



Analysis of Manipulative Motor Activity Development Needs in Children Aged 4–6 Years: A Qualitative Study

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ABSTRACT

This study aimed to analyze the needs for developing manipulative movement learning activities for children aged 4–6 years based on teachers' perspectives at Kiddyland Gym and Pre-School. A descriptive qualitative approach was employed, involving three teachers (G1, G2, and G3) through guided interviews covering 11 aspects. Data were analyzed thematically through coding, categorization, theme identification, and cross-source comparison. Five major themes emerged. First, children's manipulative movement abilities were generally perceived as good, although developmental monitoring relied mainly on daily observations and sports participation. Second, environmental and social interactions provided essential stimulation and movement learning opportunities through active engagement and imitation. Third, movement development was influenced by age, motor ability, strength, activity levels, daily routines, and parental stimulation. Fourth, effective learning strategies included varied play-based activities, creative movement, music, scheduled motor activities, structured sessions comprising warm-up, main activities, and cool-down, and progression from simple to complex movements. Fifth, Montessori materials were perceived to support manipulative movement skills, independence, and sensory, motor, and cognitive development. These findings highlight the need for structured, varied, enjoyable, adaptive, and progressive movement activities, supported by appropriate modifications and simple observation indicators. The findings provide an empirical foundation for developing a manipulative movement activity model or e-module tailored to children aged 4–6 years.

Keywords: manipulative movement; early childhood; play activity; Montessori; motor development.



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INTRODUCTION

Early childhood is a crucial period for physical, motor, cognitive, social, and emotional development (Dorji et al., 2020), because at this stage, children need learning experiences that allow them to move, play, explore, and actively interact with their environment (Buckler, E. J., Puterman, E., & Faulkner, 2021; Elsborg et al., 2021; Martínez-Bello et al., 2023). Physical activity and active play are not only

recreational activities, but also part of the learning process that can support the development of children's various skills (Utoyo et al., 2020). The World Health Organization (WHO) identifies physical activity as one of the key components in supporting the health and development of young children. Children need to have sufficient opportunities to move and engage in active play as part of their daily lives (WHO, 2024). One important aspect of children's motor development is fundamental movement skills (FMS), which include locomotor, non-locomotor, and manipulative skills (Bolger et al., 2021; Dewi & Verawati, 2022; Jones et al., 2020; Komaini et al., 2023). Manipulative movements, or object-control skills, relate to a child's ability to control, grasp, or throw an object (Pamungkas et al., 2022). These skills include, among others, holding, throwing, catching, kicking, hitting, bouncing, and dribbling a ball. Mastering manipulative motor skills at an early age is important because they form the foundation for children to participate in various games, sports, and more complex physical activities in later stages of development (Ardanari et al., 2020). Research by (Ludyana et al., 2022), shows that FMS development programs for preschoolers can contribute to improvements in motor skills, including object control skills.

However, the motor development of young children is not determined solely by the frequency of their physical activity; the quality of their motor experiences, the learning environment, the variety of activities, opportunities to try new things, and support from teachers and adults also play an important role (Imani et al., 2020; Newell & Rovegno, 2021). An environment that provides children with opportunities to engage in various forms of movement can offer them a wider range of motor experiences (Ardoin & Bowers, 2020). Activities such as throwing, catching, running, jumping, climbing, and combining various movement patterns can create a more meaningful learning experience. Therefore, motor skill learning for young children should be designed to be engaging, aligned with children's developmental characteristics, and provide opportunities for children to learn through play. The Montessori approach is also relevant in the context of motor skill development because it emphasizes the importance of the learning environment and the use of materials appropriate to children's developmental needs (Lillard, 2021; Qadafi, 2023). Learning materials can provide children with opportunities to

explore, engage in repetitive activities, and develop independence. In the context of manipulative play, the use of appropriate materials has the potential to integrate sensory, motor, and cognitive stimulation into a single learning experience (Rusli et al., 2022). Thus, a structured learning environment that still allows room for exploration can be one approach to supporting children's motor development.

At Kiddyland Gym and Pre-School, teachers support children's manipulative movement through sports, games, and daily activities. However, interview findings did not identify a structured guide with clear objectives, progressive difficulty, adaptable activities, and assessment indicators. This study addresses the need to translate existing teaching practices into structured, developmentally appropriate manipulative movement activities for children aged 4–6 years. Its novelty lies in integrating the perspectives of three teachers across 11 interview aspects using source triangulation. The findings provide an empirical basis for designing varied, play-based, progressive, and adaptable activities. Thus, this study contributes context-specific design requirements for future instructional model or e-module development, rather than evaluating product effectiveness.

METHOD

This study uses a descriptive qualitative approach (Silverman, 2022), to gain an understanding of teachers' perspectives on the development of manipulative motor skills in children aged 4–6 years, as well as the teaching practices implemented in a natural setting at Kiddyland Gym and Pre-School. This approach was chosen because the study focuses on exploring teachers' experiences, views, and practices in providing motor stimulation to children, so that the data can be understood in depth based on the context and perspectives of the informants. The research data consisted of interview transcripts with three teachers at Kiddyland Gym and Pre-School, who were subsequently coded as G1, G2, and G3 to protect the informants' identities. The interviews were conducted on August 10, 2026, and included 11 guided questions related to children's manipulative motor skills, the role of the environment and social interaction, motor development assessment, factors influencing motor development, learning strategies, the development of motor skills, play activity strategies, the application of Montessori principles, the use of Montessori materials, the implementation of motor activity guidelines, and play

strategies for children aged 4–6 years. Thus, the research data specifically represent the teachers' perspectives on the conditions and needs for manipulative motor learning in the school environment.

The data were analyzed using thematic analysis to identify patterns, meanings, and themes emerging from the informants' responses as a whole. The analysis process was conducted in stages, beginning with a review of all interview data, followed by preliminary coding of information relevant to the research focus, grouping codes based on shared meanings, forming themes, reviewing the alignment of themes with the data, and interpreting patterns in the findings. Next, the responses from G1, G2, and G3 were compared across each aspect of the questions to identify similarities, variations, and differences in emphasis among the informants. This process was used to obtain a more comprehensive picture of the needs for developing manipulative movement activities for children aged 4–6 years.

Data validity was ensured through source triangulation by comparing the information provided by the three teachers regarding the same aspects of the questions. Source triangulation is used to assess the level of consistency in information among informants while identifying different perspectives in explaining the phenomenon under study. In this study, triangulation is limited to source triangulation because the available data comes from interviews with three teachers. Therefore, this study does not claim to have used technique triangulation, direct observation, field documentation, or member checking if those procedures were not carried out. This approach is used to ensure that the resulting interpretations remain consistent with the available empirical data and do not go beyond the information provided by the informants.

RESULTS

Analysis of the 11 questions yielded five main themes. The patterns of the findings showed a high degree of convergence regarding the importance of the environment, motor activities, play, and variety in learning. Differences among teachers primarily concerned which aspects they emphasized more, rather than a rejection of the main themes.

1. Teachers' Perceptions of Manipulative Motor Skills

All three teachers gave positive assessments of the children's manipulative motor skills. Teacher 1 stated that the children's skills were evident in their daily lives and during physical education classes. Teacher 2 noted that the children were already proficient in manipulative movements, while Teacher 3 linked good motor skills to cognitive abilities in typically developing children aged 4–6 years. These findings indicate a general perception that manipulative motor skills are not considered a major area of weakness in the school setting.

"The children are already good at performing manipulative movements"
(G2/Kiddyland/10-08-2026)

However, the findings cannot be interpreted as objective evidence that all children have mastered manipulative movements. The teachers' statements are perceptions based on observations of daily activities and physical education classes. This actually highlights the need for more systematic observation guidelines or indicators if future product development is aimed at assessing children's abilities.

2. The Environment and Social Interaction as a Supporting Ecosystem

The triangulation reveals a very clear alignment on the theme of the environment. G1 views the environment and social interactions as mentors for children through the process of imitation. G2 states that the role of the environment is very important, while G3 emphasizes an active environment involving interactions between adults and children. Thus, all three sources position the environment not merely as a setting for learning, but as a stimulus that supports motor development.

"The environment plays a crucial role in supporting children's motor development, as an active environment with frequent interaction between adults and children can enhance motor skills." (G3/Kiddyland/10-08-2026)

This finding is consistent with the research (Padli et al., 2025), which views opportunities for movement, play, and interaction with the environment as essential components in the development of children's basic motor skills.

3. Developmental Assessments Are Still Based on Activity Observations

The motor development assessment practices reported by teachers were primarily conducted through direct observation of children's activities. G1 emphasized the importance of careful and ongoing observation, while G2 assessed

the alignment of children's movements with the teacher's instructions during physical education activities. Meanwhile, G3 observes children's ability to grasp and throw objects through gym or sports activities. These findings indicate that the assessment process has been conducted contextually through children's natural activities. However, based on the available interview documents, no information has been found regarding the use of assessment rubrics or standardized instruments to systematically identify manipulative motor development.

"A child's development of manipulative skills can be assessed by directly observing the child while he or she is engaged in various activities." (G1/Kiddyland/10-08-2026).

These findings have important implications for the development phase, as activity tools should not only include game steps but also incorporate simple, operational observation indicators that can help teachers systematically monitor children's motor development. These indicators need to be designed in accordance with the characteristics of the activities and the children's developmental levels so that they remain easy to use in the context of daily learning. The literature indicates that the assessment of fundamental movement skills (FMS) can be conducted using various instruments, including the Test of Gross Motor Development (TGMD)(Duncan et al., 2022), and the Peabody Developmental Motor Scales-2 (PDMS-2). However, the choice of assessment tool should take into account the purpose of the assessment, the child's characteristics, and the context in which it will be used.

4. *Factors Affecting Development: Age, Activity, Habits, and Parental Stimulation*

The responses of the three teachers indicate that children's motor development is viewed as a process influenced by various complementary factors. G1 emphasized the role of habits instilled by parents from an early age, including play, exercise, and participating in activities that interest the child. G2 identified age, daily activities, and the child's activity level as contributing factors, while G3 emphasized age, motor skills, and the child's experience in performing daily activities. The results of source triangulation reveal a shared perspective that motor development is related not only to a child's individual characteristics but also to the

motor experiences routinely gained in the everyday environment. G1's emphasis on parental stimulation broadens the understanding of the context of motor development from the school environment to the family environment. These findings have implications for the development of instructional materials, namely the need to include simple guidelines for teachers and parents so that motor stimulation can be carried out consistently, both in the school setting and outside of learning sessions. Thus, play habits and physical activities introduced from an early age can be an important part of the learning experience that supports children's motor development.

5. *Learning Strategies: Lots of Movement, Play, Music, and Progression*

In terms of learning strategies, the three teachers shared a common view on the importance of providing children with adequate opportunities to engage in motor activities. G1 suggested using icebreakers before lessons and traditional games to increase children's engagement. Meanwhile, G2 and G3 both emphasized the need to increase motor activities in the learning process. This consistency indicates that movement experiences are viewed as an important part of the early childhood learning process, not merely as supplementary activities. Regarding play activities, all three teachers also emphasized the importance of activities that are engaging and not monotonous. G1 tailored activities to the children's interests and incorporated music into the activities; G2 used games to create a playful atmosphere; and G3 combined various movement patterns, such as jumping, running, and throwing. These findings indicate that activity variety and alignment with children's interests are key considerations in designing movement-based learning experiences. Therefore, the activities developed should allow for exploration, variety in movement, and active participation by the children, while maintaining the characteristics of fun, play-based learning.

"Creativity in performing motor activities and engaging in activities that aren't monotonous, such as a combination of jumping, running, and throwing."
(G3/Kiddyland/10-08-2026)

These findings reinforce the need for physical activities that integrate play with a clear learning structure. This approach allows children to gain motor experience in a fun environment, while providing systematic guidance toward the

skills they aim to develop. In line with this, various studies on fundamental movement skills (FMS) interventions in preschool settings show that structured activities can support the development of object control and locomotor skills, including the abilities to throw, catch, and kick (Amini et al., 2020; Ockta et al., 2024; Weir et al., 2024). Therefore, the design of manipulative movement activities should retain the playful nature that suits children's needs, while still being structured around clear objectives, stages, and levels of difficulty.

6. *Montessori and Materials as Tools for Fostering Independence and Stimulation*

Regarding the application of Montessori principles, the teachers' responses indicated that manipulative movement activities are viewed as capable of being integrated with various forms of motor stimulation. G2 linked the development of manipulative movement to gross motor activities and sports, while G3 associated it with gross motor activities as well as the Practical Life (EPL) and Sensorial areas. These perspectives suggest that motor development can be incorporated into a learning environment that provides children with opportunities to use their bodies and interact directly with various objects. Responses regarding the use of Montessori materials also revealed positive perceptions from all three teachers. G1 emphasized that Montessori materials can support both children's independence and their cognitive development. G2 viewed these materials as highly beneficial for the development of manipulative movement, while G3 highlighted the diversity of materials that can be used to stimulate sensory, fine motor, and gross motor skills. These findings indicate that material variety can be a key consideration in designing richer manipulative movement activities that align with children's developmental needs. However, teachers' positive perceptions of these materials should be understood as findings based on their experiences and the informants' perspectives, not as empirical evidence of the effectiveness of Montessori materials in improving children's motor skills.

"Montessori materials are very helpful in developing children's fine motor skills independently; they can also help develop children's cognitive abilities."
(G1/Kiddyland/10-08-2026)

These positive perceptions align with the results of a research synthesis indicating that the Montessori approach makes a positive contribution to several aspects of child development, including motor skills. However, these findings must be viewed in proportion to the context of this study. This study did not test the effectiveness of the Montessori approach or materials; rather, it identified teachers' perceptions as part of a needs analysis. Therefore, teachers' positive views of Montessori materials are more appropriately positioned as a basis for consideration in designing learning activities and environments, rather than as evidence of a causal relationship between the use of Montessori materials and improvements in children's manipulative motor skills.

7. *Implementation Model: Modifications, Schedule, and Session Structure*

The interview data also illustrates how movement activities are implemented in learning practices. G1 explained that movements can be modified and combined with songs, accompanied by assistance and guidance until children are able to perform the activities independently. G2 incorporates movement activities through games, such as kicking, catching a ball, running, and crawling. Meanwhile, G3 noted that physical education activities are conducted on a scheduled basis through gym class and outdoor class. Regarding learning strategies, G1 emphasized the importance of structuring movements from easy to more difficult levels and the use of music, whereas G2 and G3 emphasized an activity structure consisting of a warm-up, the main game or activity, and a cool-down. These findings indicate that the required physical activities are not merely a collection of games but rather learning guidelines that offer both structure and flexibility. Ideally, these guidelines should include movement objectives, implementation steps, difficulty levels, alternative variations or modifications, the materials used, and the structure of each session. With these characteristics, teachers have a clearer framework for tailoring activities to children's abilities and needs, without losing the elements of play and exploration that are central to early childhood learning.

Table 1. Source Triangulation Matrix

Theme	G1	G2	G3	Triangulation Findings
Manipulative Movement Skills	Good; evident in daily activities and sports	Good	Good in movement/sports activities and associated with thinking	Convergent : Children's manipulative movement abilities were generally perceived as good.
Social Environment	Highly influential; children learn through imitation	Highly important	Highly important; an active environment supports motor development	Strong convergence : The social and physical environment is perceived as an important factor supporting motor development.
Assessment	Careful and continuous observation	Observation during sports activities and children's ability to follow instructions	Observation during gym/sports activities	Convergent : Assessment is primarily contextual and observation-based.
Developmental Factors	Parental stimulation, play, and physical activity	Age, daily activities, and activity level	Age, motor strength, and daily activities	Convergent with different emphases : Development is perceived as influenced by both child characteristics

				cs and daily movement experiences.
Learning Strategies	Break activities and traditional games	Frequent motor activities	Motor activities	Convergent : Active motor-based activities are considered important in learning.
Engaging Activities	Children's interests and music	Games	Movement variation and combinations	Convergent : Play, variation, and children's interests are important for maintaining engagement.
Montessori/Materials	Independence and cognitive development	Supports movement development	Sensory, fine motor, and gross motor stimulation	Positive convergence: Montessori materials are perceived as beneficial for children's development, with different areas of emphasis.
Implementation	Modification, songs, and guidance	Sports-based games	Scheduled gym and outdoor activities	Convergent with differences in practice: Teachers implement movement activities through varied approaches

DISCUSSIONS

The research findings indicate that teachers view the manipulative motor skills of children aged 4–6 years at Kiddyland Gym and Pre-School as generally well-developed. This perception is evident in the children's ability to perform various daily motor activities and participate in sports. However, interview results also indicate that the process of identifying motor development is still primarily conducted through observation of children's natural activities, such as play, participation in sports activities, and their ability to follow teachers' instructions. G1 specifically emphasized the importance of careful and continuous observation, while G2 and G3 linked assessment to children's performance during sports and physical activities. This situation indicates that teachers already possess practical experience in recognizing children's motor development, but the information obtained remains contextual and does not yet demonstrate the use of structured developmental indicators. In the context of developing learning activities, this is significant because a child's success in completing a game does not always indicate that the child has mastered the motor skills targeted by the learning objectives (Rihatno & Nuraini, 2021; Roscoe et al., 2024; Rusli et al., 2022). Therefore, the activities developed should be accompanied by simple observation indicators that allow teachers to track children's developmental progress more systematically without compromising the natural character of play-based learning.

Further findings reveal that the environment and social interactions are integral parts of children's motor experiences. All three teachers consistently identified the environment as a factor that supports motor development. Teacher 1 explained that children can learn through imitation, while Teachers 2 and 3 emphasized the importance of an active environment and interactions between children and adults. These perspectives indicate that motor development does not occur in isolation from children's social experiences. Children have the opportunity to observe, try, repeat, and adjust their movements through interactions with those around them. Thus, the learning environment should not only provide space for movement but also create an atmosphere that encourages children to be bold in

trying new things and to gain repeated motor experiences. This perspective is crucial in early childhood education because teachers do not merely act as instructors but also as facilitators who create a learning environment that is safe, active, and responsive to the needs of each child (Buckler et al., 2023; Vinci et al., 2023).

Another notable aspect is the nature of activities that can sustain children's engagement. All three teachers shared the view that motor activities should be engaging and not monotonous. The importance of tailoring activities to children's preferences and using music when children showed interest in activities accompanied by songs. Teacher 2 emphasized the use of games, while Teacher 3 suggested fostering creativity through a combination of various movement patterns, such as jumping, running, and throwing. These findings indicate that manipulative movement activities for young children should be embedded within meaningful play experiences, rather than presented as repetitive and rigid exercises. Play provides children with the space to move while exploring, making simple decisions, interacting with others, and enjoying the learning process (Ardanari et al., 2020; Irawan et al., 2021; Sääkslahti & Niemistö, 2021). Thus, the element of fun is not merely an afterthought, but an essential part of the activity design to encourage children to actively participate.

Interestingly, the interview results also showed that teachers have applied the principle of flexibility in providing movement experiences. The movements can be modified according to children's needs, and children who experience difficulties can be given instructions and guidance until they are able to perform activities independently. These findings indicate that movement learning needs to accommodate differences in individual abilities. Children aged 4–6 do not always have the same level of motor readiness, even within the same age group. Therefore, activities should not be designed with a single difficulty level for all children but should provide variations or modifications that allow each child to participate according to their abilities and developmental stage. This approach can also help teachers shift from an outcome-oriented learning model to one that values the process, effort, and individual development of each child.

Findings regarding the progression of activities further reinforce this need. Motor skill learning can be broken down and organized from the easiest movements to the more difficult ones. In teaching practice, an activity structure consisting of a warm-up, a game or core activity, and a cool-down. This structure provides an important foundation for the development of more systematic manipulative movement activities. This means that the learning materials developed should not merely provide a list of games but must also offer a clear sequence of learning experiences. Activities can begin with simple movements and then progress toward combinations of movements that require more complex coordination and object control. With this structure, children have the opportunity to build skills gradually, while teachers have guidelines for selecting activities appropriate to the children's readiness.

The use of Montessori materials was also a key finding in this study. All three teachers expressed positive views regarding the use of Montessori materials in supporting motor development. Teacher 1 emphasized that Montessori materials can help children develop manipulative skills independently while also providing cognitive stimulation. Teacher 2 viewed these materials as aiding the development of manipulative motor skills, while Teacher 3 highlighted the diversity of materials that can be used for sensory, fine motor, and gross motor stimulation. These findings indicate that learning materials are viewed not merely as aids but as an integral part of the environment that provides children with opportunities to touch, hold, move, control, and explore objects. In the context of developing manipulative motor activities, this principle can be translated into the use of materials that are simple, safe, engaging, and enable children to engage in activities actively and progressively (Bulubaan et al., 2023; Ludyana et al., 2022).

However, the findings regarding Montessori must be interpreted with caution, as teachers' positive perceptions of Montessori materials cannot be directly interpreted as evidence that these materials are effective in improving children's manipulative motor skills. The data from this study only reflect teachers' experiences and views regarding the benefits of these materials in the learning process. Therefore, the Montessori findings are best considered as a basis for designing learning environments and media. The effectiveness of the materials or

approaches developed still needs to be tested through further research with a design that allows changes in children's motor skills to be systematically observed and measured. Overall, the research results show that the need to develop manipulative motor activities at Kiddyland does not arise solely because teachers assess children's motor skills as still being low. Rather, the need for development arises because there is an opportunity to improve the quality of existing movement-based learning experiences. Teachers already employ practices such as games, sports activities, the use of music, movement modifications, and scheduled activities. The next developmental challenge is to organize these practices into a more systematic, progressive, varied, and responsive framework that accounts for differences in children's abilities.

Thus, the research findings point to the need for a model or e-module for manipulative movement activities that integrates play, movement variations, music, the use of media, progression in difficulty levels, activity modifications, and indicators for observing development. Ideally, such a product should retain the characteristics of early childhood learning which are fun and child-centered while also providing a structure that helps teachers plan, implement, and monitor motor activities. With this approach, the development of manipulative motor activities is not only aimed at encouraging children to move more actively but also at creating meaningful, inclusive, gradual, and developmentally appropriate motor learning experiences tailored to each child's needs. Based on triangulation, developmental needs can be formulated in the following sequence: active environment → opportunities for play and interaction → varied motor activities → repetitive and progressive manipulative movement exercises → developmental observation → activity modification → child autonomy. In this sequence, the teacher serves as a facilitator who adjusts the level of difficulty, materials, music, games, and assistance according to the child's needs. This conceptual model is an analytical synthesis of interview data, not a causally validated model. Therefore, empirical validation of the model is still required in subsequent research phases.

Table 2. Product Development Implications

Product Component	Data-Derived Needs	Design Implications
Movement Objectives	Teachers observe children's abilities to grasp, throw, catch, and kick.	Each activity should have a clearly defined movement objective.
Progression	Movements should be organized from easy to difficult.	Provide progressive levels (Levels 1–3) or sequential stages.
Play-Based Activities	Games and traditional games are perceived as engaging for children.	Incorporate play-based activities into the learning design.
Variation	Activities should avoid monotony and include combinations of movements.	Integrate locomotor and manipulative movements.
Music	Music increases children's enthusiasm and helps them remember movements.	Provide activity options incorporating music or rhythm.
Learning Media	Montessori materials are perceived as supportive of children's development.	Use safe, simple, and varied learning materials.
Adaptation	Movements can be modified according to children's individual needs.	Provide easy, moderate, and challenging activity alternatives.
Independence	Teachers provide guidance until children are able to perform activities independently.	Include guidance strategies and gradual reduction of teacher assistance.
Assessment	Teachers use observation to monitor children's development.	Provide a simple observation checklist or rubric.
Session Structure	Activities follow a warm-up–main activity–cool-down structure and are scheduled.	Provide a consistent and clearly organized session format.

CONCLUSIONS

This study found that teachers generally perceived the manipulative movement skills of children aged 4–6 years at Kiddyland Gym and Pre-School as well developed, although monitoring relied mainly on observations during daily activities, play, and sports. The findings highlighted several supporting factors, including an active environment, social interaction, parental stimulation, children's engagement, and varied play experiences. Teachers' existing strategies involved motor activities, games, music, and movement variations. These findings indicate the need for structured yet flexible learning activities that are enjoyable,

progressive, and adaptable to children's abilities. Key development characteristics include clear movement objectives, varied games and materials, modifications in difficulty levels, opportunities for independence, and simple observation indicators. Montessori principles may inform activity and material design, although their effectiveness was not established in this study. The study contributes an empirical basis for developing a manipulative movement learning model or e-module. However, the findings are limited to the perspectives of three teachers from one institution and interview data, without direct observation or measurement of children's motor skills. Future research should proceed with product development, expert validation, practicality testing, pilot implementation, and effectiveness testing using appropriate instruments, such as the Test of Gross Motor Development (TGMD).

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