Predicting the synchronized swimming distance of 20 meters crawling on the stomach according to indicators of some basic skills for The challenge champions (deaf and mute)

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Introduction and Research Problem :

The issue of educating, rehabilitating, and providing for the needs of people with special needs is a civilizational challenge for nations and societies. Disability imposes itself as a humanitarian issue in international forums because it is anything that prevents a person from living a normal life. It is considered a state of inability to meet the requirements of fulfilling one's natural role in life, related to one's age, gender, and social and cultural characteristics, as a result of injury or impairment in physiological functions. Sources add that swimming is a necessity for all able-bodied individuals in general, and a particularly urgent necessity for the deaf and mute, as it is one of the requirements for people with disabilities to unleash their potential. Sensory-motor abilities play a vital role in their learning, as all information reaches them through their various senses. The brain receives sensory information and interprets it, sending instructions to the body to perform a number of movements. These movements require their educational and training experiences, which help them understand and grasp the skills specific to swimming. The success of deaf and mute individuals in complex skills, especially swimming, depends on the relationship between the body and mind, and on possessing kinesthetic awareness. This creates a complete integration between the mind and body, fostering a sense of the body's movements in the actual direction of the action. This, in turn, manifests in the precision and creativity of their movements, helping to balance the skill within the movement sequence, leading to skill, agility, and aesthetic fluidity (37:2).

Youssef Al-Qaryouti (2007) and Adel Nassif Jabr (2007) add that the deaf and mute are among the groups that rely primarily on the senses to perceive

their surrounding environment, which imposes on them the nature of integration and dealing with it in a special way that enables them to perform all tasks in a natural manner and style through a mental response to certain sensory stimuli. Without perception, behavior does not occur because the deaf and mute recognize the motor performance according to the requirements of the situation that they perceive. Thus, sensory-motor perception was the primary support for their knowledge in light of other compensatory sensory stimuli that they rely on primarily in perceiving the surrounding environment (52:9), (74:7) .

The sources add that swimming is a necessity for able-bodied individuals in general, and a particularly urgent necessity for the deaf and mute, as it is one of the requirements for people with disabilities to unleash their potential. Sensory-motor abilities play a vital role in their learning, as all information reaches them through their various senses. This information is received through the sensory reception area and through areas in the brain that analyze this information and provide the relevant interpretation. This requires the brain to send instructions to the body to perform a number of movements, which they need to draw upon their educational and training experiences. These experiences help them understand and grasp the skills required for swimming performance. The success of deaf and mute individuals in complex skills, especially in swimming, depends on the relationship between the body and mind and possessing kinesthetic sense. This creates a complete integration between the mind and body, which develops the awareness of the body's movements in the actual direction of the movement. Consequently, this manifests in the accuracy of performance and motor creativity, and helps balance the performance of the skill within the movement sequence to begin with skill, agility, and aesthetic flow (841:8), (55:10), (217:11).

Through the work of researchers in the field of teaching and training swimming for people with special needs, specifically the deaf and mute, it has been found that synchronized swimming includes many lateral and directional motor activities, balance, motor coordination, body perception, and time design. All of these activities are necessary for the skill of synchronized swimming, as it is a complex skill that is difficult to deal with for the deaf and mute ، It is a basic skill that includes all the skills that depend on changing the body position from the vertical position to the horizontal position in the water. It requires the presence of mind to understand each movement with complete accuracy, comprehend it, and be able to perform it with neuromuscular coordination by feeling the important parts that make up the skill and focusing on them and raising the motor performance. Therefore, if it is possible to recall some basic skills, it is possible to predict synchronized swimming with a degree of accuracy. Accordingly, the researchers developed a predictive formula for

crawl swimming on the stomach according to the indicators of some basic skills of the champions of the challenge from (the deaf and mute).

Research Objective :

This research aims to identify and attempt to predict the 20-meter front crawl in synchronized swimming based on indicators of some basic skills in deaf and mute athletes.

Research Hypotheses : To achieve the research objectives, the researcher formulates the following hypotheses:

- Can the 20-meter front crawl (the subject of this research) be predicted based on indicators of some basic skills (floating on the stomach and stability, forward flow with leg movements for 10 meters, arm movements, and correct lateral breathing) in deaf and mute athletes (the research sample) ?

Terms used in the research:

Synchronized swimming: The final result of each of the basic skills (floating on the stomach and stability - forward flow with leg movements 10m - arm movements - correct breathing from the side) (operational definition).

Research Plan and Procedures :

Research Methodology: The descriptive method was employed, utilizing a field survey approach to suit the nature and context of the study.

Research Population and Sample: The research sample was selected purposively from individuals with special needs, specifically deaf and mute individuals in Minya Governorate. The sample consisted of (10) individuals, and prediction equations were applied.

Normalization of Sample Members in the Variables Under Investigation :

The researchers verified the normality of the distribution of individuals in the experimental and control groups in light of the following variables: growth rates (including age, height, and weight) and some basic skills (floating on the stomach and maintaining stability, forward glide with leg movements, arm movements, and correct side breathing) for the individuals with special needs, specifically the deaf and mute participants (the research sample).

Table (1)
Arithmetic mean, median, standard deviation and skewness coefficient of the variables under investigation for the entire research sample (n=22)

skewness	Standard Deviation	Meaning	Mean	Unit of Measurement	Variables		م
1.076	0.688	7	7.5	Years	Age	Growth Rates	1
0.206	5.072	128.5	128.55	cm	Height		2
1.031-	4.222	32	33.4	kg	Weight		3

Table (1), which indicates the arithmetic mean, standard deviation, median, and skewness coefficient of the variables (under study) for the research sample

before the research experiment was carried out, shows that the skewness coefficient ranged between (-1.031) and (1.076), i.e., between (-3) and (+3). This means that these variables fall within the normal normal curve, which indicates the homogeneity of the research sample in the variables (under study).

Table (2)
Arithmetic mean, median, standard deviation and skewness coefficient of the variables under investigation for the entire research sample (n=22)

م	Variables	Mean	Meaning	Standard Deviation	skewness
1	Horizontal floating on the stomach	6.6	7	0.598	1.245
2	Forward glide with leg movements (10m)	6.4	7	0.753	0.851-
3	Arm movements	6.5	7	0.688	1.076-
4	Side breathing	6.55	7	0.759	1.389-

Table (2), which indicates the arithmetic mean, standard deviation, median, and skewness coefficient of the variables (under study) for the research sample before the research experiment was carried out, shows that the skewness coefficient ranged between (-1.389) and (1.245), i.e., between (-3) and (+3). This means that these variables fall within the normal normal curve, which indicates the homogeneity of the research sample in the variables (under study).

Data Collection Tools :

First:

Equipment and Tools: The researcher selected the tools used in the research according to the following conditions:

• They must be effective in measuring the specific aspects of the research.

• They must possess the scientific properties of validity, reliability, and objectivity.

The researcher used the following scientific equipment and tools:

- A high-frequency, Japanese-made Sony video camera.
- A tripod for stabilizing the camera.
- A Casio fx-82MS electronic handheld calculator.
- A medical scale (for measuring weight in kilograms).
- A rectometer for measuring length in centimeters.

The researchers compared some of the devices by applying the measurements to other devices of the same type and under the same conditions, and they gave the same results, indicating the validity and reliability of the results obtained by these devices.

Basic Skills (Floating on the stomach and maintaining stability - Forward glide with leg movements 10m - Arm movements - Correct side breathing)

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Second - Tests: The researcher used the following tests:

1- Basic Skills Tests:

- Floating on the stomach and maintaining stability (Appendix 1).
- Forward glide with leg movements (10m) (Appendix 2).
- Arm movements (Appendix 3).
- Correct lateral breathing (Appendix 4).

2- Synchronized swimming tests for the front crawl (20m).

Scientific Coefficients of the Tests Under Investigation:

The researchers calculated the scientific coefficients of validity and reliability for the tests under investigation from Saturday, June 12, 2024, to Tuesday, June 15, 2025.

A. Validity: The validity of the tests under investigation was calculated using differential validity (distinguished group and non-distinguished group) by administering the tests to a group of children with prior swimming experience and a non-distinguished group of challenge champions (deaf and mute) with limited swimming experience. This was done on a pilot sample similar to the research population but outside the main research sample, consisting of (6)six participants. These six were divided into(3)with prior swimming experience and (3)with limited swimming experience, representing the non-distinguished group. The significance of the differences between the distinguished and non-distinguished groups was calculated, as shown in Table(3)which is the differential validity coefficient for the tests under investigation

Table (3)

Significance of differences between the distinguished and non-distinguished groups in the basic skills variables of crawl swimming (n1=n2=6)

Significance Leve	T-value	The non-distinguished group)n(6=		The distinctive collection)n(6=		Variables	M
		Standard Deviation	Arithmetic Mean	Standard Deviation	Arithmetic Mean		
Function	8.944	0.707	3	0.707	7	Belly floating and stability	Basic skills for synchronized swimming: crawling (front crawl)
Function	10.752	0.547	3.4	0.447	6.8	Forward glide with leg movements (10m)	
Function	7.155	0.836	4.2	0.547	7.4	Arm movements	
Function	4.185	1.341	3.6	1.224	7	Proper side breathing	

The tabulated t-value at the (0.05) level = 2.228.

Table(3)shows that there are statistically significant differences between the distinguished group and the non-distinguished group in the tests under investigation, and in the direction of the distinguished group, as the probability of error values are significant at the(0.05)significance level. Also, the calculated t-value is greater than its tabulated value, which indicates the validity of these tests and their ability to differentiate between groups .

B- Reliability : To calculate the reliability of the tests under investigation, the researcher used the method of applying the test and reapplying it to a sample of (6)six challenge champions (deaf and mute) from outside the research sample and they have the same characteristics as the original sample, with a time interval of (7)three days between the first and second applications. Table (4)shows the correlation coefficients between the two applications.

Table (4)
Correlation coefficients between application and reapplication in the tests under investigation (n=6)

Significance Leve	Correlation Coefficient	Reapplication (n=6)		Application (n=6)		Variables	M
		Standard Deviation	Arithmetic Mean	Standard Deviation	Arithmetic Mean		
Function	0.845	0.836	3.2	0.707	3	Belly floating and stability	Basic skills for synchronized swimming: crawling (front crawl)
Function	0.872	0.836	3.2	0.547	3.4	Forward glide with leg movements (10m)	
Function	0.943	1.140	4.4	0.836	4.2	Arm movements	
Function	0.958	1.516	3.4	1.341	3.6	Proper side breathing	

Table (4)shows that the correlation coefficients between the application and reapplication of the tests under investigation ranged between (0.782, 0.968), and all of them are statistically significant correlation coefficients, as the calculated (r)values are greater than the tabulated (r)value at the significance level of (0.05), which indicates the reliability of those tests .

Statistical Analysis Used in the Research :

The researchers used the following statistical analyses :

- Arithmetic mean
- Standard deviation
- Median
- Skewness coefficient
- Man-Whitney U test
- Percentage contribution
- Multiple regression coefficient and its significance

Presentation and discussion of the results :

Multiple regression coefficient, t-value, multiple correlation, covariance, constant, standard error, and percentage contribution of independent variables for some basic skills (under investigation)affecting synchronized swimming over

a distance of 20 meters for the deaf and mute challenge champions (research sample) (n=10)

Contribution percentage %	Standard error	Constant value	Covariance	Multiple correlation	Function level	t-value	Regression coefficient	Variables
75.74	19.70	46.361	0.92	0.93	دال	4.74	0.14-	Belly floating and stability
					دال	3.92	0.15	Forward glide with leg movements (10m)
					دال	3.54	0.40	Arm movements
					دال	3.74	0.19-	Proper side breathing

*** The tabulated t-value at the 0.05 level is (2.262) .**

Table (5), which shows the multiple regression coefficients, t-value, multiple correlation, covariance, constant, standard error, and percentage contribution of the independent variables for some basic skills (under investigation) affecting the 20-meter synchronized swimming of deaf and mute challenge champions (the research sample), indicates that all the independent variables of the basic skills (floating on the stomach and stability, forward flow with leg movements for 10 meters, arm movements, and correct lateral breathing) affect the 20-meter synchronized swimming of the deaf and mute challenge champions (the research sample). Their 20-meter synchronized swimming can be predicted based on these indicators of the basic skills (under investigation).

Researchers attribute the effective impact of these variables in 20-meter synchronized swimming to the interconnectedness of the fundamental skills involved in this distance. The horizontal and streamlined floating technique, performed by deaf and mute individuals, marks the beginning of a crucial swimming phase: sloshing in the water with the feet off the pool floor. This allows the body to enter a physical phase, the most important for achieving buoyancy. The use of arms in an alternating motion beneath the body, combined with leg kicks to propel the body as far as possible while raising the head without any equipment, and performing the skill in a straight line, are

significant for maintaining body alignment. Standing in the water fosters confidence and increases control over body movements, particularly regarding density relative to water density. Lower body density enhances buoyancy and overall motor performance. Meanwhile, the 10-meter freestyle proved to be the most effective of the fundamental swimming skills, as it integrates all the previously mentioned techniques. This is a direct result of proper progression in performance and the optimal effectiveness of both leg kicks and movements. The combination of arm and breathing in a single skill allows for efficient speed control of both leg and arm strokes. It also incorporates coordination through the individual interplay of upper and lower limb movements, enhanced by increased breathing.

Based on the results in Table (5), the following equation is used: 20-meter synchronized swimming (research sample) = 46.361 + (-0.14 × flat-front buoyancy with stability) + (0.15 × forward glide with leg movements for 10 meters) + (0.40 × arm movements) + (-0.19 × correct lateral breathing).

The length of the stroke is determined by the following equation: This is consistent with the findings of the studies by Abdul Salam Saleh Ali (2018)(4), Ali Khalid Kazem (2018)(5), Tariq Abdul Jabbar Hussein (2017)(3), Hazem Moussa Abdul Hassoun (2016)(1), and Ali Safwat Jalal (2012)(6).

Through the presentation, interpretation and discussion of Table (5), the first question is verified that the synchronized swimming of the 20-meter crawl on the stomach (under investigation) can be predicted according to the indicators of some basic skills (floating on the stomach and stability - forward flow with leg movements 10m - arm movements - correct breathing from the side) for people with special needs from the heroes of challenge (the deaf and mute) (the research sample).

Conclusions:

Within the scope of the research problem and its significance, and in light of its objectives, hypotheses, and the nature of the sample, and within the framework of statistical analysis, interpretation, and discussion of the results, the researchers were able to reach the following conclusions:

The synchronized swimming of the 20-meter front crawl (the subject of this research) can be predicted based on indicators of some basic skills (floating on the stomach and maintaining stability, forward flow with leg movements for 10 meters, arm movements, and correct lateral breathing) for athletes with special needs (deaf and mute athletes) (the research sample) using the following equation:

20-meter synchronized swimming (research sample) = 46.361 + (-0.14 × floating on the stomach with stability) + (0.15 × forward flow with leg movements for 10 meters) + (0.40 × arm movements) + (-0.19 × correct lateral breathing).

Recommendations:

In light of the research findings, the researchers recommend the following:

1- Conducting further studies and research on predictive studies, as they resolve the debate between dependent and independent variables (under investigation).
2- Expanding the application of synchronized swimming studies to both able-bodied individuals and those with special needs, particularly (deaf and mute athletes), due to its significant positive impact on them.
3- Focusing on fundamental skills as the basis for developing technical performance, especially in swimming, across all age groups (children, juniors, able-bodied individuals, and those with special needs).
4- Emphasizing sensory-motor training as the basis for developing skill performance across all age groups (children, juniors, able-bodied individuals, and those with special needs).
5- Promoting basic skills training as an effective method for activating sensory aspects in the child development stage, enhancing their abilities, and improving their efficiency. 6. Adopting a scientific approach when selecting variables related to developing all technical aspects, taking into account the nature, characteristics, and needs of people with disabilities.
6- Conducting modern and advanced studies in the field of basic swimming skills, including the use of equipment and tools.
7- Promoting the use of scientific methods in swimming, considering it one of the fastest ways to enhance brain activity and achieve neuromuscular coordination in athletes with disabilities.

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Research Summary
The Effect of an Educational Program Using Augmented Reality on Sensory-Kinesthetic Perception (Land and Water) and Crawl Swimming for Deaf and Mute Challenge Champions

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The research aims to predict the synchronized swimming of 20 meters crawl on the stomach according to the indicators of some basic skills of the challenge champions (deaf and mute). The researchers used the descriptive approach using the "field survey" method to suit the nature and situation of the study followed. The research sample was chosen intentionally from people with special needs from the deaf and mute in Minia Governorate and their number reached (10). The prediction equations were conducted, and the most important conclusions were that the synchronized swimming of 20 meters crawl on the stomach (under study) can be predicted according to the indicators of some basic skills (floating on the stomach and stability - forward flow with leg movements 10 m - arm movements - correct breathing from the side) for people with special needs from the challenge champions (deaf and mute) (research sample) through the following equation: Synchronized swimming for a distance of 20 meters (research sample) = 46.361 + (-0.14 × buoyancy on the stomach with stability) + (0.15 × forward flow with leg movements 10m) + (0.40 x arm movements) + (-0.19 x correct breathing from the side), and the most important recommendations are to conduct more studies and research on predictive studies because they resolve the controversy between the dependent variables and the independent variables (under investigation), generalize the application of studies in synchronized swimming on both sides, normal and those with special needs in particular (challenge champions of the deaf and mute) because of its strong positive change on them, and focus on basic skills as a basis for developing the level of technical performance, especially swimming, and in all age groups for each of (buds, juniors, healthy people, those with special needs), focus on sensory-motor perception training as a basis for developing the level of skill performance in all age groups for each of (buds, young people, healthy people, those with special needs), and work to spread basic skills training as one of the effective training in activating the sensory aspects of the buds stage and increasing their capacity and raising their efficiency, and following the scientific method when choosing the variables responsible for developing all Technical aspects, taking into account the nature, characteristics and needs of people with special needs and the disabled, and conducting modern and advanced studies in the field of basic swimming skills, including the use of devices and tools and the generalization of the use of scientific methods in the sport of swimming, considering it the fastest way to enhance brain activity in creating neuromuscular coordination among people with special needs who are challenge champions.

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