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Visual Memory and relationship to the Intelligence of Working Memory among students with Learning Disabilities

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Abstract:

This study aimed to identify (Visual Memory, VM) and its relationship to (Working Memory Intelligence, WMI) in students with (Learning Disabilities, LD). The descriptive correlative approach was used to achieve the study's objectives. In the Kingdom of Saudi Arabia, the study sample included (47) students, including (30) students with (LD) and (17) normal students, ranging in age from (7 to 13) years. The Wechsler-4 scale and the (VM) scale were also used. Indications of validity were got, as evidenced by content validity (80%), internal construct validity greater than 0.30, and concurrent validity for the construct validity of the (WMI) intelligence test for students with (LD) compared to normal students. The correlation coefficients for the sub-tests (Straight, Inverse, Numbers Memory Test, and Sequence of numbers and letters test) with the total score of the (WMI) among (LD) students are (0.747, 0.851, 0.886, 0.829), respectively. Cronbach's alpha coefficient, which amounted to, was also used to determine the scale's reliability (0.888).

The study's findings revealed that the levels of (VM), shapes test, colors test, and numbers test were low. The level of memory intelligence for the memory of numbers intelligence test, as well as the straight and inverse tests, was low. While the test of the numerical and letter sequence was average. And that the (WMI) level of the (LD) students was average. The series of numbers and letters test is intermediate, and the memory of the numbers test is low. The results revealed a small difference between the students' average scores on the (VM) sub-tests and the total score. There was also a simple difference between the average student scores on the sub-digit memory tests and the total score. There were also differences in the average scores of students on the number and letter sequence tests, with the highest score being. There were also only minor differences in students' overall average scores on the (WMI). There is no connection between the (VM) intelligence test and (WMI).

The study recommends developing tools for measuring and diagnosing (VM) for students of (LD) and conducting studies related to the relationship between (VM) and achievement.

Keywords: Learning Disabilities, Visual Memory, Working Memory, Wechsler Scale-4.

Introduction

The (LD) category is one of the most common in the field of special education, especially when it comes to problems involving both (VM) and (WMI). Specifically, with (LD) reading, writing, and arithmetic, where memory is concerned with the process of retrieving information and the ability to remember, whether

for auditory or visual memory, where the problems of (LD) students lie in their ability to retrieve stored information from short-term or long-term memory.
As a result, this study came to demonstrate the significance of both (VM) and (WMI).

Research Problem
Although the concept of memory poses a great challenge for those working with (LD) students, there are many problems that students face during the learning process, and from here we try to answer the following main question:

- What is the relationship between visual memory with the intelligence of working memory among students of Learning Disabilities?

The following sub-questions arise from the research problem, which deals with the psychometric properties:

1- What are the signs of the validity and reliability of the tests of visual memory and intelligence of working memory among students with Learning Disabilities?
2- What is the level of visual memory and working memory intelligence among students with Learning Disabilities?
3- Are there statistically significant differences at (α = 0.05) between the students' scores for visual memory and the success score among students with Learning Disabilities?
4- Are there statistically significant differences at (α = 0.05) between the students' scores for working memory and the score for success among students with Learning Disabilities?
5- Are there statistically significant differences at the significance level (α = 0.05) in the level of visual memory and working memory intelligence among students with Learning Disabilities due to the age variable?
6- Is there a statistically significant relationship at the significance level (α = 0.05) between visual memory and working memory intelligence among students with Learning Disabilities?

Research Importance
First: The theoretical importance of this research lies in:

- The importance of (VM) in acquiring (LD) students to study properly.
- Focusing on the nature of (VM) patterns in (LD).
- The VM contributes to determining the level of student achievement.
- Monitor the importance of (VM) within the education system.

Second: The practical importance:

- Benefiting from the results of this study in determining the problems of (LD) students.
- Determining the strengths and weaknesses of (LD) students.
- Benefiting from the results of this study in the work of the individual educational plan.

Research Goals:
The current research aimed to Verification of (VM) and (WMI) by finding indications of validity and reliability of the scale.

Research Justification:

- The dearth of studies (according to the researcher's knowledge) that dealt with (VM) and (WMI) among (LD) students.
- Employing the results of (VM) and (WMI) to recruit teachers to prepare (IEP).

Research Limitations:
Research limits include the following:

- Age limits: This research was only applied to (LD) students around the age group (7 - 13) years, in the primary stage.
- Spatial limits: This research was only applied to the Kingdom of Saudi Arabia (middle) through schools.

- Temporal limits: Research data was collected during 2022/2023.

Research Delimitations:

- The findings of this research are influenced by the validity and reliability of the study tools applied to students.
- The difficulty in generalizing the findings of this research relates to the research subjects' representation of the research population.

The operational definition

Visual memory: is a type of memory that describes the connection between visual perception, mental storage, and the ability to recall previously stored scenes.

Working memory intelligence: is a set of processors that allows students to store and use information in the short term in order to complete cognitive tasks such as language comprehension, reading, arithmetic skills, learning, and reasoning.

Learning Disabilities: A disorder that impedes students' natural learning processes, such as memory, perception, attention, thinking, learning strategies, and how to process oral and written language materials. With such upheaval, reading and writing (spelling, written expression, and handwriting) are frequently affected, as is mathematics.

Theoretical framework and Previous studies

First: Theoretical framework

According to (Lyon, Fletcher, Barnes, 2003), the Joint National Committee on Learning Disabilities (1988) defined (LD) as a general term that refers to a group of heterogeneous disorders that manifest as obvious difficulties in acquiring and using listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are personal in nature and are thought to be caused by a defect in the central nervous system. It can appear at any time in a person's life. (LD) may cause difficulties with self-regulation, social cognition, and social interaction.

In terms of medicine, (Cortiella, Horowitz, 2014) stated that (LD) is caused by neurological differences in the structure and function of the brain and affects a person's ability to receive, store, process, retrieve, or communicate information. While the specific nature of these brain disorders is still unknown.

When discussing (VM), Abu Zaid (2011) defined it as the lowest level of the process of organizing information, and it is also referred to as symbolic memory, which is considered a temporary memory where the information will remain stored in the memory even in the absence of the stimulus. Al-Rousan (2016), on the other hand, defined it as the part of the human's total memory that is responsible for receiving, storing, and retrieving visual experiences through his learning of a number of prescribed topics. According to (Sahar, Samira, 2020), (VM) has the capacity to retain the mental visual image, store it, and process it even after its contents are hidden. A lack of this capacity makes it challenging to retain visual images of visual objects. Knowing the extent to which (VM) is associated with (WMI), we find researchers showed that (WMI) is one of the most important characteristics that distinguish the strengths and weaknesses of (LD), as (Spreeen, 2011) showed that (WMI) and its problems are the most common among children with disabilities. (LD), which appears in a set of signs and indicators that appear on the child, the most important of which are: failure to learn academic subjects, difficulties in attention, remembering and awareness of concepts and objects, and spatial relationships, and a deficit or deficiency in (WMI) is also associated with some types of (LD). Academic difficulties such as reading difficulties, reading comprehension, difficulties in writing and written expression, learning mathematics and gaining mathematical concepts and symbols.

According to Swanson and Siegel (2001), (WMI) is a structured mental program whose significance is that it temporarily stores and processes information when required for difficult tasks such as language learning, thinking, and learning. It can also perform multiple tasks at the same time, such as storing and processing data. It can be classified as follows: (1) (WMI) Central Executive, responsible for attention and control. (2): spatial and visual information working memory (3) the ability to hold information in phonological working memory, as well as the speech training required to develop a vocabulary in both the mother tongue and the second language. Because a human being performs all of their thinking and problem-solving processes through (WMI), which is dependent on the effectiveness of learning and problem-solving, (WMI) is critical to language and reading development. According to (Solomon, 2001), (WMI) is one of the most important psychological functions of the remembering process because of its importance in the retrieval processes of presented and learned experiences, information, and previous stimuli, and it plays an important role in life activities because it is an integral part of long-term memory. In addition to short-term memory, it is involved in many aspects of human behaviour, such as speaking, writing, and reading, as well as carrying out tasks and performing various skills.

When discussing intelligence (LD), the Wechsler Children's Intelligence Scale is an important diagnostic tool for detecting problems that may predict low mental ability, which can have a negative impact on achievement. According to (Wechsler, 2003) stated that (LD) students have (75 and above) intelligence and that a deficiency in either (VM) or (WMI) may affect their intelligence. According to (Cornoldi, Giofrè, Orsini, & Pezzuti, 2014) children with (LD) perform poorly on (WMI) and processing speed tests when compared to normal children. And (Melby-Lervg, Lyster & Hulme, 2012) found that children with (LD) have low Wechsler Scale (WMI) scores, which is consistent with a large body of literature showing impairments in working memory tasks related to (LD). A meta-analysis discovered a mean effect size (0.71) in short-term verbal memory tasks when comparing good reading ability to non-reading ability. Because of the significance of the numbers test, (Giofrè, Cornoldi, 2015; Styck, Watkins, 2014) demonstrated that the Wechsler scale-4 and associated (WMI) sub-test of number memory is very important for the diagnosis of (LD). Whereas (Alloway, Gathercole, Kirkwood, & Elliott, 2009) showed that the (straight numbers) sub-test of memory is related to short-term memory, and that the (reverse numbers) test is related to intelligence (WMI).

Second: Previous studies

(VM) and (WMI) are among the most important challenges facing (LD) students, whether for teachers or for students' ability to achieve. We find studies deal with many issues. Al-Khatib (2012) used the descriptive analytical method to identify working memory patterns in a study titled "Working Memory Patterns (Executive, Visual, and Phonics) among (LD) Students in Reading and Mathematics." The study sample included (120) male and female students diagnosed with (LD) who were enrolled in the resource rooms of the Directorate of Education in the Irbid region, with (60) male students distributed among (30) students who have reading difficulties and (30) students who have difficulty in mathematics, and (60) female students distributed among (30) students who have difficulty in mathematics. Working memory patterns were tested using a research tool. The findings revealed:

- The visual pattern was the most common memory pattern among students with LD in reading and mathematics; it was highly common within the level and ranked first.
- The prevalence of both vocal and executive styles was low.
- In the executive and auditory styles, differences in responses from the study sample members regarding the variable "type of difficulty" were not statistically significant.
- In the visual field, the results revealed that differences in the responses of the study sample members to the variable "gender" were not statistically significant in the executive style.

Hamoudi (2019) also conducted a study titled "The Effectiveness of a Behavioral Kinesthetic Training Program in Developing Both the Sensorimotor Factor and Visual Memory for Students with (LD) Writing" to discover the effectiveness of a behavioral-kinesthetic training program in developing both sensorimotor synergy and visual memory of students with (LD) writing in the primary stage. To implement this program, a sample of (21) students was purposefully chosen from students who suffer from (LD) writing difficulties accompanied by sensorimotor synergy and visual memory difficulties; the quasi-experimental design based on one group was based on a pre-and post-measurement. The researcher used several tools, including what she employed in the exploratory study, which included the diagnosis and filtering phase (interviews, observation network, scale of estimating sensorimotor synergy, scale of estimating visual memory-which are directed to teachers-and intelligence test for Raven), and including what she employed in the main study: (Test Writing, visual memory test, and sensorimotor synergy measure) The program applied to the experimental sample with (22) sessions, an average of two sessions per week over three months, and the results showed:

- The proposed training program is effective in developing both sensorimotor coordination and visual memory for students with (LD) writing.
- The mean scores of the sample members on the sensorimotor synergy scale differ between pre- and post-measurements.
- The mean scores of the sample members on the visual memory test differ between pre- and post-measurements.
- The mean scores of the sample members on the writing test differ between pre- and post-measurements.

Mabroukah (2018) conducted a study titled "The Relationship of Dyslexia with Visual Memory for Fourth-Year Students of Primary 2017-2018" to investigate the relationship between dyslexia and visual memory, as well as the differences in visual memory between normal and dyslexic reading. The study's sample was purposefully drawn from fourth-year primary school students who met the diagnostic criteria. These people were divided into two groups: normal readers (n = 22) and Asiri readers (n = 22), and they were initially classified based on the teachers' opinions and the students' results in a subject reading. The descriptive approach was used in this study. The Raven test (intelligence and reading test for common and non-circulated words) and semi-words (visual memory test) were used to identify potential differences between the two groups in these tests using statistical methods (T) test for differences and Pearson correlation coefficient. The findings revealed:

- The sample members' reading ability and visual memory have a statistically significant correlation.
- In visual memory, there is a statistically significant difference between the two reading groups (normal and dyslexic).

Ben Hanachi (2021) also conducted a study titled "Assessment of Visual Memory for Children with (LD) Mathematics" which aimed to assess children with (LD) mathematics' visual memory. The study sample included two cases, both aged eight years, who were diagnosed using diagnostic tests (man's drawing test). The Rey test is used to evaluate visual memory and the (ZAREKI-R) test is used to evaluate number processing and arithmetic. The findings revealed:

- Children with (LD) in mathematics have poor visual memory.

Abu Zaid (2011) conducted a study titled "Audio-visual memory and its relation to recognition and reading comprehension in normal and (LD) students." The study's goals were to 1) determine the nature of the relationship between audio-visual memory and recognition and reading comprehension in students with (LD) versus normal students. 2) Determining the differences in memory test performance between normal and (LD) students. The (Raven) test, the Wechsler children's intelligence scale, the achievement test, the learning competency test, the reading recognition test, and the reading comprehension test were all used to assess intelligence. The study's sample included two samples, one exploratory and one basic, drawn from fourth-grade students. The basic sample consisted of (120) students. The findings revealed:

- In favor of normal students, there are statistically significant differences in average scores across all dimensions of visual memory, auditory memory, reading recognition, and reading comprehension.

Kaddouri and Maryam (2016) conducted a study titled "The Relationship of Reading Ability with Phonological Working Memory and Visual Attention for Fourth and Fifth Elementary Pupils," which aimed to learn about the relationship between dyslexia and phonological working memory (oral and visual) and visual attention, as these are two of the most important components of teaching a child to read. A group of primary school students (4 and 5 years old) were chosen based on a set of diagnostic reading criteria. These people were divided into two groups: normal readers (95) and dyslexics (20). Individuals were classified primarily based on teacher opinions and reading results. The comparative descriptive method was used in this study. To detect differences between two groups in these tests, the word reading test (current, non-circular, and semi-words), the phonological working memory test (oral and visual), and the visual attention (cancel test) were administered to all study sample members. In terms of statistical techniques, we used the (T) test for differences and Pearson's correlation coefficient for the study's results. The findings revealed:

- In the phonological working memory test, there is a difference between the two groups in reading for both normal and dyslexic students (oral and visual).
- There is a difference in visual attention between the two groups of dyslexic and normal students.
- There is a correlation between reading ability and phonological working memory (oral and visual).
- There is a correlation between reading ability and visual attention due to canceling letters on the one hand, and there is no correlation between reading ability and visual attention due to canceling pictures.

As for the studies related to the Wechsler Intelligence Scale, especially the intelligence of working memory, Abu Drei and Al-Rosan (2021) conducted a study entitled "The psychometric characteristics of the Jordanian version from the Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV) for the school stage. "This study aimed to identify the characteristics of the psychometric features of the Wechsler Intelligence Scale for Children- Fourth Edition (WISC-IV) on a Jordanian hearing sample to assess mental capacity at the school level. (418) students were part of the study sample. To achieve the objectives of the study, the items of The Validity, reliability. Concurrent Validity with Goodenough- Harris Drawing Test Man (0.946), achievement (0.887), Pearson's correlation coefficient for (Verbal Comprehension Index, VCI) = (0.414-0.824), (Perceptual Reasoning Index, PRI) = (0.734-0.922), (Working Memory Index, WMI)= (0.743-0.930), (Processing Speed Index, PSI) = (0.643-0.954), Correlation coefficients for all subparagraphs between (0.602-0.823), Indications of the stability of the scale were also found in using Cronbach's alpha (0.928), the Test-Retest Reliability method was the coefficient of stability (0.888), reliability of standard are conveyed, Resident Agreement (0.890), Resident stability by Holste method (86.5%). The study recommends measuring and diagnosing students with the (WISC-IV) scale to identify strengths and weaknesses. And make an individual educational plan. Carrying out qualitative studies on the scale sub-tests.

To assess the validity implications of the Wechsler Scale-4 for students with Learning Disabilities, (Styck, Watkins, 2016) conducted a study under the working title "Indications of Validity of the Wechsler Scale-4 for Students with Learning Disabilities." Confirmatory analysis coefficients were used for a clinical sample of (1537) students diagnosed with (LD) in America by psychologists in two significant school districts in the Southwest. The findings revealed:

- The significance of the validity of a test of total intelligence with an arithmetic mean (91.20) and a standard deviation (11.51).
- There are indications of validity for the test of working memory intelligence, with an arithmetic mean (88.94) and a standard deviation (11.92).

(Giofrè, David, 2016) conducted a study titled "Forward and backward digit span difficulties in children with specific learning disorders" to compare the performance of the Wechsler Scale-4 working memory task in a large group of children with (LD). The sample included (318) children diagnosed with (LD) in Italy, ranging in age from (7-14) years, along with a group of normal children. The findings revealed:

- Working memory is worse in children with (LD), especially in regular numbers than in inverse numbers.
- The correlation between the two paragraphs and the general ability index (GAI) was similar in (LD) children and smaller in normal children.
- The arithmetic mean of working memory is (88.29), with a standard deviation of (12.40).
- Children with (LD) had difficulty with both number tasks.
- Because of age differences, older children with (LD) have a significant impairment when compared to younger children.

Both (Becker, Daseking, and Koerner, 2021) carried out a study titled "WISC-V Cognitive Profiles of Children with (ADHD) and Specific Learning Disorders Sustainability "that sought to discover the similarities and differences in the cognitive characteristics of each of the children with (ADHD), and (LD).

The Wechsler-4 scale profiles of (62) children with (ADHD), (19) female children with (LD), (35) children with (LD), and (62) children without (ADHD) were compared in a sample from Germany (ADHD). The findings revealed:

- The (LD) and (ADHD) groups performed poorly on all Wechsler scale indicators (total intelligence, WMI, and Processing Speed Index).
- The (LD) group performed low on the (GAI and Verbal Comprehension Index) indicators.
- The Wechsler scale can determine cognitive strengths and weaknesses.

In addition, (Martinussen, Hayden, Hogg-Johnson, & Tannock, 2005) conducted a study titled "A Meta-analysis of Working Memory Impairments in Children with Attention-Deficit/Hyperactivity Disorder" to investigate whether children with (ADHD) have impaired working memory. The sample comprised (26) experimental research studies published between (1997 to 2003). Working memory measurements were classified based on the method (verbal or spatial) and the type of processing required (storage or processing). The findings revealed:

- Children with (ADHD) have deficits in several aspects of working memory.
- The overall effect size of spatial and central executive working memory storage was greater than verbal and central executive working memory storage.

In their study, "Developmental dyscalculia and basic numerical capacities: A study of 8-9-year-old students," (Landerl, Bevan, Butterworth, 2004) compared (31) children aged (8 to 9) years. In Australia, they were chosen because they had dyscalculia, dyslexia, or both. The results revealed:

- Children with dyscalculia had poor performance in tasks.
- Intelligence tests, vocabulary tests, and working memory tasks yielded excellent results.
- Children with dyslexia have difficulty performing tasks that require speech.
- Children with both disorders exhibited a pattern of dyscalculia similar to that of the dyscalculia group, with no distinguishing features of reading or language deficits.
- Dyscalculia is caused by issues with basic numerical processing.

Methods and Procedures

This section provides a detailed description of the study subjects, the method of selection, and a description of the Wechsler Intelligence Scale as a study tool. It also describes methods for verifying the validity and reliability of these tests, as well as the study method and data statistical analysis.

Research approach:

Because of its relevance to the study's purposes regarding (VM) and its relationship to (WMI) intelligence among (LD) students, this study is based on the use of the correlative descriptive approach.

Population and Sampling

The study population included (LD) students from Dammam's government schools, which totaled (81) in number.

Sample

The study samples were selected at random from the study population of resource room students in Dammam, where the study sample included (n= 47) students, including (30) students with (LD) and (17) students from the normal in the Eastern Province, whose ages ranged from (7 - 13) years old, and the demographic Table (1) shows the distribution of subjects by age:

Table 1. Distribution of subjects (n=47) by age

Age	Frequency	Ratio
8 – 7 years	7	23.3
10 – 9 years	15	50.0
13 – 11 years	8	26.7
Total	30	100.0

Table (1) clearly showed that (23.3%) of the study sample members of the (LD) students were aged within the age group (7-8) years, and (50%) of the study sample members were aged within the age group (7-8) years. The age group is (9-10) years, whereas it was discovered that (26.7%) of students with (LD) were in the age group (11-13) years, as illustrated in Figure No. (1):

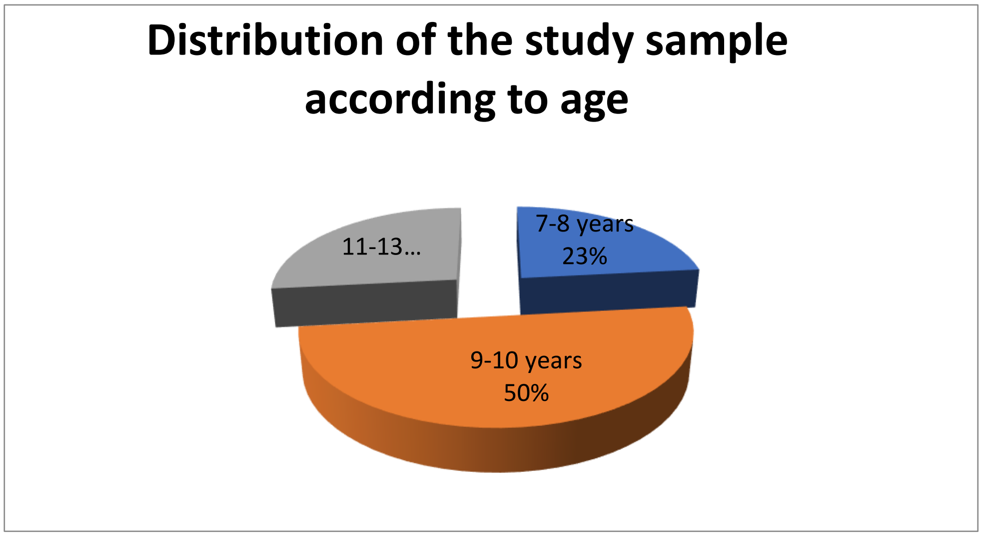

Figure No. (1) Distribution of the study sample by age

Instrument

The first tool: is a measure of visual memory (visual-motor synergy) for LD students at the school stage. (Prepared by the researcher)
A description of the scale: The scale comprises the following sub-tests:
1- Numbers memory: It comprises (21) items.
2-Color Memory: It comprises (7) colours and (21) items.
3- Shapes memory: It comprises (7) shapes and (21) items.
Age group: The age group comprises (7 - 13) years.
Duration of application for each test: 10 minutes.
Correction time for each test: 4-5 minutes.
- Method of application of the test: individual.
The second tool: The Wechsler Scale-4 for children's intelligence for the age group (6-16.11) years.
The original version of the WISC-IV (Liban Tests Editions) was developed by (Abu Drei, 2017). The original version of the scale comprised (4) sub-scales. Each scale contains sub-tests:
- The VCI Scale, which includes the following sub-tests (similarities, vocabulary, comprehension, information, verbal reasoning).
- The PRI Scale includes (Block Design, Picture Completion, Picture Concepts, and Matrix Reasoning).
- The WMI Scale includes (Digit Span, letter-number sequencing, arithmetic).
- Where the PSI scale includes (coding, symbol search, Cancellation).
- The total intelligence scale includes (VCI, PRI, WMI, PSI).
Debug Test Key:
First: The key to debugging the (VM) tests for the (LD) students:
Depending on the scores of (LD) students got from the (VM) tests in its branches (the numbers test, the shapes test, and the colour test), the students' scores were dealt with as follows to determine the student's achievement level according to the following equation:
The highest value of the sign - the lowest sign divided by the number of levels, i.e.,

$$\frac{21-0}{3} = \frac{21}{3} = 7.00$$ and this value is equal to the length of the category

So, the low level of the (VM) level on the tests (numbers, shapes, colours) is (0.00 - less than 7.00).

The average level of (VM) on the tests (numbers, shapes, colours) is from (7.00 – less than 14.00).

And the high level of (VM) on the tests (numbers, shapes, and colours) from.(21.00 – 14.00)

When collecting scores to determine the level of total (VM) of (LD) students, the level of total (VM) of (LD) students is determined as follows:
The highest value of the sign - the lowest sign divided by the number of levels, i.e.,

$$\frac{63-0}{3} = \frac{63}{3} = 21.00$$ and this value is equal to the length of the category

So, the low level of (VM) is from (0.00 - less than 21.00).
And the average level of (VM) from (21.00 - less than 42.00).
The high level of the (VM) is from (42.00 - 63.00).

Second: The key to correcting working memory intelligence tests

- Key to correcting tests (memory of numbers) for students of (LD):
Depending on the student's scores (LD) from the intelligence tests (memory of numbers) in its two branches (the straight test and the inverse test), the student's scores were dealt with as follows to determine the level of students' achievement according to the following equation:
The highest value of the sign - the lowest sign divided by the number of levels, i.e.,

$$\frac{16-0}{3} = \frac{16}{3} = 5.33$$ and this value is equal to the length of the category

Therefore, the low level of IQ (memory of numbers: straight, inverse) is from: (0.00 - less than 5.33).
The average level of intelligence (memory of numbers: straight and inverse) is from: (5.33 - less than 10.66).
and a high level of intelligence (memory of numbers: straight, and inverse) from (10.67-16.00).

When collecting the scores to identify the levels of (intelligence of total numbers memory) and the level of (sequence of numbers and letters) among students of (LD), the level of total learning (LD) is determined:
The highest value of the sign - the lowest sign divided by the number of levels, i.e.,

$$\frac{32-0}{3} = \frac{32}{3} = 10.67$$ and this value is equal to the length of the category

So, the low level is from (0.00 - less than 10.67).
The average level is from (from 10.67 - less than 21.34).
The high level is from (21.34 - 32.00).

When collecting the scores to identify the level of (WMI), which includes (memory of numbers, sequence of numbers and letters), the level of the total working memory of (LD) students is determined:
The highest value of the sign - the lowest sign divided by the number of levels, i.e.,

$$\frac{64-0}{3} = \frac{64}{3} = 21.33$$ and this value is equal to the length of the category

Therefore, the low level of the (WMI) is from (0.00 - less than 21.33).
And the average level of (WMI) (from 21.33 - 42.66).
The high level of (WMI) is from (42.67- 64.00).

Study tools

1- Getting permission to use two tests (memory of numbers and sequence of numbers and letters) from the Wechsler scale-4.

2- Preparing a preliminary image of the optical-kinetic synergy meter:

- Prepare a list of terms.

- Revision and revision of terminology.

- Using the Saudi dialect in applying the test (for Saudi students).

Age determination.

- Specify the gender.

3- Correcting the study tools after applying them to the study sample.

4- Unload the results for each case according to the specified model to be processed statistically.

5- It applies to an experimental sample (n = 5) to achieve the extent of language formulation and correction procedures.

6- The two scales applied to a sample of students (LD) (n = 30).

7- Divide the students into categories according to the age group variable.

8- Indications of validity and reliability were reached.

Statistical Analysis:

To answer the research questions, the following statistical methods were utilized:

- Extracting frequencies and percentages to describe the study sample members.
- Using the Pearson Correlation test and using Cronbach's alpha test to ensure the validity and reliability of the study tests.
- The Varimax Rotation test was used to check the construct validity of the study tests.
- Arithmetic means and standard deviations were used to identify the students' scores on the (VM) and (WMI) tests.
- Using the one-way test of variance to identify the differences in the level of the study tests (VM and WMI) due to the age variable.
- Using the Pearson Correlation test to verify the relationship between (VM) and (WMI) among students with (LD).

Results and Discussion

This section discusses the findings of a study that sought to identify the relationship (VM) and its relationship to intelligence (WMI) among (LD) students, as well as differences in the level of (VM) and (WMI) among (LD) students due to the variable of age. The outcomes are:

The first question: What are the signs of the validity and reliability of the tests of visual memory and intelligence of working memory among students with Learning Disabilities?

The validity of the (VM) and (WMI) tests was verified:

Validity and Reliability of the (VM) test:

First: Validity of the (VM) test:

The (VM) test was validated by:

1- Content Validity

The content validity method was used to validate the (VM) test's validity. The test was presented to (2) faculty members in the Special Education Department at Imam Abdul Rahman bin Faisal University, and

(4) faculty members at Al-Balqa Applied University, in order for them to express their views on the sincerity of the content and the affiliation of the questions to the test and their suitability for measuring what they measured, as well as the clarity of the questions for students with LD, and then some appropriate modifications were suggested. And some of them have been deleted due to their similarity and proximity with other questions, or they are not suitable for the study, and as a result, the test comprises (3) sub-tests (shapes, colors, and numbers), and each sub-test comprises from (21) questions, the researcher considered the arbitrators' opinions and their amendments as a sign of the validity of the (VM) test content.

2- Construct Validity

The construct validity of the test was determined by calculating the correlation of the sub-test score with the major test to which it belongs among the study participants (n = 30), as shown in Table (2):

Table (2)

Correlation coefficients of the subtest with the total score using the Pearson Correlation test to identify the construct validity of the (VM) test

(VM)		
Numbers	Pearson Correlation	.554**
	Sig. (2-tailed)	.001
	N	30
shapes	Pearson Correlation	.817**
	Sig. (2-tailed)	.000
	N	30
Colors	Pearson Correlation	.789**
	Sig. (2-tailed)	.000
	N	30

**Statistically significant at (0.01)

Table (2) shows that the correlation coefficients between the sub-tests and the total score of the (VM) test were greater than (0.30), which is the minimum acceptable to distinguish the test questions, showing that the sub-tests effectively contribute to the overall score of the (VM) test. And that all sub-tests measure the same property, confirming the test's construct validity; thus, the (VM) test includes three important sub-tests related to the (VM), which are (numbers, shapes, and colors).

The Construct Validity (VM) test was validated using the (Varimax) method, which revealed the significance of each sub-test in the explained variance in the degree of the (VM) test, as shown in Table (3).

Table (3) Construct Validity for (VM) Test by (Varimax) Method

Factors of (VM)	Eigen Value	% of variance	Cumulative %
Numbers	1.611	53.716	53.716
shapes	.943	31.437	85.153
Colors	.445	14.847	100.000

Table (3) shows that the first component (the numbers test) explained (53.716) percent of the explained variance in the (VM) test, while the second component (the shapes test) explained (31.437) percent of the explained variance in the (VM) test. The third component (color test) explained (14.847%) of the explained variance in the (VM) test, so the sum of what was explained by the three sub-tests (numbers, shapes, and colors) explained (100%) of the explained variance in the (VM) test, showing that each subtest is an important and complementary test to the other tests that comprise the (VM) as a whole.

3- Concurrent Validity

The validity of the (VM) test among (LD) students was verified using Concurrent Validity, where the value of the construct validity coefficient of the (VM) test among (LD) students was compared with the value of the construct validity coefficient of the (VM) test among normal students, where the value of the correlation coefficients of the tests reached (numbers, shapes, and colors) with the total score of the (VM) test among (LD) students (0.554, 0.817, 0.789), respectively, and (0.01).

While the correlation coefficients for the sub-tests (numbers, shapes, and colors) with the total score of the (VM) test for normal students are (0.703, 0.682, 0.725), respectively, and with statistical significance less than (0.01), this shows concurrent validity between (VM) for (LD) students and the (VM) test for normal students.

Second: The Reliability of the visual memory test:

The researcher determined the consistency of each sub-test of the sub-tests (numbers, shapes, and colors) with the total score of the test to which it belongs (visual memory test), and it was used to calculate the correlation coefficients between each sub-test of the tests with the total score by using a parameter (Cronbach's alpha), where the value of the reliability coefficient of Cronbach's alpha for the sub-tests and the total score was (0.787), which is an acceptable value for the current study.

Validity and reliability of the working memory intelligence test:

First: The validity of the (WMI) test:

The validity of the (WMI) test was verified by:

1- Content Validity

The content validity method was used to validate the intelligence test (WMI). And the extent to which the questions are clear for students with (LD). The (WMI) test questions were adapted from the Wechsler Scale-4, which was used in the study (Abu Drei, 2017), and it includes an intelligence test (WMI). Both the numbers memory test, which comprises two tests (straight and inverse), and the sequence of numbers and letters test, show the validity of the (WMI) test's content.

2- Construct Validity

The construct validity of the test was determined among the study participants (n = 30) by calculating the correlation of the sub-test score with the main test to which it belongs, and the results are shown in Table (4):

Table (4)

Correlation coefficients of the subtest with the total score using the Pearson Correlation test for construct validity of the (WMI) test

(WMI) intelligence		
straight sequence	Pearson Correlation	.747**
	Sig. (2-tailed)	.000
	N	30
reverse sequence	Pearson Correlation	.851**
	Sig. (2-tailed)	.000
	N	30
Intelligence memory numbers	Pearson Correlation	.886**
	Sig. (2-tailed)	.000
	N	30
Sequence of numbers and letters	Pearson Correlation	.829**
	Sig. (2-tailed)	.000
	N	30

**Statistically significant at (0.01)

Table (4) shows that the correlation coefficients between the sub-tests and the total score of the (WMI) test were greater than (0.30), which is the minimum acceptable to distinguish the test questions, showing that the sub-tests contribute to the overall score of the (WMI) test. And that all sub-tests measure the same characteristic, which confirms the test's construct validity, and thus the working memory intelligence test comprises the number memory intelligence test (straight and inverse), and the test of the sequence of numbers and letters. The validity of the (WMI) test construct was validated using the (Varimax) method, which revealed the significance of each subtest in the explained variance in the (WMI) test degree. This is shows in Table (5).

Table (5) The construct validity of the (WMI) intelligence test by Varimax method

Factors of (WMI)	Eigen Value	% of variance	Cumulative %
(1) straight sequence	2.948	73.689	73.689
(2) reverse sequence	.717	17.927	91.616
(3) Intelligence memory numbers	.335	8.384	100.000
(4) Sequence of numbers and letters	.001	0.004	100.000

According to Table (5), the first component (straight test) explained (73.689%) of the explained variance in the (WMI) test, while the second component (inverse test) explained the percentage (17.927%). The third component (the overall memory of numbers test) explained (8.384%) of the explained variance, and the sequence of numbers and letters test explained (0.004%) of the explained variance, so that the sum of all sub-tests and main ones explained (100%) of the variance. Each subtest, according to the interpreter, is an important and complementary test to the other tests that comprise the (WMI) for students with (LD) as a whole.

3- Concurrent Validity

The validity of the intelligence test (WMI) of the students of (LD) was verified through concurrent validity, where the value of the construct validity coefficient of the intelligence test (WMI) of the students of (LD) was compared with the intelligence test (WMI) of the students of normal, where the value of the correlation coefficients of the sub-tests (straight, inverse, memory test, and sequence test of numbers and letters) with the total score of the WMI test among students (LD) (0.747, 0.851, 0.886, 0.829), respectively, and with a statistical significance less than (0.01). While the correlation coefficients for the sub-tests (straight, inverse, the memory of numbers test, and sequence of numbers and letters test) with the total score of the intelligence test (WMI) were (0.724, 0.770, 0.913, 0.851), respectively, with a statistical significance of less than 0.05, (0.01). which shows concurrent validity between the IQ test (WMI) of students with learning disabilities and the IQ test (WMI) of normal students.

Second: Reliability Intelligence Test (WMI):

The researcher identified the consistency of each sub-test of the sub-tests (straight, inverse, memory of numbers test, and sequence of numbers and letters test) with the total score of the test to which it belongs to calculate the stability of the study tool for the (WMI) test, where the calculation of correlation coefficients between each test was used. Sub-tests are linked to the total score via the coefficient (Cronbach's alpha), where the value of the stability coefficient of Cronbach's alpha for the sub-tests and total score (0.888) is an acceptable value for the current study.

The study's findings show that there are indications of validity represented by Content Validity and Construction Validity of the test, as the values of the correlation coefficients between the sub-tests and the total score of the (WMI) test were greater than (0.30), and Concurrent Validity by comparing the value of the Construct Validity coefficient for the intelligence test (WMI) in (LD) students with an IQ test (WMI) in normal students. Where the correlation coefficients for the sub-tests (straight, inverse, numbers memory test, and sequence of numbers and letters test) with the total score of the (WMI) test among students (LD) were (0.747, 0.851, 0.886, 0.829), respectively, with statistical significance less than (0.01). The study's findings also revealed signs of stability represented by Cronbach's alpha coefficient, with the value of Cronbach's alpha stability coefficient for the sub-tests and total score being (0.888).

The second question: What is the level of visual memory and working memory intelligence among students with Learning Disabilities?

To answer the second question; Arithmetic means and standard deviations were extracted to identify the level of (VM) and intelligence (WMI) of the (LD) students, and the following are the results:

First: the level of (VM) for students of (LD):

Arithmetic averages and standard deviations were extracted to identify the level of (VM) of (LD) students through the students' scores on the numbers, shapes, and color tests, and table (6) shows this:

Table (6) Arithmetic averages and standard deviations to identify the level of (VM) of students of (LD)

NO.	Subtest of (VM) tests	Minor degree	Grand degree	verified marks Mino	verified marks Grand	Arithmetic mean	standard deviation	Rank	Level
2	Shape test	0.00	21.00	0.00	10.00	4.00	2.57	1	Low
3	color test	0.00	21.00	0.00	14.00	3.97	3.45	2	Low
1	numbers test	0.00	21.00	0.00	10.00	3.37	2.34	3	Low
	Total of (VM)	0.00	63.00	0.00	24.00	11.33	6.12		Low

Table (6) shows that the arithmetic averages of (LD) students' scores on the (VM) tests ranged between (4.00 and 3.37), with the (LD) students scoring a total (VM) of (11.33) and a standard deviation of (6.12), which is from the low level.

The shape test came in first, with the highest arithmetic average (4.00) and standard deviation (2.57), both of which are low, and the color test came in second, with an arithmetic mean of (3.97) and standard deviation (3.45), both of which are low. And the numbers test came in third place, with an arithmetic mean (3.37) and a low standard deviation (2.34).

Second, the level of intelligence (WMI) of students (LD):

The arithmetic averages and standard deviations were extracted to identify the level of intelligence (WMI) of the (LD) students through their scores on the two number memory intelligence tests in its branches: (straight test, inverse test), and test (sequence of numbers and letters). The results are:

1- Number memory intelligence test:

To identify the level of intelligence of number memory among (LD) students, the arithmetic averages and standard deviations were extracted, and Table (7) illustrates this:

Table (7) Arithmetic averages and standard deviations to identify the level of intelligence of numbers among (LD) students

NO.	Subtest of (WMI) tests	Minor degree	Grand degree	verified marks Mino	verified marks Grand	Arithmetic mean	standard deviation	Rank	Level
2	Straight test	0.00	16.00	4.00	10.00	6.70	1.32	1	Low
3	Inverse test	0.00	16.00	0.00	6.00	3.60	1.71	2	Low
	Total of (WMI)	0.00	32.00	4.00	15.00	10.30	2.76		Low

Table (7) shows that the arithmetic averages of (LD) students' scores on the memory intelligence sub-tests ranged between (6.70 and 3.60), with the total memory of numbers intelligence among (LD) students scoring arithmetic mean of (10.30) with a standard deviation of (2.76), which is of low level.

The straight test came in first, with the highest arithmetic mean (6.70) and standard deviation (1.32), both of which are low, and the inverse test came in second, with an arithmetic mean of (3.60) and standard deviation (1.71), both of which are low.

2- Test the sequence of numbers and letters:

To identify the level of intelligence of the sequence of numbers and letters among (LD) students, the arithmetic averages and standard deviations were extracted, and Table (8) shows this:

Table (8) Arithmetic averages and standard deviations to identify the level of intelligence of the sequence of numbers and letters among (LD) students

NO.	Subtest of test	Minor degree	Grand degree	verified marks Mino	verified marks Grand	Arithmetic mean	standard deviation	Level
	the sequence of numbers and letters	0.00	32.00	8.00	21.00	17.23	2.28	average level

Table (8) shows the arithmetic mean of the student's scores on the sequence of numbers and letters intelligence test was (17.23) with a standard deviation of (2.28), showing an average level.
Table (9) below shows the arithmetic averages and standard deviations to identify the total level (WMI) with its two branches (memory of numbers and sequence of numbers and letters).

Table (9) Arithmetic averages and standard deviations to identify the level of intelligence (WMI) of the (LD) students

				verified marks					
NO.	Subtest of (WMI) tests	Minor degree	Grand degree	Mino	Grand	Arithmetic mean	standard deviation	Rank	Level
2	the sequence of numbers and letters	0.00	32.00	8.00	21.00	17.23	2.28	1	average level
1	memory of numbers	0.00	32.00	4.00	15.00	10.30	2.76	2	Low
	Total of (WMI)	0.00	64.00	14.00	35.00	27.53	4.34		average level

Table (9) shows that the arithmetic averages of the scores of students with learning disabilities on the working memory intelligence sub-tests ranged between (17.23 and 10.30), with the total working memory intelligence among students with (LD) scoring arithmetic mean of (27.53) and a standard deviation of (4.34). which is of a medium level. The sequence of numbers and letters test for students with learning disabilities came first, with the highest arithmetic average (17.23) and standard deviation (2.28), which is of average level. The memory of numbers test came in second place, with an arithmetic average of (10.30) and a standard deviation (2.76), which is a low level.
The results show the student performed better on the numbers and letters sequence test than on the number memory test.
The third question: Are there statistically significant differences at (α = 0.05) between the students' scores for visual memory and the success score among students with Learning Disabilities?
To answer the third study question, arithmetic averages and standard deviations were calculated, and the (One Sample T-test) was used to determine the significance of the differences between students' achievement on the (VM) sub-tests (numbers, shapes, and colors) and the total score, noting that the default arithmetic mean (success mark) was (10.50) for the sub-test and (31.50) for the total score, as shown in table (10).

Table (10) One Sample T-test to identify the significance of the differences between the students' achievement on the (VM) sub-tests and the college and the default arithmetic mean (success mark)

source	Arithmetic mean	Standard Deviation	Value (t) default average (pass mark)	The difference between the mean and the value (t)	Calculated (t) value	value (t) table	Degrees of Freedom	Statistical Significance
Numbers	3.37	2.34	10.50	-7.13	-16.69	1.96	29	*0.000
shapes	4.00	2.57	10.50	-6.50	-13.84	1.96	29	*0.000
Colors	3.97	3.45	10.50	-6.53	-10.38	1.96	29	*0.000
Total (VM)	11.33	6.12	31.50	-20.17	-18.045	1.96	29	*0.000

*: Statistically significant at significance level (0.05) or less, tabular t-value = (±1.96).

The student's scores on the tests (numbers, shapes, and colors) were (3.37, 4.00, 3.97), respectively, with standard deviations (2.34, 2.57, 3.45), and the arithmetic mean value of the total score for the (VM) test was (11.33) and standard deviation (6.12), while the calculated (t) values for the sub-tests (numbers, shapes, colors, and total score.
Table (10) shows the difference between the student's scores on the numbers test and the default arithmetic mean (success mark) = (-7.13), as well as the difference between the student's scores on the shapes test and the hypothetical arithmetic mean (-6.50), as well as the difference between the student's scores on the shapes test, the default arithmetic mean, and the hypothetical arithmetic mean (-6.53), and the difference between the student (-20.17).
The results show that there are statistically significant differences at the significance level (0.05) between the average scores of students on the (VM) sub-tests and the total score; and the hypothetical arithmetic averages (success marks), where the achievement of the student's scores on the sub-tests and the total score is less than the default arithmetic average, showing general weakness and low levels of student achievement on the (VM).

The fourth question: Are there statistically significant differences at (α = 0.05) between the students' scores for working memory and the score for success among students with Learning Disabilities?
Arithmetic averages and standard deviations were calculated, and the (One Sample T-test) was used to determine the significance of differences in the student's achievement on the sub-digit memory tests (the straight test, the inverse test), the total score, and the test of the sequence of numbers and letters, considering that the default arithmetic mean (the success mark) (8.00) for the subtests (rectum and inverse). And (16.00) for the number memory intelligence tests, as well as the number and letter sequence. And (32.00) for the total score on the working memory test, as shown in table (11).

Table (11) One Sample T-test to identify the significance of the differences between the students' achievement on the (VM) sub-tests and the college and the default arithmetic mean (success mark)

source	Arithmetic mean	Standard Deviation	Value (t) default average (pass mark)	The difference between the mean and the value (t)	Calculated (t) value	value (t) table	Degrees of Freedom	Statistical Significance
Straight numbers	6.70	1.32	8.00	-1.30	-5.407	1.96	29	*0.000
Inverse numbers	3.60	1.71	8.00	-4.40	-14.060	1.96	29	*0.000
Memory of numbers	10.30	2.76	16.00	-5.70	-11.327	1.96	29	*0.000
the sequence of numbers and letters	17.23	2.28	16.00	1.23	2.96	1.96	29	*0.006
Total (WMI)	27.53	4.34	32.00	-4.47	-5.641	1.96	29	*0.000

*: Statistically significant at significance level (0.05) or less, tabular t-value = (±1.96).

The arithmetic mean of the student's scores on the tests (straight and inverse) was (6.70, 3.60) with standard deviations (1.32, 1.71), and the arithmetic mean of the total score for the memory of numbers test was (10.30) with a standard deviation (2.76).) The calculated t values for the sub-tests (straight, inverse, and total score) were (-5.407, 14.060, -11.327), which were higher than the tabular value (1.96).
It is also noted that the difference between the students' straight test scores and the hypothetical arithmetic mean (success score) = (-1.30), as well as the difference between the student's inverse test scores and the hypothetical arithmetic mean (-4.40), and the difference between the student's scores on the number memory test. The default arithmetic mean (success mark) = (-5.70).
It was discovered that the arithmetic mean of the student's scores on the sequence of numbers and letters test was (17.23), with a standard deviation of (2.28), and that the difference between the student's scores on the sequence of numbers and letters test and the default arithmetic mean (success mark) = (1.23), which is a value higher than the default arithmetic mean, and that the statistic value (t) reached (2.96).
The arithmetic mean of the student's overall (WMI) test scores was (27.53), with a standard deviation of (4.34), and the difference between the students' overall scores and the hypothetical arithmetic mean (success score) = (-4.47), and the statistic value (t) was (-5.641). It is greater than the tabulated value (1.96)
There are statistically significant differences at the significance level (0.05) between students' average scores on the sub-digit memory tests and the total score and the hypothetical arithmetic averages (success marks), where the achievement of students' scores on the sub-tests and the total score is less than the hypothetical arithmetic average, showing general weakness and a low level of achievement.
The results show that there are statistically significant differences at the significance level (0.05) between the average scores of students on the numbers and letters sequence tests, and the hypothetical arithmetic mean (pass marks), where the achievement of students' test scores was higher than the hypothetical arithmetic mean, showing good performance and achievement.
The results show that there are statistically significant differences at the significance level (0.05) between the average scores of students on the (WMI) tests and the hypothetical arithmetic average (success marks), where the students' test scores were less than the default arithmetic average, showing general weakness and low student achievement.

The fifth question: Is there a statistically significant relationship at the significance level ($\alpha = 0.05$) between visual memory and working memory intelligence among students with Learning Disabilities?
Table (12) shows the correlation coefficients extracted using (Pearson Correlation) to identify the relationship between (VM) and (WMI) intelligence among (LD) students.

Table (12) Pearson Correlation Test to identify the relationship between (VM) and (WMI) intelligence among (LD) students

		Straight numbers	Inverse numbers	Memory of numbers	the sequence of numbers and letters	(WMI) intelligence
Numbers	Pearson Correlation	-.097	.124	.030	.286	.170
	Sig. (2-tailed)	.609	.515	.873	.125	.368
	N	30	30	30	30	30
shapes	Pearson Correlation	-.081	.219	.097	.264	.201
	Sig. (2-tailed)	.669	.245	.609	.159	.287
	N	30	30	30	30	30

Colors	Pearson Correlation	.074	.231	.179	.106	.170
	Sig. (2-tailed)	.699	.219	.344	.577	.371
	N	30	30	30	30	30
Total (VM)	Pearson Correlation	-.030	.269	.153	.280	.245
	Sig. (2-tailed)	.875	.150	.419	.134	.192
	N	30	30	30	30	30

The findings revealed that there was no statistically significant relationship between (VM) and its sub-tests (numbers, shapes, and colors) and the (WMI) intelligence test and its sub-tests (straight, inverse, the intelligence of numbers and letters). All correlation coefficient values were non-statistically significant, showing that (VM) has no effect (WMI).

Discussion

1. **What are the signs of the validity and reliability of the tests of visual memory and intelligence of working memory among students with Learning Disabilities?**

The results revealed that there were indications of validity through the Content Validity and the Construction Validity of the test, with the values of the correlation coefficients between the sub-tests and the total score of the intelligence test (WMI) being greater than (0.30), and the Concurrent Validity by comparing the value of the Concurrent Validity coefficient of the intelligence test (WMI) at students (LD) with a normal student intelligence (WMI) test. The correlation coefficients for the sub-tests (straight, inverse, numbers memory test, and sequence of numbers and letters test) with the total score of the WMI test among students (LD) were (0.747, 0.851, 0.886, 0.829), respectively, with statistical significance less than 0.05. (0.01).

The study's findings also revealed signs of stability, as represented by Cronbach's alpha coefficient, where the values of the sub-tests and the total score were compared (0.888).

- The study's findings agree with Mabroukah (2018) that there is a statistically significant correlation between the sample members' reading ability and (VM). It also agreed with Abu Drei and Al-Rousan (2021) that the correlation coefficients for intelligence (WMI) are positive (0.743-0.930). It also agreed with (Styck & Watkins, 2016) that there are indications of validity for the IQ test (WMI) with an arithmetic mean of (88.94) and a standard deviation of (11.92).
- The researcher's interpretation: is that the various validity and reliability coefficients got by any of the previous methods are acceptable and good, showing that there is a correlation between the scales used and what is measured of the characteristics of students with disabilities (LD).

2. **What is the level of visual memory and working memory intelligence among students with Learning Disabilities?**

   The results showed that the (VM) level of (LD) students ranged between (4.00 and 3.37), with a standard deviation of (6.12), showing a low level. And the shape test has an arithmetic mean (4.00) and a standard deviation (2.57), which is low, the color test has an arithmetic mean (3.97) and a standard deviation (3.45), which is low, and the numbers test has an arithmetic mean (3.37) and a standard deviation (2.34).

   And that the student's level of intelligence (WMI) to test the intelligence of numbers memory, the arithmetic averages ranged between (6.70 and 3.60), Also, the (LD) students' sequence of numbers and letters test level was average, with an arithmetic mean (17.23) and a standard deviation of (2.28).

   And that the (LD) students' level of intelligence (WMI) was average, with arithmetic averages ranging between (17.23 and 10.30), arithmetic mean (27.53), and a standard deviation of (4.34). The Sequence of Numbers and Letters test has an arithmetic mean (17.23) and a standard deviation (2.28), showing a medium level. The memory test has an arithmetic mean (10.30) and a standard deviation (2.76), showing a low level.

- The study's findings Ben Hanachi (2021) agreed that children with learning disabilities have poor visual memory. Also agreed with (Giofrè, David, 2016) that children with learning disabilities struggled with the two number tasks.

- The results of the study differed from Al-Khatib (2012) that the common memory pattern among (LD) students was the visual pattern to a high degree. and Abu Al-Diyar (2017) in the presence of a statistically significant positive correlation between the components of phonological awareness represented in the tests of deletion of syllables and sounds, the accuracy of reading false words, and the spatial (VM) represented by the serial and inverse spatial memory. It also differed with (Giofrè, David, 2016) that children with (LD) suffer from (WMI) in regular numbers to a greater extent than in the inverse numbers task, and that (WMI) was the arithmetic mean (88.29) with a standard deviation (12.40). It was also agreed with (Martinussen, Hayden, Hogg-Johnson, & Tannock, 2005) that children with ADHD showed deficits in multiple components of (WMI), and that the overall effect size of spatial storage and spatiocentral execution of (WMI) was greater than that achieved in both verbal and central executive storage (WMI).

The researcher's interpretation: the level of awareness of (LD) students in (VM) and (WMI), as well as the presence of a clear decline in the overlap of shapes and the similarity of some numbers, resulted in their indistinguishability from them, which resulted in a clear decline, which is one of the characteristics of (LD).

3. Are there statistically significant differences at (α = 0.05) between the students' scores for visual memory and the success score among students with Learning Disabilities?

The results showed that the arithmetic mean of the student's scores on the tests (numbers, shapes, and colors) was (3.37, 4.00, 3.97), respectively, and with standard deviations (2.34, 2.57, 3.45), and the arithmetic mean value of the total score for the (VM) test was (11.33) and standard deviation (6.12).

The results show that there are statistically significant differences at the significance level (0.05) between students' average scores on the (VM) sub-tests and the total score; and the hypothetical arithmetic averages (success marks), where the achievement of the student's scores on the sub-tests and the total score was less than the default arithmetic average, showing the general weakness and low level of student achievement on the (VM).

- The study's findings agreed with Al-Khatib (2012) that differences in the answers of the study sample members in the executive and auditory styles were not statistically significant. It also agreed with Abu Zaid (2011) that there are statistically significant differences in the total dimensions of (VM) between students with (LD) and normal students in favor of normal students.

The researcher's interpretation: the low level of achievement of students on the (VM) tests administered to them, whether it was a low ability to distinguish remembering colors, numbers, or irregular shapes, led to a lack of ability to remember, particularly in visual working memory.

4. Are there statistically significant differences at (α = 0.05) between the students' scores for working memory and the score for success among students with Learning Disabilities?

The study's findings revealed that the arithmetic mean of the student's scores on the tests (straight and inverse) was (6.70, 3.60), with standard deviations (1.32, 1.71), and the arithmetic mean of the total score for the memory of numbers test was (10.30), with a standard deviation of (2.76).

While it was discovered that the arithmetic mean of the student's scores on the sequence of numbers and letters test was (17.23), with a standard deviation of (2.28), and the difference between the student's scores on the sequence of numbers and letters test and the default arithmetic mean (success mark) = (1.23), which is a value greater than the default arithmetic mean. The arithmetic mean of the students' (WMI) test scores was (27.53), with a standard deviation of (4.34).

There were statistically significant differences at the significance level (0.05) between the average scores of students on the sub-digit memory tests and the total score; and the hypothetical arithmetic averages (success marks), where the achievement of students' scores on the sub-tests and the total score was less than the default arithmetic average, indicating general weakness and low level of student achievement on the number's memory test.

There were statistically significant differences at the significance level (0.05) between students' average scores on the numbers and letters sequence tests; and the hypothetical arithmetic mean (pass marks), where the student's test scores were higher than the default arithmetic mean, indicating good performance and achievement on the numbers and letters sequence tests.

There were statistically significant differences at the significance level (0.05) between the average scores of students on the (WMI) tests as a whole; and the hypothetical arithmetic mean (pass marks), where the achievement of students' test scores was less than the hypothetical arithmetic mean, indicating general weakness and a low level of student achievement on the (WMI) test as a whole.

- The study's findings agreed with Kaddouri and Maryam (2016) that there is a difference in the phonological working memory test between the two groups (oral and visual).

Interpretation of the researcher: Working, short, and long-term memory are among the problems of (LD), so their low ability to distinguish between audio and visual is one of the challenges these students face, particularly during the teaching process.

5. **Is there a statistically significant relationship at the significance level ($\alpha = 0.05$) between visual memory and working memory intelligence among students with Learning Disabilities?**

The findings revealed that there was no statistically significant relationship between (VM) and its sub-tests (numbers, shapes, and colors) and the (WMI) intelligence test and its sub-tests (straight, inverse, the intelligence of numbers memory, and sequence of numbers and letters).

- The study's findings agreed with Becker, Daseking, Koerner, 2021) that the performance of the (LD) group with ADHD was low across all Wechsler scale indicators (total intelligence, WMI, PSI).

- Interpretation of the researcher: When there are multiple types of memory, whether visual, auditory, or working memory represented through short-term memory, working memory is better than visual shapes and colors, as evidenced by the results that (VM) does not affect the intelligence of (WMI).

Recommendations:

- Educational recommendations:
  - Creating measurement and diagnostic tools for (VM) students with (LD).
  - Training of teachers to use metrics associated with the (VM).
  - Educating teachers about their students' visual perception issues.
- Suggestions for research purposes.
  - Conducting research on (VM) among (LD) students.
  - Researching the visual-motor perception of (LD) categories (reading, writing, and arithmetic).
  - Researching the relationship (VM) and collection.

References

Abu Drei, S, Al-Rousan, F. (2021). psychometric evidans of Wechsler Intelligence Scale For Children-Fourth Edition (WISC®-IV) Deaf student aging from 6 - 16.11 years Via Sign Language . Jordanian Journal of Applied Sciences - Humanities Series. Vol. 27 : Iss. 2. DOI: https://doi.org/10.35192/jjas-h.v27i2

Abu Drei, S.(2017).Standardization A Jordanian Version of The Wechsler Intelligence Scale for Children -Fourth Edition Adapted for Deaf Via Sign Language From(6-16,11) years. PhD dissertation. Amman, Jordan: The Word Islamic Science and Education University.

Abu Zeid, Khader Mukhaimer. (2011). Auditory and visual memory and their relationship to recognition and reading comprehension among ordinary students and those with learning difficulties. Educational and social studies, volume 17 - part 2

Alloway, T. P., Gathercole, S. E., Kirkwood, H., & Elliott, J. (2009). The cognitive and behavioral characteristics of children with low working memory. *Child Development*, 80, 606–21. doi:10.1111/j.1467-8624.2009.01282.x

Al-Rousan, Farouk (2016): Methods of measurement and diagnosis in special education, seventh edition, Jordan: Dar Al-Fikr for printing, publishing and distribution.

Becker, A., Daseking, M., & Kerner auch Koerner, J. (2021). Cognitive Profiles in the WISC-V of Children with ADHD and Specific Learning Disorders. *Sustainability*, 13(17), 9948.

Ben Hanachi, Kenza (2021). Assessment of visual memory for children with difficulties learning mathematics, master's thesis, Larbi Ben M'hidi University, Algeria

Cornoldi, C., Giofrè, D., Orsini, A., & Pezzuti, L. (2014). Differences in the intellectual profile of children with intellectual vs. learning disability. *Research in Developmental Disabilities*, 35, 2224–2230. doi:10.1016/j.ridd.2014.05.013.

Cortiella, C., & Horowitz, S. H. (2014). The state of learning disabilities: Facts, trends and emerging issues. *New York: National center for learning disabilities*, 25, 2-45.

Kaddouri, Amal, Sudani, Maryam. (2016). The relationship of reading ability with phonological working memory and visual attention among fourth and fifth primary students, Master's thesis, El Wadi University.

Khatib, Monica (2012). Patterns of working memory (executive, visual, and phonological) among students with learning difficulties in reading and mathematics. Master's Thesis in Education. College of Educational and Psychological Sciences: Amman University.

Landerl, K., Bevan, A., & Butterworth, B. (2004). Developmental dyscalculia and basic numerical capacities: A study of 8–9-year-old students. *Cognition*, 93(2), 99-125.

Lyon, G. R., Fletcher, J. M., & Barnes, M. C. (2003). Learning disabilities. In E. J. Mash & R. A. Barkley (Eds.), *Child psychopathology* (pp. 520–586). Guilford Press.

Mabroukah, Zaghb (2018) The relationship of dyslexia to visual memory among fourth-year primary students, Master's thesis, El Wadi University.

Martinussen, R., Hayden, J., Hogg-Johnson, S., & Tannock, R. (2005). A meta-analysis of working memory impairments in children with attention-deficit/hyperactivity disorder. *Journal of the American academy of child & adolescent psychiatry*, 44(4), 377-384.

Melby-Lervåg, M., Lyster, S.-A. H., & Hulme, C. (2012). Phonological skills and their role in learning to read: A meta-analytic review. *Psychological Bulletin*, 138, 322–352. doi:10.1037/a0026744

Solomon, M., Pistrang, N., & Barker, C. (2001). The benefits of mutual support groups for parents of children with disabilities. American journal of community psychology, 29(1), 113-132.

Spreen, O. (2011). Nonverbal learning disabilities: A critical review. Child Neuropsychology, 17(5), 418-443.

Styck, K. M., & Watkins, M. W. (2014). Structural Validity of the WISC-IV for Students with Learning Disabilities. *Journal of Learning Disabilities*. doi:10.1177/0022219414539565

Styck, K. M., & Watkins, M. W. (2016). Structural validity of the WISC-IV for students with learning disabilities. *Journal of Learning Disabilities*, 49(2), 216-224.

Swanson, H. L., & Siegel, L. (2011). Learning disabilities as a working memory deficit. *Experimental Psychology*, 49(1), 5-28.

Wechsler, D. (2003). *WISC-IV technical and interpretive manual. San Antonio* , TX: Psychological Corporation.