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**Research Paper**

# Developing A Scale to Assess the Interaction Between Sensory Perception and Motor Skill Among Primary School Students

**Dr. Sanaa Abdul Ameer Abed**

Faculty of Physical Education and Sports Sciences, Al-Mustaqbal University, Iraq

**Corresponding Author:** *Dr. Sanaa Abdul Ameer Abed

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**ABSTRACT**

The interaction between sensory perception and motor skills is one of the fundamental pillars of healthy child development, especially during the primary education stage, which witnesses significant development in the functions of the central nervous system. In this context, the current research aims to develop a standardized scientific scale to measure this interaction among students in grades three to five in schools in Babil Governorate, using a descriptive and analytical approach. A 26-item instrument was developed, divided into four dimensions (visual perception, auditory perception, balance perception, and sensorimotor coordination). Its psychometric properties were verified by applying it to a sample of 120 male and female students. The results showed high reliability using Cronbach's alpha coefficient, ranging between 0.77 and 0.86, confirming the internal consistency of the instrument. Statistical correlation tests also revealed significant relationships between the scale's dimensions and motor skill tests (running, balance, jumping, and visual-motor coordination), indicating the validity of the scale. Analyses revealed statistically significant differences in favor of males, as well as between educational levels, with sensorimotor interaction levels increasing with grade. This research is consistent with previous literature emphasizing the close link between sensory perception and motor development. It emphasizes the importance of using the scale in the early detection of sensorimotor interaction difficulties and designing appropriate educational intervention programs. It also points to the need to train teachers and provide a supportive learning environment to implement the scale's tests effectively.

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## 1. INTRODUCTION

Early childhood, particularly primary school, is one of the most important developmental stages during which a child's cognitive and skill foundations are formed. During this stage, the central nervous system develops and integrates with the child's motor functions, enabling them to interact with the environment in a more complex and mature manner. One of the most prominent elements of this interaction is sensory perception, which is a major gateway for receiving information from the surrounding environment and transforming it into organized motor responses appropriate to the nature of the situation. Sensory perception is not merely a mental process isolated from the body; rather, it is closely linked to motor skills, as motor skills are built on the

child's ability to interpret sensory signals such as touch, sight, hearing, and balance. Therefore, the interaction between sensory perception and motor skills represents a vital aspect of a child's behavioral and cognitive development and is an important indicator of the integrity of their neurosensory development.[1] Despite the significant importance of this interaction, the educational, psychological, and physical education literature demonstrates a dearth of accurate and comprehensive measures that enable researchers and teachers to assess this interaction objectively and scientifically.[2] This hinders early intervention and educational diagnosis in schools. Based on this deficiency, the importance of this research lies in developing a robust measure that assesses the interaction between sensory perception and motor skills in primary school students. This measure is achieved by developing standardized quantitative tools by the principles of educational measurement and evaluation.

**Research Problem**

The research problem lies in the absence of a standardized scientific measure that can be used to assess the relationship between sensory perception and motor skills in primary school students. This hinders teachers and specialists in educational and physical education from early detection of weaknesses in this relationship and developing appropriate programs to address or develop them. Accordingly, the main research question is formulated as follows:

To what extent is a developed measure effective in assessing the interaction between sensory perception and motor skills in primary school students?

## 2. RESEARCH OBJECTIVES

1. Develop a scientific measure to assess the interaction between sensory perception and motor skills in primary school students.
2. Verifying the scale's psychometric properties (validity, reliability, and objectivity).
3. Determining the level of interaction between sensory perception and motor skills in a sample of primary school students.

**Research Hypotheses**

1. There is a statistically significant correlation between students' scores on the sensory perception scale and their scores on motor skills tests.
2. The developed scale has a high degree of validity and reliability.
3. Students can be classified into different levels in terms of sensory-motor interaction based on the scale results.

**Research Areas**

Human domain: Students in the third, fourth, and fifth grades of primary school.

Temporal domain: From October 2024 to March 2025.

Spatial domain: Primary schools in Babylon Governorate.

## 3. RESEARCH METHODOLOGY

The researcher used the descriptive analytical approach as it is most appropriate for the nature of the research, which aims to develop a scale and evaluate the relationship between two variables without direct experimental intervention.

**Research Sample:** The sample consisted of (120) male and female students from primary schools. They were randomly selected according to class and gender, representing the study population in a balanced manner.

**Tools and Devices Used**

1. A sensory perception scale (developed).
2. Basic motor skills tests (running, jumping, balance, coordination).
3. Measuring tools such as stopwatches, hurdles, cones, a balance mat, and measuring rulers.

**Exploratory Experiment:** The pilot experiment was conducted on a sample of (20) students to verify the validity of the measurement tools, adjust the formulations, determine the time required for application, and determine the extent of students' understanding of the instructions.

**Main Experiment:** The main experiment was conducted on the primary sample after ensuring the readiness of the tools and scales. Data on sensory perception and motor skills were collected for statistical analysis.

**Tests and Measurements Used**[3]

1. Visual Shape and Size Recognition Test.
2. Auditory Stimuli Discrimination Test.
3. Static and Dynamic Motor Balance Test. Hand-eye coordination test using a small ball.

**Statistical methods**

The statistical package SPSS from IBM (version V26) was used.

1. Mean and standard deviation.
2. Pearson's correlation coefficient.
3. Split-half reliability.
4. Test for significant differences.
5. One-way analysis of variance (ANOVA).

## 4. RESULTS

**Table 1:** Means and standard deviations of the scale items after the main application

| Sub-dimension of the scale | Number of items | Mean | Std | Arrangement |
|---|---|---|---|---|
| Visual Perception | 8 | 4.22 | 0.61 | 1 |
| Auditory Perception | 6 | 4.08 | 0.74 | 2 |
| Balance Perception | 5 | 3.95 | 0.81 | 3 |
| Sensorimotor Coordination | 7 | 3.85 | 0.79 | 4 |
| **Total** | 26 | **4.03** | **0.73** | — |

The results indicate that all dimensions of the scale fall within a high level of response, reflecting the validity of the scale items for measuring sensorimotor interaction.

**Table 2:** Reliability coefficient using Cronbach's alpha coefficient for each dimension

| Distance | Cronbach's α |
|---|---|
| Visual Perception | 0.84 |
| Auditory Perception | 0.79 |
| Balance Perception | 0.81 |
| Sensorimotor Coordination | 0.77 |
| Total Scale | **0.86** |

All reliability coefficients fall within the scientifically accepted limits (>0.70), indicating high internal consistency of the scale.

**Table 3:** Pearson's correlation coefficient between the scale dimensions and motor skills tests

| Distance | Fast running | Balance | Hand-eye coordination | Jumping |
|---|---|---|---|---|
| Visual Perception | 0.63** | 0.55** | 0.68** | 0.51** |
| Auditory Perception | 0.58** | 0.49** | 0.61** | 0.43* |
| Balance Perception | 0.47** | 0.71** | 0.54** | 0.46** |
| Sensorimotor Coordination | 0.69** | 0.58** | 0.72** | 0.57** |

**Note:** ** *p < 0.05 | p < 0.01

The correlations indicate a statistically significant relationship between the scale and motor skill tests, strengthening the concurrent validity of the scale.

**Table 4:** Results of the (t) test for the significance of differences between males and females in sensory-motor interaction

| Gender | Number | Mean | Std | value of (t) | Significance |
|---|---|---|---|---|---|
| Males | 60 | 4.12 | 0.68 | 1.98 | Sig. at 0.05 |
| Females | 60 | 3.92 | 0.72 | | |

There were statistically significant differences in favor of males in some dimensions, indicating the need to take into account qualitative differences in the design of sensorimotor educational programs.

**Table 5:** Results of one-way analysis of variance (ANOVA) according to the academic grade

| Class | Mean | Std | F-value | Significance level |
|---|---|---|---|---|
| Third grade | 3.85 | 0.70 | 5.41 | 0.006 |
| Fourth grade | 4.05 | 0.66 | | |
| Fifth grade | 4.18 | 0.71 | | |

There are statistically significant differences in sensorimotor interaction between grades, with proficiency increasing with grade progression, supporting gradual developmental progress.

## 5. DISCUSSION OF RESULTS

The results of the current study, which aimed to develop a scale to assess the interaction between sensory perception and motor skills among primary school students in Babil Governorate for the year 2025, revealed a set of statistical indicators demonstrating the validity of the scale and its effectiveness in revealing the complementary relationship between the senses and basic motor abilities. These results are of significant scientific and educational value, given their clear implications for the level of normal developmental growth of children at this stage, in addition to their potential for field application in assessment and diagnosis.[4]

**First: Discussion of the results of arithmetic means and standard deviations**

The results of the first table showed that the average responses to the scale dimensions were relatively high, specifically in the visual perception dimension, followed by auditory perception, then balance perception, while the sensorimotor coordination dimension ranked last. This ranking can be explained by the fact that visual perception is one of the most frequently used and interacted with senses within the classroom and school environment in general, whether in reading the blackboard, following the teacher, or participating in educational activities.[5] The current educational environment relies heavily on visual aids, which enhances the development of this type of perception. Conversely, the delayed ranking of sensorimotor coordination may be attributed to limited motor programs or a lack of practical activities that integrate sensory perception with movement, a gap that must be addressed in curricula and classroom practices.[6]

**Second: Discussion of Reliability Results (Cronbach's Alpha)**

Reliability results showed that the developed scale possesses a high degree of internal consistency, with Cronbach's alpha values for all dimensions exceeding the scientifically accepted value (0.70), confirming that the items comprising each dimension clearly measure a single characteristic without overlap or confusion. This result indicates that the scale's development process was based on precise scientific principles in the wording of the items, the selection of phrases, and the division of dimensions, which enhances the instrument's reliability and its replicability and applicability in similar contexts.[7]

**Third: Discussion of the results of the Pearson correlation coefficient between sensory perception and motor skills.**

The results indicate a statistically significant correlation between sensory perception dimensions and motor skill tests (running, balance, hand-eye coordination, jumping). This reflects the functional overlap between sensory reception and motor response processes in children. This finding is important, as it supports the "sensory-motor integration" theory, which states that the development of motor skills requires a sound cognitive foundation, and that poor sensory perception is directly reflected in motor performance.[8] For example, the strong relationship between sensory-motor coordination and hand-eye coordination demonstrates that fine sensory processes, such as the perception of distance, speed, and direction, are directly related to a child's ability to control tools, balls, or fine motor movements.[9]

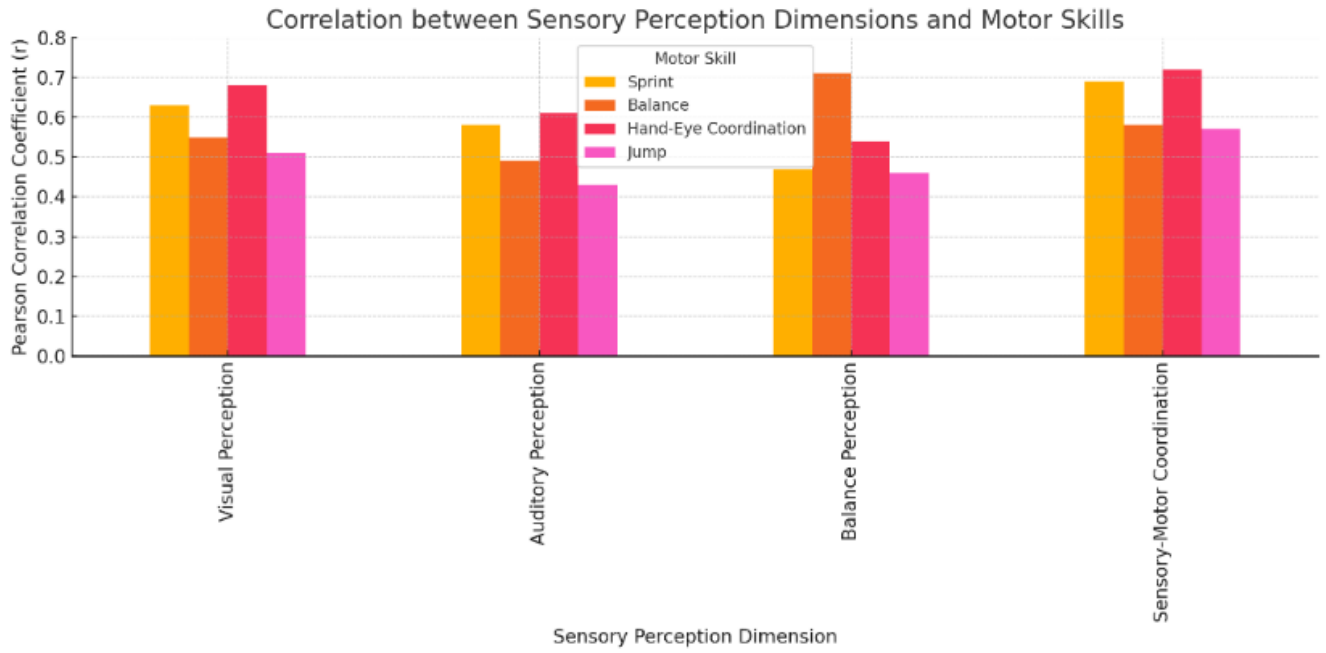


**Figure 1:** Show the correlation between Sensory Perception Dimensions and Motor Skills

**Fourth: Discussion of the results of the t-test for gender differences.**

The results of the statistical analysis revealed statistically significant differences between males and females in some dimensions of sensorimotor interaction, in favor of males. This is consistent with some previous studies that indicated males' superiority in physical and motor skills in the early stages of education. This is due to several factors, including socialization, the nature of recreational games played by males outside of school, and family encouragement of movement and physical activity. However, this superiority should not be considered a biological inevitability. Rather, it is often the result of greater opportunities for males to engage in more diverse motor activities, highlighting the need to enhance sensorimotor interaction activities for females both inside and outside the classroom.[10]

**Fifth: Discussion of the results of the analysis of variance (ANOVA) by grade level.**

The analysis of variance revealed statistically significant differences between students in the third, fourth, and fifth grades of primary school in the level of sensorimotor interaction, with values increasing with the increase in grade level. This makes sense from a developmental perspective, as the child's sensory and motor abilities gradually develop as a result of the maturation of the nervous system, increased interaction with the environment, and the accumulation of educational and motor experiences. However, it is essential to note the need to begin sensorimotor training at an early stage to ensure equal opportunities for students and achieve balanced development.[11]

**Sixth: Discussion in Light of Previous Studies**

The results of the current research are consistent with the findings of studies such as Schmidt & Lee (2019) on the importance of sensorimotor integration in childhood. The researchers emphasized that motor competence does not develop in isolation from sensory input, but rather is the result of a consistent integration process between sensory signals and motor responses. The results are also consistent with previous local studies that focused on the importance of balance, visual perception, and neuromuscular coordination in educational performance.[12]

**Seventh: Practical Importance of the Results**

These findings reinforce the urgent need to adopt the measurement tools used in this research within schools as a tool to assist teachers, educational supervisors, and special education specialists. It can also be used to design intervention programs aimed at strengthening sensorimotor skills, particularly for children who exhibit delayed motor development or difficulty interacting in the classroom.[13]

**Eighth: Challenges Associated with Implementing the Scale**

Despite the positive results demonstrated by the scale, its widespread implementation requires appropriate training for educational staff. Additionally, it is necessary to provide a suitable classroom environment and sufficient space for conducting some motor tests. Furthermore, families must be aware of the role of sensory perception in enhancing their children's educational proficiency.[14]

## 6. CONCLUSIONS

1. Effectiveness of the Developed Scale: The developed scale demonstrated a high degree of reliability and validity, confirming its validity as a scientific tool for measuring the interaction between sensory perception and motor skills in students.
2. Strong correlation between sensory perception and motor skills: The results revealed statistically significant correlations between the dimensions of sensory perception (visual, auditory, balance, and sensorimotor coordination) and basic skill tests (running, balance, jumping, and visual-motor coordination).
3. Males outperformed females: Statistically significant differences were found in favor of males in some dimensions of sensorimotor interaction, reflecting the influence of social and cultural factors associated with motor activity outside the classroom.
4. Increasing level of sensorimotor interaction across grades: The results of the analysis of variance (ANOVA) showed significant differences between the three grades (third, fourth, and fifth) in favor of the upper grades, indicating the gradual cumulative growth of sensorimotor abilities with age and educational advancement.
5. Weakness in sensorimotor coordination compared to other dimensions: Despite the strength of visual and auditory perception, sensorimotor coordination ranked last, indicating a lack of targeted activities that integrate the senses with movement.

## 7. RECOMMENDATIONS

1. Adopting the scale in schools: It is recommended that school administrations adopt the scale developed as a diagnostic tool for early detection of sensorimotor interaction difficulties in students.
2. Designing educational and training programs: It is necessary to design educational and educational intervention programs aimed at developing sensorimotor abilities, especially among students who suffer from delays or weaknesses in this area.
3. Training educational personnel: It is necessary to qualify and train teachers, psychologists, and educational specialists on how to apply the scale and analyze and interpret its results.
4. Integrating motor activities into the curriculum: Encouraging the integration of sensorimotor activities into classroom lessons, and allocating sufficient time during the school day to systematically develop these skills.
5. Caring for female students: Focus on developing female sensorimotor skills by providing equal opportunities to participate in games and motor activities, both in and out of school.
6. Preparing the Classroom Environment: Providing a suitable classroom environment, in terms of space and equipment, to facilitate the implementation of the scale and related activities without physical obstacles.
7. Promoting Family Awareness: Educating families about the role of sensory perception in developing motor performance and academic abilities, and guiding them to motivate their children to engage in sensory-based physical activities.

## REFERENCES

1. Howe TH, Chen HL, Lee CC, Chen YD, Wang TN. The Computerized Perceptual Motor Skills Assessment: A new visual perceptual motor skills evaluation tool for children in early elementary grades. Res Dev Disabil. 2017;69:30–8.
2. Wuang YP, Huang CL, Tsai HY. Sensory integration and perceptual-motor profiles in school-aged children with autistic spectrum disorder. Neuropsychiatr Dis Treat. 2020;:1661–73.
3. Elena S, Georgeta N, Cecila G, Lupu E. Perceptual-motor development of children in elementary school. Procedia Soc Behav Sci. 2014;114:632–6.
4. Aydoner S, Bumin G. The factors associated with school readiness: Sensory processing, motor, and visual perceptual skills, and executive functions in kindergarten children. Appl Neuropsychol Child. 2025;14(2):154–62.
5. Baranek GT, Wakeford L, David FJ. Understanding, assessing and treating sensory-motor issues. In: Autism Spectrum Disorders in Infants and Toddlers. 2008. p. 104–40.
6. Swart S. The relationship among three perceptual-motor skills in children aged six years referred for occupational therapy in Tshwane East [dissertation]. University of Pretoria (South Africa); 2015.
7. Suri M, Azadian E. The Effect of Sensory-Motor Training on Visual Perception Skills and Attention in 8-and 9-Year-Old Students with Slow and Normal Handwriting Speed in Hamedan. J Clin Physiother Res. 2023;8(1):e77.
8. D'Anna C, Basadonne I, Aquino G, Minghelli V, Limone P. Relationships Between Motor Skills and Academic Achievement: An Exploratory Study on Italian Primary School Children. Educ Sci. 2025;15(2):124.
9. Athab NA. An analytical study of cervical spine pain according to the mechanical indicators of the administrative work staff. Indian J Public Health. 2019;10(5):1349.
10. Athab NA, Hussein WR, Ali AAM. A Comparative Study for Movement of Sword Fencing Stabbed According to the Technical Programming in the Game of Fencing Wheelchairs Class B. Indian J Public Health. 2019;10(5):1345.
11. Athab NA, Alsayigh HA. Rehabilitation of the wrist joint injury accordance of kinesiology variables. 2021.
12. Schmidt RA, Lee TD. Motor Learning and Performance: From Principles to Application. 6th ed. Champaign: Human Kinetics; 2019.

13. Athab NA. Effect of a rehabilitation program to improve the structural stability of the elbow joint for injured players. J Stud Res Sport Educ. 1818;41.
14. Abdulhussein AR, Athab NA, Falih Hassan R. The relationship of some physical variables to heart health. J Coll Phys Educ. 2024;17(3):1142–9.