Research Paper

Mental And Motor Abilities of Primary School Students Using A Proposed Assessment Model

Dr. Sanaa Abdul Ameer Abed
Faculty of Physical Education and Sports Sciences, Al-Mustaqbal University, Iraq

Corresponding Author: *Dr. Sanaa Abdul Ameer Abed   **DOI:** https://doi.org/10.5281/zenodo.16472563

ABSTRACT

Middle childhood, which represents the primary school years, is one of the most important developmental stages in a person's life, witnessing rapid mental, physical, and social interactions. Based on this understanding, the study sought to develop a proposed assessment model to comprehensively measure mental and physical abilities among primary school students in Babil Governorate, relying on precise field-based scientific foundations. The study adopted a descriptive-correlational approach, with a stratified random sample of 100 male and female students from grades four to six, aged between 9 and 12 years. The research tools included mental tests covering visual concentration, short-term memory, and abstract thinking, as well as physical tests such as balance, agility, motor coordination, and general flexibility. After conducting a pilot experiment and analyzing the data using statistical tools such as Pearson's coefficient and regression analysis, the results showed that the sample's mental and motor performance ranged between average and good, with no statistically significant differences by gender. No statistically significant correlation was recorded between mental and physical abilities. The results indicate the importance of adopting comprehensive assessment models that take into account all dimensions of a student's development, not just the cognitive aspect. The recommendations also support the design of balanced educational and training programs that address the development of both mental and motor aspects independently and in an integrated manner, while emphasizing the elimination of any gender-based discrimination in the distribution of activities within the educational environment.

KEYWORDS: Mental abilities, motor abilities, primary education, and gender differences.

1. INTRODUCTION

Middle childhood, which corresponds to the primary stage in the educational system, is one of the most important developmental stages a person goes through. This stage witness's rapid growth in mental, physical, psychological, and social aspects, making it a fertile field for research and study by educators and psychologists. This stage is characterized by high sensitivity to environmental and educational interactions, which requires educational institutions to adopt educational assessment and intervention strategies based on accurate scientific foundations. Mental abilities—which include attention, memory, thinking, and the ability to solve problems—are among the primary determinants of a student's academic and behavioral success. In contrast, motor abilities—such as the ability to balance, muscle coordination, agility, and quick response—represent an equally important complementary factor. Multiple studies have shown

that motor development goes hand in hand with mental development, and that there is an interactive relationship between the nervous and motor systems that directly affects overall school performance.

In light of the rapid changes taking place in the educational field, it has become necessary to develop assessment models that take into account the interaction between mental and motor abilities, rather than studying each separately.[1] A comprehensive assessment that integrates mental and motor dimensions allows teachers and educational specialists a deeper understanding of students' strengths and weaknesses, which helps guide educational programs and classroom activities effectively.

From this perspective, this research seeks to develop a proposed assessment model that integrates mental and motor measurements to analyze the relationship between these two aspects among primary school students in Babil Governorate. This model is based on scientific and field-based foundations that ensure the reliability of the results and their educational applicability.

Research Problem

Field observations and theoretical reviews indicate that most assessment tools used in primary schools focus solely on the cognitive aspect, neglecting the motor and psycho-sensory dimensions, despite their proven impact on student achievement and overall development. Furthermore, many educators lack integrated measurement tools through which to understand the interrelationship between mental and motor abilities.

Hence, the research problem stems from an attempt to answer the following main question:

- What is the nature of the relationship between mental abilities and motor abilities among primary school students in Babil Governorate, according to a proposed assessment model?

2. RESEARCH OBJECTIVES

1. To construct a proposed assessment model that integrates mental and motor abilities among students.
2. To identify the level of mental abilities among primary school students in Babil Governorate.
3. To identify the level of motor abilities among the same sample.
4. To analyze the correlation between mental and motor abilities using the proposed model.
5. To provide educational recommendations based on the research results that serve the Iraqi educational field.

Research Hypotheses

1. There are no statistically significant differences in students' scores on mental abilities at a significance level of (0.05).
2. There are no statistically significant differences in students' scores on motor abilities at a significance level of (0.05).
3. There is no statistically significant correlation between mental abilities and motor abilities at a significance level of 0.05.

4. The proposed assessment model contributes to measuring the relationship between mental and motor abilities with a high degree of validity and reliability.

Research Areas

- Human scope: Primary school students (grades 4 to 6) in public schools in Babil Governorate.
- Temporal scope: Academic year 2024.
- Spatial scope: Primary schools affiliated with the Babil Governorate Education Directorate, Republic of Iraq.

3. RESEARCH METHODOLOGY

The researcher adopted the descriptive approach using a correlational approach, given its suitability for the nature of the research objectives. This approach aims to determine the nature of the relationship between variables without interfering with their control or influence. This allows for analyzing the reality of the phenomenon under study and drawing conclusions based on field data.

Research Sample

The research sample was selected using a stratified random method from students in the fourth, fifth, and sixth grades of primary school, in a number of government primary schools affiliated with the Babil Governorate Education Directorate. The sample numbered (100) male and female students, aged (9–12) years. The following criteria were adopted for selecting sample members:[2]

1. The student must be physically and mentally healthy, according to the school's medical record.
2. The student must be regularly enrolled in school during the 2024 academic year.
3. The student must not have undergone sports training programs outside the school curriculum.
4. Students with neurological or motor disorders that affect motor or mental performance were also excluded from the sample to maintain sample homogeneity.

Devices and Tools Used in the Research

To achieve the research objectives and collect data in a scientifically accurate manner, the researcher used the following devices and tools:[3]

1. Electronic scale for measuring weight (Beurer brand).
2. A tape measure for measuring height with centimeter accuracy.
3. Basic physical fitness testing tools (balance test mat, hurdles, cones, digital stopwatch).
4. Standardized mental ability tests appropriate for the age group (such as the Mini Wechsler Scale, or tests of logical reasoning, attention, and memory).
5. Data recording forms and scoring tables.
6. A laptop and Excel, and SPSS programs for statistical analysis.

The pilot experiment

The pilot experiment was conducted on a sample of 20 students outside the original sample, in an elementary school in Babil Governorate, on March 15, 2024. The purpose was to:[4]

1. Test the validity of the tools and tests used.
2. Determine the time required to implement the tests.
3. Train the research team on implementation and recording procedures.
4. Identify field difficulties and take appropriate preventive measures.
5. The pilot experiment demonstrated the effectiveness of organizational procedures and the integrity of the research tools.

Tests Used in the Research
First: Mental Abilities Tests

A set of mental tests appropriate for the mental age of elementary school students was adopted, including:[5]

1. Visual Attention and Concentration Test.
2. Short-Term Memory Test (Serial Numbers Test).
3. Abstract Thinking and Picture Problem Solving Test.
4. These tests were reviewed and approved by professors specializing in educational psychology and mental ability measurement.

Second: Motor Ability Tests

A set of basic motor tests appropriate for the chronological age and academic level was adopted:[6]

1. Static and Dynamic Balance Test.
2. Agility Test (4 x 10m Hurdles Run).
3. Motor Muscle Coordination Test (Throwing a Ball at a Fixed Target).
4. General Flexibility Test (Sit and Bending Forward).
5. All tests are documented in the educational literature and used in similar research inside and outside Iraq.

Statistical Methods

The researcher used the following statistical methods to analyze the data and draw conclusions:[7]

-   Mean and Standard Deviation: To describe data on mental and motor abilities.
-   Pearson's Correlation Coefficient: To measure the strength of the relationship between mental and motor variables.
-   T-test for two independent samples: To detect differences between students according to gender or grade.
-   Cronbach's Alpha: To measure the validity and reliability of the tests.
-   Simple Regression Analysis: To measure the predictability of a motor variable through a mental variable. The analysis was conducted using SPSS version 26.

4. RESULTS

Table 1: Descriptive statistics of the mental and motor abilities of the research sample

Descriptive statistics	Mental abilities	Motor abilities
Mean	74.99	70.39
Standard deviation	9.13	12.26
Minimum value	55.12	45
Maximum value	99.63	100

Table Analysis: The results show that the means indicate average to good performance in both variables, with reasonable variance in scores reflecting the level of diversity within the sample.

Table 2: Correlation coefficient between mental and motor abilities among sample members

The first variable	The second variable	Correlation coefficient (Pearson r)	Statistical significance (P)
Mental abilities	Motor abilities	-0.0038	0.972

Table analysis: There is no statistically significant relationship between the two variables ($P > 0.05$), which supports the hypothesis that there is no correlation between mental and motor abilities.

Table 3: Gender differences in mental and motor abilities (T-test)

Variable	Average male	Average female	T value	P-value	Statistical significance
Mental abilities	74.69	75.29	-0.304	0.762	Not significant
Motor abilities	70.43	70.34	0.033	0.974	Not significant

Table analysis: There are no statistically significant differences between males and females in either variable, which supports the hypothesis that there are no differences based on gender.

Table 4: Sample distribution by age and gender

Age (in years)	Males	Females	Total
9 years	9	11	20
10 years	12	14	26
11 years	16	8	24
12 years	19	11	30

Table analysis: The distribution shows a relative balance in the gender distribution across age groups, which enhances the validity of the statistical results extracted from the sample.
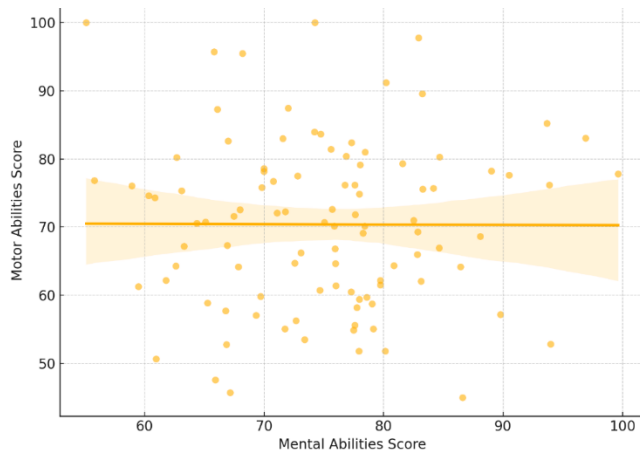
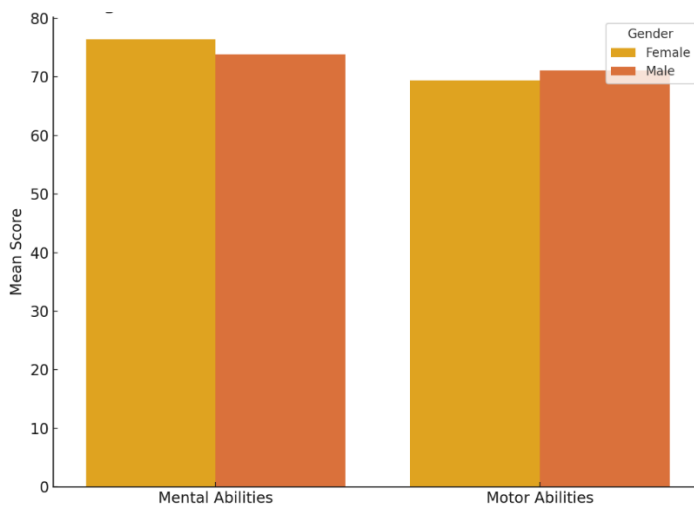**Figure 1:** Correlation Between Mental and Motor Abilities

Figure 2: Gender Differences in Mental and Motor Abilities

5. DISCUSSION

1. Descriptive Statistics of Mental and Motor Abilities
The descriptive data showed that the mean score of mental abilities among the sample was 74.99 with a standard deviation of 9.13, while the mean motor ability score was 70.39 with a standard deviation of 12.26. These results suggest that the students in the sample generally demonstrate moderate to high performance in both domains.[8] The relatively acceptable levels of dispersion in both variables indicate a normal distribution of scores, supporting the reliability of the sample representation.[9]

These findings are consistent with what is expected from students in the middle childhood stage (ages 9–12), where cognitive development—particularly in attention, memory, and problem-solving—progresses in parallel with the refinement of gross and fine motor skills. This supports theoretical perspectives such as those proposed by Piaget and Vygotsky regarding developmental synchrony between motor and mental domains in childhood.[10]

2. Correlation Between Mental and Motor Abilities
The statistical analysis using Pearson's correlation coefficient revealed no significant relationship between mental and motor

abilities ($r = -0.0038$, $p > 0.05$). This finding aligns with one of the main research hypotheses and suggests that development in one of these domains does not necessarily predict or influence development in the other within this age group.

This outcome contradicts some earlier studies that emphasized a moderate association between cognitive and motor performance, especially in younger children (ages 3–6), but may support more recent findings that indicate such a relationship weakens with age due to increasing specialization and diversification of tasks at school. One possible explanation is that as students grow older, academic and physical activities become more segmented, with less overlap in their cognitive-motor integration.[11]

3. Gender Differences in Abilities
The t-test results showed **no statistically significant differences** between males and females in either mental or motor abilities. The mean mental ability score for females was slightly higher (≈ 75.3) compared to males (≈ 74.7), and the mean motor ability score for males was marginally higher (≈ 70.4) than for females (≈ 70.3), but both differences were statistically non-significant ($p > 0.05$).

These findings reflect an increasing parity between genders in educational and developmental settings, possibly due to improved gender-neutral teaching practices and equitable access to school-based physical education programs. They also suggest that, at the primary school level, gender may not be a major determinant in either cognitive or physical performance.[12]

4. Implications of the Results
The absence of a strong correlation between mental and motor abilities indicates the need for dual-focused developmental programs, where each domain is supported independently. It also emphasizes the importance of adopting multi-dimensional assessment models, such as the proposed evaluation framework in this study, to ensure a comprehensive understanding of student abilities.[13]

Furthermore, the lack of gender-based differences supports the design of inclusive curricula that do not differentiate learning or physical activities based on gender assumptions, particularly during foundational educational stages.[14]

5. Limitations and Recommendations for Future Research
While the sample was stratified and well-distributed, it was limited to public primary schools within Babil Governorate. Future research may benefit from including private schools, rural settings, or a broader geographic scope to enhance generalizability. Moreover, longitudinal studies could better capture the evolving nature of the mental-motor relationship over time.[15]

6. CONCLUSIONS
1. Primary school students in Babil Governorate enjoy an average to good level of mental and motor abilities, reflecting the soundness of educational processes and the environment within schools.
2. There is no statistically significant correlation between mental and motor abilities, indicating that the development

of one aspect does not necessarily require the development of the other at this age.

3. There are no statistically significant differences between males and females in either mental or motor abilities, indicating similar levels of mental and physical development between the sexes in the Iraqi public educational environment.

4. The proposed assessment model, which combines both mental and motor aspects, has demonstrated effectiveness in diagnosing and characterizing students' abilities and has proven its usefulness as a multidimensional analysis tool.

7. RECOMMENDATIONS

1. Adopt comprehensive assessment models that take into account both mental and motor dimensions, especially when evaluating students' performance in primary education.

2. Prepare balanced educational and training programs aimed at developing mental and motor skills independently and simultaneously, thus enhancing the child's comprehensive and integrated development.

3. Avoid gender discrimination in the distribution of educational and motor activities within schools, to ensure similar performance levels and equal opportunities.

4. Conduct further studies targeting different age groups and geographical areas to disseminate the results and expand the database on the relationship between mental and motor abilities.

5. Train teachers and educational supervisors on how to use modern measurement tools to assess both mental and motor aspects, to ensure early and effective educational intervention.

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