was used to draw conclusions regarding the impact of the two conditions on the children's motor development and perceived competence.

Peabody Developmental Motor Scales

For the motor age scores of subjects, there was a significant effect for testing time, $F(1,29)=465.51$, $p<.001$. That is, within each group, post test scores were significantly higher than pretest scores. There was also a significant group X testing time interaction effect,

$F(1,29)=3.12$, $p<.10$. Cell means are listed in Table 1 and illustrated in Figure 1. Post-hoc comparisons of the group means using the Fishers's Protected LSD (FPLSD: Peterson, 1985) associated with this significant interaction effect revealed the following results: a) there were no significant differences between groups on the mean pretest and post test scores; b) within each group post test scores were significantly higher than pretest scores ($p<.05$).

Table 1

Mean Motor Age Scores of Subjects By Group and Testing Time

Group	Pretest Mean	Post Test Mean
Curriculum	45.77	54.59
Non-curriculum	44.93	55.33

Fine Motor Subscale

When considering the fine motor subscale scores, there was a significant effect for testing time, $F(1,29)=305.89$, $p<.001$. That is, within each group, post test scores were significantly higher than prestest scores. Significant effects were also seen for the group X testing time interaction, $F(1,29)=4.04$, $p\leq.05$. Cell

means are listed in Table 2 and illustrated in Figure 2. Post-hoc comparisons of the group means using the Fishers's Protected LSD (FPLSD: Peterson, 1985) associated with this significant interaction effect revealed the following results: a) there were no significant differences between groups on the mean pretest and post test scores; b) within each group post test scores were significantly higher than pretest scores ($p<.05$).

Table 2

Mean Fine Motor Scores of Subjects By Group and Testing Time

Group	Pretest Mean	Post Test Mean
Curriculum	44.12	53.62
Non-curriculum	44.23	56.20

Gross Motor Subscale

There was a significant effect for testing time, $F(1,29)=181.34$, $p<.001$. Within each group, post test scores were significantly higher than pretest scores. However, there were no significant group or interaction effects for gross motor subscale scores. Table 3 summarizes gross motor scores by group and testing time.

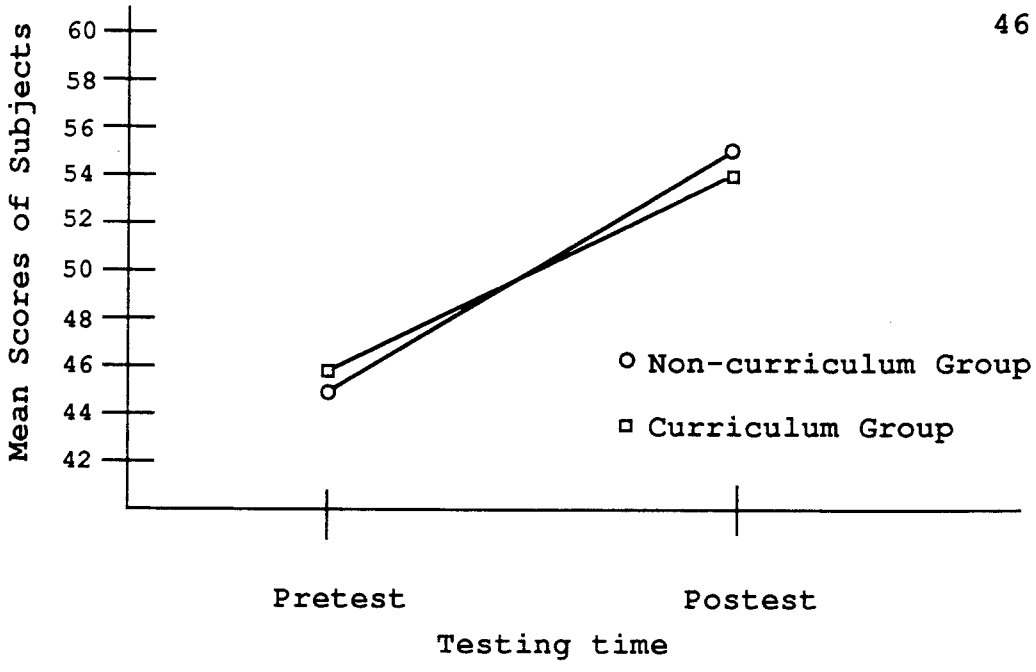

Figure 1: Group X Testing Time Interaction Effect Related to Motor Age Scores of Subjects

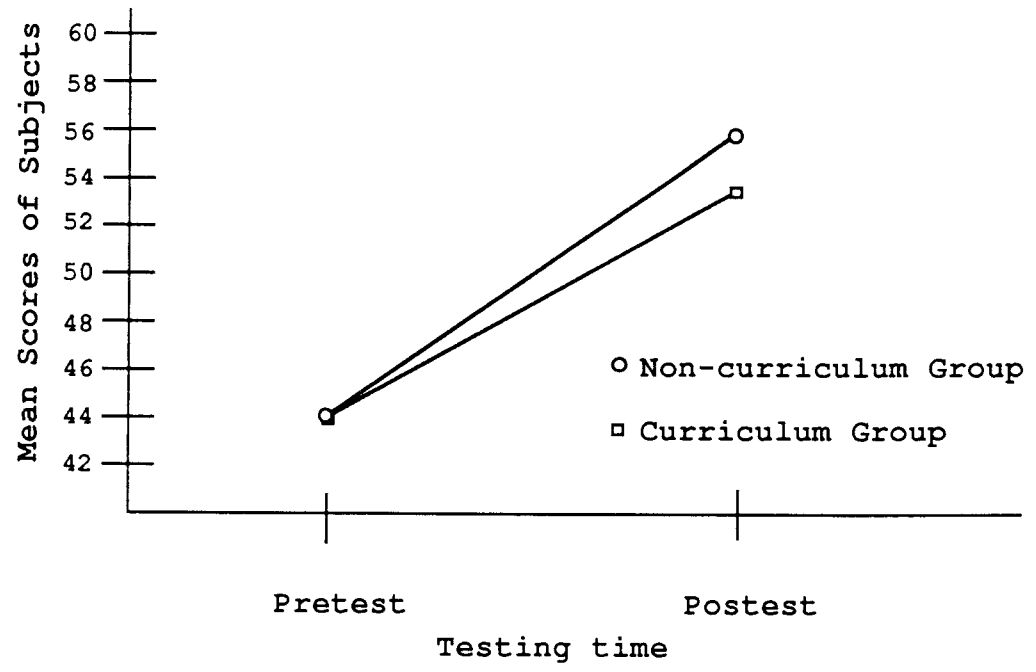

Figure 2: Group X Testing Time Interaction Effect Related to Fine Motor Scores of Subjects

Table 3

Mean Gross Motor Scores of Subjects By Group and Testing Time

Group	Pretest Mean	Post Test Mean
Curriculum	47.40	55.53
Non-curriculum	45.63	54.43

Pictorial Scale of Perceived Competence and Social Acceptance

For the perceived competence scores of subjects, there were no significant group, testing time, or interaction effects. Table 4 summarizes the perceived competence scores by group and testing time.

These results suggest that the overall motor development, gross motor development, and fine motor development of subjects in both treatment groups increased significantly over time, however there were no differences between groups. Perceived competence did not change significantly over time nor was it influenced by the study conditions.

The Relationship Between Motor Development and Perceived Competence

To determine the relationship between motor development and perceived competence, two sets of analyses

were performed. The first analysis indicated whether children's motor development was associated with their perceived competence, and whether the association changed over time. Initially, using a product-moment correlation, pretest motor age scores were compared with pretest perceived competence scores. Results revealed a correlation of r=.50 between pretest scores, and a correlation of r=.31 between post test scores. In a final portion of this set of analyses, the correlations were compared by means of a statistical formula (Blalock, 1960, p. 305). A comparison revealed no significant difference between these two correlations.

Table 4

Mean Perceived Competence Scores of Subjects By Group and Testing Time

Group	Pretest Mean	Post Test Mean
Curriculum	3.22	3.38
Non-curriculum	3.24	3.40

In the next portion of the statistical analyses, two regression analyses were applied to further evaluate the relationship between motor development and perceived competence while taking into account the factors of age and group assignment. First, a linear regression analysis

was performed with post test motor age as the dependent variable and post test perceived competence scores, age, and group assignment as independent variables (see Table 5). Among the variables, age significantly predicted motor age, accounting for 66% of the variance ($p<.01$). Perceived competence also significantly predicted motor age at the post test ($p<.05$), accounting for 29% of the variance. No significant predictions of motor age were evident for group assignment.

Table 5

Results of Linear Regression Analysis Predicting Preschool Children's Post Test Motor Age Scores

Predictor	Standard Regression Coefficient
Age	0.66**
Perceived Competence	0.29*
Group Assignment	-0.11

N=31
* $p<.05$
** $p<.01$

In addition, a regression analysis was performed with post test perceived competence scores as the dependent variable and post test motor age scores, age and group assignment as independent variables. Table 6 lists the standard regression coefficients for this analysis. Post

test motor age significantly predicted perceived competence ($p<.05$), accounting for 52% of the variance. No significant predictions of perceived competence were evident for the variables of age or group assignment.

Table 6

Results of Linear Regression Analysis Predicting Preschool Children's Post Test Perceived Competence Scores

Predictors	Standard Regression Coefficient
Age	-0.31
Motor Age	0.52*
Group Assignment	0.03

N=31
* $p<.05$

This series of analyses indicated a reciprocal relationship between motor development and perceived competence in preschool children. This relationship was not affected by group assignment to the study conditions.

Among all motor age and perceived competence scores for the children, no scores were determined to be extremely larger or smaller compared to the rest of the data. That is, all scores appeared to be within an

acceptable range for use in the analyses. Therefore, review of either the attendance sheets or the parent surveys was deemed unnecessary for the analysis and interpretation of results.

Teacher Survey

The teacher survey developed during this study is in Appendix E. The teacher survey was used to provide two types of information: a) teacher response to the questionnaire format, wording and design; and b) specific responses to the statements. A Likert-type scale was used to evaluate consultant skills and teacher competencies. The scale offered numerical choices of one to five. The numbers represented the following responses: a) one represented "strongly agree"; b) two represented "agree"; c) three represented "neutral"; d) four represented "disagree"; and e) five represented "strongly disagree". These results were summarized for the revision and future use of the survey with larger samples.

The survey responses from the four teachers indicated they were in agreement with several statements. The teachers agreed that the theoretical basis for the curriculum was explained in understandable terms, that the consultant was timely in providing information to them, and that the consultant provided the equipment/materials

necessary to implement the curriculum. The mean response on these statements was 1.2.

Among statements related to traits displayed by the consultant, the four teachers all agreed with the following statements in the survey: a) The consultant established a climate of mutual trust with me; b) The consultant was flexible for changes or adjustments to applying the conditions of the study; c) The consultant remained focused on topics and information related to the study during consultations; d) The consultant displayed active listening during interactions with me. The mean response on these statements was 1.6.

Among statements which reflected teacher competencies, all four teachers responded that they were comfortable in modifying the conditions to maximize the children's participation, and that they felt competent to make judgements regarding changes in the lesson plans. The mean response on these statements was 1.3.

The teachers' responses to all other statements on the survey reflected differing individual attitudes and opinions. The responses to the remainder of statements regarding teacher competencies gave a mean of 2.1. A response mean of 2.1 for the remaining statements regarding consultant skills indicated differing opinions among the four teachers.

DISCUSSION

The purpose of this study was to compare the effects of two conditions on the motor development of preschool children and to investigate the relationship between preschool children's motor development and perceived competence. Specifically, it sought to provide information for discerning: a) the relative effects of a sensory-motor condition and an unstructured activities condition on the motor development of preschool children immediately following the 20 week intervention; and b) whether perceived competence was related to motor development in the preschool children following termination of the treatment.

Program Effects on Motor Development and Perceived Competence

Results of the present study revealed that both the curriculum and non-curriculum groups appeared to increase in their motor development scores from pretest to post test times. However, the two study conditions had no significant impact on the preschool children's motor age scores. Further, neither condition had a significant impact on the preschool children's fine motor, gross motor, or perceived competence scores.

The findings may be explained by several factors which may have influenced the results. First, the preschool

program which hosted this study was comprehensive in addressing all developmental domains of the children. That is, cognitive, social, language, and motor experiences were included in the overall preschool program. It is possible that the motor experiences available to the whole sample throughout the treatment period were sufficient to equalize the effects of the two treatment groups.

Second, the potential for equalization of the two groups due to the comprehensive preschool program gains emphasis with the fact that the study conditions comprised only 20 minutes of each two-and-one-half hour daily program. That is, there was a proportionately larger amount of time available for the two groups of children to have similar motor experiences than the amount of time during which their activities were structured to be different for the study.

Third, the role of the undergraduate student teachers may have influenced how the overall preschool program affected the intervention. Under the supervision of the head and assistant teachers, the student teachers planned the activities made available to the children each day. Although the head and assistant teachers implemented the study conditions, the student teachers observed the curriculum condition. Observation of the curriculum condition may have influenced the student teachers in planning more motor activities than they would have without

this observation. The preschool teachers were asked not to change any of their teaching practices based on their experiences with the curriculum; however, the student teachers may have inadvertently influenced the effects of the conditions on the preschool children's motor development.

Fourth, the non-curriculum condition was implemented in a manner similar to the overall preschool program's format. That is, for the majority of the time during the preschool program, activities were available to the children in an unstructured and supervised format. Several activities, with various teaching goals, were in place as the children arrived at the preschool. For the first hour, the children were allowed to self-select those activities in which they would participate. The children were also allowed to self-select outdoor activities for 30 minutes each day. The non-curriculum condition was similar to this format; however, the materials, space and time were determined by the study design. Within this format, the children themselves may have influenced each other toward equal growth in skills. That is, children from either treatment group may have influenced children in the other group in self-selection of activities. If some of the children attempted or modeled new skills during these unstructured time periods, other children may have attempted the new skills also just by

observing them.

Finally, it might be questioned whether the PDMS measured all potential effects of the two conditions. Poest, Williams, Witt, and Atwood (1990) have categorized motor development into: a) fundamental movement skills; b) physical fitness; and c) perceptual-motor development. According to these authors, fundamental movement skills include jumping, hopping, running, skipping, galloping, tricycling, ball-handling skills, and walking on a balance beam. Physical fitness refers to cardiovascular endurance, flexibility, and muscle strength. "Perceptual-motor development involves monitoring and interpreting sensory data and responding in movement" (Poest et al., p. 6). With reference to these categories of motor development, this study assessed the effects of the two conditions based on changes in fundamental movement skills. However, the sensory integration-based curriculum may have had un-tested effects in the area of perceptual-motor development. Although the PDMS appeared to be an appropriate measure for the effects of a sensory integration-based curriculum, it may not have provided information on all the potential effects of the curriculum. Other authors have noted differences between intervention effects and outcome measures when evaluating motor mechanisms and processes (Bundy, 1990; Keshner, 1990) Potentially, there changes in

the children based on the condition they experienced, but which were not demonstrated by the measure used.

The results of this study indicated that inclusion of a specially designed sensory-motor curriculum within a comprehensive preschool program did not provide enhancement effects in the motor development of the preschool children. Children who were provided this sensory-motor curriculum developed motor skills at a pace similar to a group of peers who were not provided the curriculum. Although sensory integration theory (Ayres, 1975) appeared to support the concept of enhancement in normally developing children, it was not demonstrated in this study. This theory implied the potential for enhancing the maturation or development of preschool children. The sensory-motor curriculum was designed to reflect sensory integration theory. Additionally, the curriculum was not designed to teach the children those specific skills which would advance their scores on the PDMS. Therefore, the results of this study did not necessarily demonstrate that maturation had a greater impact than learning on children's motor development. Rather, these results demonstrated that maturation was the predominant influence on the children's motor development, and that maturation was not enhanced by activities specifically designed to have a sensory-integrative effect on preschool children.

Other research has provided support for the remedial effects of intervention based on sensory integration theory. Ottenbacher (1982) concluded there was empirical support for the effect of sensory integration therapy programs on certain populations over those not receiving therapy. In addition, sensory integrative treatment may be as effective as other interventions in facilitating childhood motor development in other than normal populations. In a study by Jenkins, Fewell, and Harris (1983), sensory integrative therapy was shown to be equal to small group, gross motor programs in mild to moderately delayed preschool children.

The Relationship Between Motor Development and Perceived Competence

Results of the correlation analyses revealed that the relationship between motor development and perceived competence did not change over time. Although the children's abilities increased commensurate with their ages, their perceived competence changed very little. That is, the mean age of the children increased by 7 months during the study, the mean motor age of the children increased by 9.4 months, and the mean perceived competence scores changed by only 0.2. It may be that there were no significant or measurable differences in the development of perceived competence in the age range tested (pretest mean age = 49. 7

months; post test mean age = 56.6 months).

The potential for developmental changes in perceived competence between the ages of 3 and 5 years is implied in the literature. Harter and Pike (1984) discussed the tendency toward inflated perceived competence in this age range. In the development of the PSPC, the authors noted a general trend toward positive self-evaluations in the two competence subscales. This may be a plausible pattern since judgements of self tend to be influenced by ideal self fantasies at this age. In a review of literature pertaining to self-concept, Mayberry (1990) also noted a tendency by younger children to give desirable answers when tested.

Conclusions from another study appear to disagree with Harter and Pike (1984) and Mayberry (1990). Anderson and Adams (1985) concluded that 5-year-old children realistically assessed their own academic achievement. However, these authors are specific to an age in their findings, while Harter and Pike (1984) and Mayberry (1990) were not. Other authors have made specific statements regarding age and competence. Geppert and Kuster (1983) concluded that near the third year of age, children begin to incorporate competence into their perception of self. Therefore, the literature may not be providing conflicting information. The studies mentioned may be interpreted to suggest a developmental sequence in which children

incorporate competence into their self-concept (about age 3 years), form an idealized perception of competence (about age 4 years), and progress to a more realistic assessment of competence (about age 5 years). The results of this study were consistent with this interpretation of the literature since the ages of the children tested averaged between 4- and 5-years-old. Within the age range tested, the children showed a consistent and high perception of competence despite their actual level of motor development.

Results of the regression analyses provided further information concerning the relationship between perceived competence, age, and group assignment on motor development in preschool children. This analysis reinforced the predominant effect of maturation on motor age. Although age contributed the most to motor age, the significant contribution of perceived competence to motor age is worth noting. These results indicated that children's perceptions of themselves appeared to influence their motor development. In addition, the relationship of age, motor age, and group assignment on perceived competence was revealed in another regression analysis. Results of this analysis indicated that motor age significantly contributed to perceived competence at the post test. Apparently, a reciprocal effect may have occurred between motor development and perceived competence for these preschool children.

Earlier studies have attempted to demonstrate a positive relationship between motor development and self-concept (Flinchum, 1975; Platzer, 1980). That is, researchers have attempted to show that motor activities promoted development of a positive or more complete self-concept. However, the methodological problems found within these studies have provided a poor research base for this concept. Among the methodological problems in these studies, absence of a reliable and valid outcome measure for self-concept has been noted. The use of the PSPC and the design of this study have attempted to overcome methodological problems of previous studies. This study has provided sound research-based information for helping to understand the relationship between motor development and self-concept. The results of this research have given evidence suggesting that preschool children's motor development and perceived competence may be interactive, and that perceived competence may not change significantly in the 3- to 5-year-old age range. This is in contrast to conclusions from other studies which have described a cause-and-effect relationship between these two domains. With respect to this study also, the developmental interaction between motor development and perceived competence occurred within the context of a comprehensive preschool program, and was not affected by assignment to either of two conditions

implemented within that program.

Teacher Survey

The proposed objective of compiling and piloting a teacher survey was met in this study. The four teachers were in agreement in responding to several statements about consultant traits and teacher competencies. For example, the teachers agreed that the consultant was flexible in making changes in the lesson plans, and that the teachers were competent to make judgements regarding changes in the lesson plans. The teachers' responses to most statements, however, reflected differing individual attitudes and opinions.

Two factors appeared to have affected the teacher responses. First, the implementation of this study did not allow a typical teacher/consultant relationship. That is, the consultant was restricted from participating in implementing the curriculum due to the need to remain blind as to the group assignment of the subjects. Had the consultant been involved in the curriculum implementation, the consultant may have been perceived differently. In other than research settings, the service delivery by the consultant as was provided in this study would be termed as "indirect service" (Heron & Harris, 1987, p. 45). The alternative circumstance, "direct service", according to

Heron and Harris (1987, p. 45), is used for a situation where the consultant works with another change agent (the teacher) to change the behavior of the target individual (a child or the children). The increased responsibility given to the teachers for implementing the curriculum by using the indirect service model may have influenced more diverse responses from the teachers. That is, there was less uniformity in the implementation of the curriculum compared to having the consultant involved in the implementation, and therefore less uniformity in the responses on the survey. This survey may be useful in determining the impact of direct versus indirect consultation in future studies.

Secondly, comments from the teachers reflected an opinion that the conditions of the non-curriculum condition were difficult to maintain for some children. This information became known to the principle investigator during the treatment period, and resulted in two subjects being dropped from the study. However, these comments illustrate the importance of including open-ended questions in such a survey. Open comments may provide valuable feedback for evaluating a consultant relationship. Some authors have indicated that there is a primarily unidirectional flow of feedback from the consultant to a teacher (Conoley & Conoley, 1982; Heron & Harris, 1987). However, this survey could be used to obtain important

feedback from teachers to the consultant regarding the consultation process.

Summary

In summary, results of this study showed that a specially designed sensory-motor curriculum did not enhance the motor development of children when it was included in a comprehensive preschool program. More specifically, children who were provided a specially designed sensory-motor curriculum developed motor skills at a pace similar to a group of peers who were provided a non-curriculum condition. In addition, this study revealed a reciprocal relationship between motor development and perceived competence in preschool children.

Finally, during this study a survey was developed to evaluate the teacher-consultant relationship. This survey may be used in future research to investigate the different impacts of various consultant service models. The survey developed during this study may also serve to provide feedback in the teacher-consultant relationship.

Limitations and Directions for Future Research

Although the results of this study provided interesting findings regarding preschool children's motor development and perceived competence, certain limitations existed which

suggest directions for future research.

Sampling and Design Limitations

The children who were subjects in this study were enrolled in a university laboratory program. Due to other funded research within the preschool program, children from low income families were included in the sample. The children came from a broad range of socioeconomic backgrounds - from less educated, poorer families to highly educated, middle-to-upper income families. Although the subjects comprised a relatively diverse sample, generalizations from this study should be made cautiously due to the relatively small sample size. Additionally, there were ethnic representations within the sample for which neither testing procedure was standardized. The various ethnic backgrounds may have had greater impact in the use of the PSPC due to possible language difficulties. Some of the subjects came from families where English was not the primary language.

Considering the cultural diversity which is present in our society, norms for the various ethnic backgrounds represented in this study would be helpful in future studies. Future research could also provide important additional information if larger groups of children could be included in similar studies. Larger samples could be incorporated into future research by testing children in

more than one university laboratory program while providing the curriculum to only one program. Because intervention effects are often difficult to demonstrate on small samples, larger sample studies may demonstrate differences based on the treatment as opposed to the effects of maturation. Additionally, with larger samples, the data may be separated into age groups (3-, 4-, and 5-year-old children) for a better understanding of the developmental differences at these ages.

Larger samples may also give credence to the information gained regarding the relationship between motor development and perceived competence. Future research might include assessment of cognition and language development to determine the interrelatedness of more than two domains in childhood development.

Another design limitation within this study was the requirement for the principle investigator to remain blind as to group assignment of subjects. This prevented her from participating in the implementation of the curriculum. The inclusion of the principle investigator's expertise in the implementation of the curriculum may have influenced the effect of the curriculum on the children. Having separate individuals for testing and implementing the curriculum would overcome this limitation. Both measures have proven to have good reliability between raters, and therefore,

would accommodate such a design.

Intervention Limitations

Although both the curriculum and non-curriculum conditions were carefully planned and implemented, the intervention comprised a very small portion of the whole preschool program. Additionally, there was virtually no research control over the content of the remainder of the preschool program. A more clear measure of the impact of a sensory-motor curriculum on preschool children may be seen in future studies in which the rest of the program is more controlled for activities similar to those in the curriculum.

The curriculum used in this study is based upon a specific theoretical reference. Results of this study should not be generalized to all motor activity curricula for preschool children. However, future studies of other similar curricula is indicated. Other motor activity curricula for preschool children should be tested for their intended effects on the motor and social development of the children.

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APPENDICES

Appendix A

Sample Letter to Parents

(Oregon State University letterhead)

Child Development Center

Dear Parents:

As you are probably aware, children's abilities in physical activities (or motor ability) begin to develop at a very young age. Many people believe that programs to develop these abilities are beneficial and help children feel more competent in all activities. We will be assessing children's motor abilities (running, skipping, drawing) and how they feel about their abilities as part of a research project at Oregon State University.

This study will include evaluating each child at the beginning of the fall quarter and at the end of the spring quarter. For both the fall and spring quarters, the assessments will be done in two short time periods in game-like format. One session will be used to assess how they feel about their abilities, and one will be used to assess motor abilities. The same assessments will be done by Barbara Boucher in the fall and spring so that comparisons can be made. It is important that you do not reveal to Barbara in which group your child participates. In this way, she will not be influenced in the scoring of the evaluations.

During the school year each child will be participating in one of two programs for development of certain skills. This study will help us determine the effects of the two programs on motor abilities. Both programs are fun and considered to be beneficial preschool activities.

If you have further questions or concerns, please contact us at 737-4765. Your child's participation in this research is greatly appreciated. Thank you.

Sincerely,

Barbara Boucher
Principal Investigator

Susan M. Doescher, PhD
Major Professor

Appendix B

Teacher Orientation to the Study

I. Sensory integration theory
   - A. Ayres' work
   - B. Sensory integration development
   - C. Sensory integration with other populations

II. The study
   - A. Purpose of the study
   - B. Study design
   - C. Weekly consultations
     1. written directions
     2. demonstration of activities

III. Implementing the study
   - A. Movement Is Fun by Young (1988)
     1. space and equipment
     2. schedule
   - B. Components of teaching the group
     1. listening and giving directions
     2. assistance and reinforcement
     3. competition and safety
     4. waiting and participation
   - C. Review of sample lesson plans
   - D. The control condition
     1. space and materials
     2. assistance and reinforcement

Appendix C

Sample Lesson Plan from the Curriculum

Lesson 5
(from the unit on the tactile system)

Equipment

Two mats
Record player
Record of choice

Objectives

Assist in promoting a healthy tactile system.

Experience different textures.

Reinforce through tactile experiences the concept of between.

Generalized tactile input.

Experience deep pressure.

Activities

1) Warm-up.

2) People sandwich.
Children are divided into two groups. One group lies between two mats (the sandwich). The other group goes over them by crawling, rolling, or walking. When ready to change groups, the teacher "lies" on top to "squish" them out. The children crawl out and change places.

3) Going swimming.
The children pretend they are going swimming by moving on the carpet with swimming motions. They then pretend to get out of the pool and "dry off", using the carpet as a towel. The teacher says, Dry your arms on the 'towel'. Dry your face on the 'towel', and continues until body parts such as noses, feet, knees, and arms are "dry".

4) Relaxation.
The children lie in the "sun" very quietly. As the teacher touches each child, the child "shuffles" his or her feet in the "sand" to line up.

Suggestions

Keep the children's heads out from under the

mat. If there is only one mat, a carpet or many carpet squares can be under the children.

A Beach Boys record is fun to use while "swimming".

The children enjoy telling the teacher what kind of "sandwich" they want to be.

When changing groups, be sure the children are separated. They tend to get excited as they come out of the "sandwich" and can bump into each other.

Appendix D
Student Attendance & Participation Record

Name:_____

Week	Tuesday	Wednesday	Thursday	Friday
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Code: A = Absent
Participation scale:
1=did not participate 2=25% participation
3=50% participation 4=75% participation 5=100%
Observation (child observing other children) or engaging in other than program behaviors = non-participation

Appendix E

Teacher Survey

Please **circle** the appropriate number.

Which Early Childhood professional level are you? (Levels defined according to the National Association for the Education of Young Children.)

1 Level 1 - Early Childhood Teacher Assistant: high school diploma and no specialized Early Childhood preparation

2 Level 2 - Early Childhood Associate Teacher: associate degree in early childhood education/child development

3 Level 3 - Early Childhood Teacher: baccalaureate degree in early childhood education/child development

4 Level 4 - Early Childhood Specialist: graduate degree in early childhood education/child development and/or Level 3 with three years experience

How many years of employed experience in the field of early childhood education/child development do you have at this level?

1 0 to 2 years

2 3 to 6 years

3 7 to 10 years

4 More than 10 years

Please respond to each statement according to the code:

1 strongly agree **2** agree **3** neutral **4** disagree **5** strongly disagree

1 2 3 4 5 The consultant explained the theoretical basis for the curriculum in terms understandable to me.

1 2 3 4 5 The consultant explained techniques to be implemented in the curriculum in terms understandable to me.

1 2 3 4 5 The consultant demonstrated techniques to be implemented in the curriculum when necessary and in an understandable manner.

1 2 3 4 5 The consultant provided the equipment and materials needed to implement the curriculum.

1 2 3 4 5 The consultant adapted lesson plans as necessary for repeating the lesson plan daily within each week.

1 2 3 4 5 The consultant adapted lesson plans as necessary due to the particular physical aspects of the preschool.

1 2 3 4 5 The consultant established a climate of mutual trust with the me.

1 2 3 4 5 The consultant asked for my ideas for adaptations or changes in the lesson plans.

1 2 3 4 5 The consultant incorporated my ideas for adaptations or changes in the lesson plans.

1 2 3 4 5 The consultant was timely in providing information to me.

1 2 3 4 5 The consultant answered my questions adequately.

1 2 3 4 5 The consultant responded to my questions in an adequate amount of time.

1 2 3 4 5 The consultant was flexible for changes or adjustments to applying the conditions of the intervention.

1 2 3 4 5 The consultant provided information which was relevant to the implementation of the intervention.

1 2 3 4 5 The consultant remained focused on topics and information related to the intervention during consultations.

1 2 3 4 5 The consultant provided adequate information for me to implement the intervention.

1 2 3 4 5 After review with the consultant, I was able to follow the lesson plans as written.

1 2 3 4 5 The intervention recommended was appropriate for the level of skills of the children.

1 2 3 4 5 The intervention benefitted the children.

1 2 3 4 5 With the support of the consultant, I had the skills necessary to implement the intervention.

1 2 3 4 5 I was comfortable in modifying the intervention to maximize the children's participation in the intervention.

1 2 3 4 5 I felt competent to make judgements regarding changes in the lesson plans.

1 2 3 4 5 I was provided with adequate consultation and support from the consultant throughout the school year.

1 2 3 4 5 I was given adequate information and explanation of the lesson plans.

1 2 3 4 5 The consultant monitored the program in a consistent manner ie her recommendations for problem-solving were similar in each case.

1 2 3 4 5 The consultant attempted to build a relationship with me prior to the implementation of the intervention.

1 2 3 4 5 The consultant displayed active listening during interactions with me.

1 2 3 4 5 The consultant displayed empathy when appropriate during our interactions.

1 2 3 4 5 Appropriate self-disclosure was given by the consultant during our interactions.

1 2 3 4 5 The consultant helped me establish priorities in the implementation of the intervention.

1 2 3 4 5 I was positively reinforced by the consultant for my questions or suggestions.

1 2 3 4 5 The intervention would be more successful if the consultant was directly involved with the implementation of the intervention.

1 2 3 4 5 I have learned new information about preschool children's development of physical skills through implementing the intervention.

1 2 3 4 5 I have a better understanding of a consultant relationship in an educational setting after participating in this project.

1 2 3 4 5 The small gains made by the children as a result of the intervention are not worth the efforts to include it in program.

1 2 3 4 5 Other more important developmental areas were sacrificed with the inclusion of the intervention in the program.

1 2 3 4 5 I disliked having to accommodate for the intervention in the program.

1 2 3 4 5 The consultant explained the research basis for inclusion of the non-curriculum group.

1 2 3 4 5 The consultant explained the implementation of the non-curriculum condition.

1 2 3 4 5 The consultant was open to discussion of changes in the non-curriculum condition.

1 2 3 4 5 The consultant incorporated my ideas for changes or adaptations to the non-curriculum condition.

1 2 3 4 5 The consultant explained reasons why suggested changes were not made to the non-curriculum condition.

1 2 3 4 5 The non-curriculum condition had no effect on the children.

1 2 3 4 5 The non-curriculum condition had a detrimental effect on the children.

1 2 3 4 5 The children benefitted from the non-curriculum condition.

1 2 3 4 5 I felt competent to make judgements regarding changes in the non-curriculum condition.

1 2 3 4 5 The consultant helped me establish priorities in the implementation of the non-curriculum condition.

Do you have anything additional to add which was not covered in this summary?

Please add any comments regarding the research process in this early childhood program where you were a teacher, but which you did not direct.

Please add any comments regarding the inclusion of motor development activities in an early childhood educational setting.

Did you use the preschool director as an intermediary between you and the consultant? How often and why?

What advantages and/or disadvantages were there to using the preschool director as an intermediary between you and the consultant on occasion?

Appendix F

Parent Questionnaire

Child's first name _____

Number of adults in the home _____

Number of children in the home _____

Does an adult in the home participate in any organized team or competitive sports (i.e., volleyball, tennis, bowling, racquetball, basketball, softball)? Yes___ No___

Activity (specify which one)	Average amount of time per week
_____	_____
_____	_____

Is your child enrolled in any organized team sports (i.e., soccer, little league baseball)? Yes___ No___

Activity (specify which one)	Average amount of time per week
_____	_____
_____	_____

Is your child involved in any classes to develop specific individual skills (i.e., ballet, dance, gymnastics)? Yes___ No___

Activity (specify which one)	Average amount of time per week
_____	_____
_____	_____

Does any adult or older child spend individual time with your preschool child developing skills such as throwing, skipping, or batting on a regular basis? Yes___ No___

Activity (specify which one)	Average amount of time per week
_____	_____
_____	_____

Does your preschool child own a tricycle or bicycle? Yes___ No___

Does your preschool child ride the tricycle or bicycle?
Yes__ No__

Is a gym set or swing set available for your preschool child to use? Yes___ No___

How many hours per week does your preschool child play on a gym or swing set? _____