A training program based on mental abilities and its effect on some mental variables and improving the skill and digital performance of young swimmers (under 13 years)

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Introduction:

Mental abilities play a crucial role in achieving sporting success. Neglecting this role and not paying attention to it can significantly harm performance. Emphasizing the importance of mental abilities and their effective role in reaching the state of ideal performance is essential. [14: 45]

Raniney D. (2019) suggests that mental training includes various psychological skills such as relaxation training, recognizing the emotional profile of the athlete, mental imagery, technical aspects of performance recall, recalling successful experiences, attentional focus training, and isolating thoughts from non-training processes. [22: 48]

Mental imagery is indeed an important mental skill that should be emphasized to achieve the best results in sports. To develop mental imagery, it's crucial to enhance relaxation skills, which are among the most significant mental capabilities. Additionally, it's important to highlight the significance of early planning for the development of mental skills in young athletes through long-term programs. [12: 166]

The importance of training in mental and psychological skills extends beyond just sports competition but is also crucial in the broader context of physical activity and skill acquisition. As Mohammed Allawi explained in 2008, training in mental and psychological skills can provide athletes with an advantage over others who do not engage in this type of training. Often, these mental and psychological skills can be the deciding factor in achieving success, excellence, and sports performance. [18: 193]

According to Mohamed Shimon in 2016, training on psychological and mental skills should accompany physical fitness and motor skills training. This holistic approach aims to help athletes reach the highest level of achievement in both physical and motor performance. Some of these psychological and mental skills include mental imagery, attentional focus, and relaxation. Consequently, these skills can be utilized to enhance the psychological and mental capabilities of athletes, assisting them in making appropriate decisions and thinking clearly in various situations during both training and sporting competitions. [12: 371]

Both Osama Rateb in 2017, Mohamed Allawi in 2008, and Mohamed Shimon along with Majda Ismail in 2014 agree that skills such as mental imagery, objective setting, problem-solving, relaxation, emotional energy regulation, attentional focus control, and feedback are examples of psychological and mental skills that athletes need to train and develop. [20: 21] [18: 195] [15: 95]

Through the literature review and the researcher's practical experience in swimming coaching, it has become evident that some technical errors occur during the backstroke rotation phase in swimming. These errors can sometimes lead to disqualification or poor race results, and they can negatively impact the digital performance level in backstroke swimming.

Given that mental training is considered an important factor for improving technical aspects, the importance of mental training and its impact on the rotation in backstroke swimming becomes evident. This led the researcher to conduct this study in an attempt to explore the effect of mental training on backstroke rotation in swimming. Consequently, the study aims to investigate the influence of mental training on performance levels and digital achievement of swimmers. The results of this study can provide valuable insights for coaches and swimmers into the significance of incorporating mental training and rotation techniques into training programs and races, aiming to enhance performance and achieve desired results.

Therefore, this research serves as a scientific investigation that aims to identify the key mental capacities associated with enhancing technical performance in the backstroke rotation in swimming. It also seeks to activate the role of mental training in assisting swimmers to effectively utilize their mental capabilities alongside their physical and technical abilities during training. Moreover, it explores how the application of these mental capacities reflects on their technical proficiency and opens up opportunities for further research on the impact of mental training in improving both the technical and digital achievement levels in swimming. This aligns with the findings of researchers such as Hail 2019 (6) and Tonay 2013 (26), who highlight that athletes accustomed to using mental

imagery before competitions tend to perform better than those who do not use imagery. Consequently, this research may serve as a pioneer in the field of scientific research that delves into the influence of mental capacities on both the technical and digital aspects of young backstroke swimmers' performance.

In light of the above, the researcher designed a training program based on mental abilities and examined its effect on the development of certain mental variables, as well as the improvement of skill performance and digital achievement levels in backstroke swimming for swimmers under the age of 13.

Research Objective:

This research aims to investigate the effect of a training program on some mental variables (imagery, attentional focus, relaxation), skill performance level (technical performance in the backstroke stage), and digital achievement level in backstroke swimming for athletes under 13 years old from the Cairo Sporting Club.

Research Hypotheses:

1- There are statistically significant differences between the means of the pre-test and post-test measurements for the research sample in the level of mental variables (mental imagery, attentional focus, relaxation) in favor of the post-test measurement.

2- There are statistically significant differences between the means of the pre-test and post-test measurements for the research sample in the level of skill performance (technical performance of the backstroke turn) in favor of the post-test measurement.

3- There are statistically significant differences between the means of the pre-test and post-test measurements for the research sample in the digital level (achievement level) in favor of the post-test measurement.

Methodology

Method:

The researcher used an experimental research design with a single experimental group and pre- post test measurements.

Research Population and Sample:

The research community consisted of 34 swimmers from the Cairo Sporting Club during the 2021 sports season. The actual sample for the primary experiment was selected intentionally and included 24 swimmers born in 2008 and 2009 (12-13 years age group). The size of the survey study sample was 10 swimmers from the research community, and they were not part of the core sample for calculating the scientific measurements related to the tests under investigation.

Moderation of the research sample distribution(Homogeneity):

Table (1)
Descriptive Distribution for the Research Sample, N=34

N	Variables	Measurement Unit	Statistical Analysis			
			Mean	Standard Deviation	Median	Skewness Coefficient
1	Age	Years	12.60	0.36	12.50	0.83
2	Height	Cm	146.75	4.21	147.80	- 0.75
3	Weight	Kg	45.69	2.44	45.70	- 0.01
4	Trunk and thigh flexibility	Cm	5.84	0.94	6.00	- 0.51
5	Agility	Second	6.88	0.59	6.90	- 0.10
6	Muscle power of the legs	Cm	117.02	2.96	117.00	0.02
7	Back muscle strength	Number	13.85	1.96	14	0.23
8	Balance	Second	10.63	1.08	10.7	- 0.19
9	Arm muscle strength and shoulder	meters	3.74	0.81	4	- 0.96
10	visual imagination	degree	10.35	1.59	10.3	0.09
11	auditory imagination	degree	10.51	1.46	10.5	0.02
12	motor sensation	degree	11.02	1.33	11	0.05
13	imagination of accompanying emotional	degree	10.33	1.35	10.4	- 0.16
14	control imagination	degree	10.49	1.31	10	1.12
15	mental visualization from an internal perspective	degree	10.41	1.45	10.5	- 0.19
16	Attention Concentration	degree	6.12	1.36	6	0.18
17	The Ability to Relax	degree	27.46	1.95	27.5	- 0.06
18	The skill test	Second	20.35	0.54	20.4	- 0.28
19	The digital test	Second	22.91	1.95	22.9	0.02

It is clear from Table (1) that the previous variables range between (+3, -3), and thus moderation/ homogeneity in the previous variables.

Tools:

- **Measurement and Devices:** Stadiometer for measuring height and weight (in cm and kg), Wall-mounted measuring scale, A 50m x 25m swimming pool, Stopwatch, Flags, 5kg medical balls. (Attachments 1, 2, 3).

- **The Used Tests (Physical, Skill, Digital, and Mental):**

(a) The used physical tests based on the references (1, 2, 5, 8, 9, 11, 21, 23, 25). (Attachment 1).

(b) The skill test "15m Backstroke Performance Test" was determined based on the reference (1). (Attachment 2)

(c) The digital test "25m Backstroke Time Performance Test" was determined based on reference (21). (Attachment 3)

(D) Mental Tests: Mental tests were determined as follows:

(1) The Mental Visualization Scale in the Sports Field, through reference number 15. (Attachment 4/1)

(2) Attention Concentration Test, through reference number 13. (Attachment 4/2)

(3) The Ability to Relax Test, through reference number 17. (Attachment 4/3).

These tests were presented to the expert (Attachment 8), and their approval rate was 100%, as shown in Tables 2,3 at Attachment 4.

Validity: Discriminant validity was used, which relies on comparing the performance of two distinct groups, one of which excels over the other. The tests were administered on the 20th and 21st of June 2021:

- **Distinguished Group:** Comprising 10 players from the advanced training level at the club (players from the first team at the club).

- **Non-Distinguished Group:** Consisting of 10 players from the low-level training (players not registered with the club's first team). As shown in Table 4 at Attachment 4.

Reliability: The tests under research were assessed for reliability using a test-retest method. They were initially applied to a sample of (10) players (the undistinguished group) during the days of June 20 and 21, 2021, for the first application, and June 27 and 28, 2021, for the second application, with a gap of (7) days between the two applications, as illustrated in Table 5 at Attachment 4.

A mental training program:

The research designed a mental training program by following these steps:

(1) The main objective of the Program: The main objective of the program is to enhance specific mental abilities (mental imagery, concentration, and relaxation) and investigate their impact on skill performance (technical performance in backstroke swimming) and achievement level in swimmers under 13 years old at the Cairo Sporting Club.

(2) Determining the Level of Variables under research: The level of the research sample in each of the physical, skill-based, digital, and mental variables was determined through the tests used (as detailed in item 2 in the third section: Tools) and Table 10.

(3) Program Content: The training program includes:

- Mental exercises specific to the rotation phase in backstroke swimming. These exercises encompass the development of mental capabilities related to swimming in the rotation phase during backstroke swimming.

- Gradation in performing mental exercises specific to the rotation phase in backstroke swimming, from simple to complex. The program design includes a progression in the execution of mental exercises related to the rotation phase, starting from simple exercises and progressing to more complex ones.
- Defining mental exercises and distributing them within the units (Appendix 5, 6), as explained in the following item number (4).

(4) Description of the Dimensions of the Mental Training Program: (Appendix 5)

Table (6) in Appendix 5 illustrates the description of the dimensions of the mental training program.

(5) The timing distribution of the content of the mental training program: (Appendix 6)

The timing distribution of the mental training program, As indicated in Table 7 at Appendix 6, which it appears that the total duration of each unit is 30 minutes, and the total number of units in the program is 36. This is further elaborated in Appendix 6.

(6) The time duration of the training program:

Table (8): The time duration of the research sample program:

N.	Content	Timing distribution
1	Program Duration	12 weeks
2	Number of Units per Week	3
3	Total Number of Program Units	36
4	Duration of Each Training Unit	30 minutes
5	Total Program Duration	1080 minutes (18 hours)

As shown in Table (8), the program duration is 12 weeks, with three units per week, totaling 36 units.

This program extends over 12 weeks, with three units per week, making a total of 36 training units. Each unit has a duration of 30 minutes, resulting in a total program duration of 18 hours.

The following table shown one of the program units:

Table (9)
An example of one program modules

Week	Unit	Aspect	N.	Unit Content	Training Time
2	6	Muscle Relaxation (Progressive Relaxation)	1	(Lying down) Push your chin inwards (5 seconds, repeat twice)	2 minutes
			2	(Lying down) Relax all parts of your face (forehead, eyes, jaws, lips, tongue, chin)	3 minutes
			3	(Sitting square) Lift your shoulders up, trying to touch your ears without raising your arms (5 seconds, repeat twice)	3 minutes
			4	(Lying down) Press your heels against the ground as hard as possible (5 seconds, repeat twice)	2 minutes
		Mental Relaxation (Breathing Control)	5	(Lying down) Close your eyes and focus on the rise and fall of your chest during breathing. Try to make your breathing calm and regular	4 minutes
			6	(Lying down) Focus on the sound of your breathing, ensuring it's calm and regular for 2 minutes	4 minutes
			7	(Lying down) Try to relax the muscles in your chest after each exhale, always maintaining calm and regular breathing for 2 minutes	4 minutes
			8	(Lying down) Listen to the sound of your breathing while in a state of complete chest muscle relaxation	3 minutes
		Awakening	9	(Lying down) Slowly move your arms (up and down)	1 minute
			10	(Lying down) Slowly move your head from side to side	1 minute
			11	(Lying down) Shake your thighs to the sides	1 minute
			12	(Lying down) Shake your legs	1 minute
			13	(Lying down) Bend your torso forward and then stand up	1 minute

It is clear from Table (9) that the training program shows the week and unit number, and the content of the mental training unit.

(7) The survey of experts:

In the survey of experts (Appendix 8), opinions were collected regarding the physical, skill, digital, and mental tests under investigation, as previously explained in item 2 in the third section: Data Collection Tools and Methods, and Appendixes (1, 2, 3).

Opinions of experts were also gathered regarding the dimensions of the mental training program, the time distribution of the program's content, and the program's duration, as detailed in Tables 6, 7, 8, and Appendixes (5, 6).

A pilot study:

The researcher conducted a pilot study on a sample of exploratory study participants on June 29-30, 2021, with the following objectives:

- To perform the scientific procedures for the tests used.
- To assess the suitability of the location where the training program will be implemented.
- To apply some modules of the program.

The confirmation of all the mentioned points was carried out through a sample of the exploratory study, consisting of 10 swimmers from the research community, who were outside the main sample.

Measurements of Research: The research measurements are as follows:

- **Pre-assessments:** The pre-assessments for the mental, skill, and numerical variables were conducted on July 4th, 5th, and 6th, 2021, as outlined in Table (10).

- **Program Implementation:** The execution of the mental training program took place over 12 weeks, from July 11, 2021, to September 30, 2021. The program consisted of three units per week, totaling 36 training units, as indicated in Tables (7, 8) and in Addenda (6, 7).
- **Post-assessments:** The post-assessments were conducted after the completion of the training program for the research sample on October 3rd, 4th, and 5th, 2021. These assessments were performed under the same conditions and circumstances as the pre-assessments, as outlined in Table (10).

Results

Table (10) Significance of Differences Between Pre- measurements and Post-measurements Means for the Research Sample in Physicalm Skill and Digital Variables, N=24

Variables	Measurement Unit	Pre		Post		Mean Difference	Value "t" Calculated
		Mean	Standard Deviation	Mean	Standard Deviation		
visual imagination	degree	10.34	1.58	12.55	1.97	2.21	3.54*
auditory imagination	degree	10.52	1.47	12.65	1.54	2.13	3.16*
motor sensation	degree	11.03	1.34	13.01	1.96	1.98	2.59*
imagination of accompanying emotional	degree	10.32	1.37	12.74	1.48	2.42	3.98*
control imagination	degree	10.47	1.30	12.86	1.43	2.39	3.94*
mental visualization from an internal perspective	degree	10.43	1.46	13.00	1.88	2.57	4.12*
Attention Concentration	degree	6.13	1.35	8.42	1.95	2.29	3.78*
The Ability to Relax	degree	27.48	1.97	31.56	2.01	4.08	7.84*
The skill test	Second	20.36	0.55	18.19	0.55	2.17	3.39*
The digital test	Second	22.90	1.96	21.54	1.97	1.36	2.11*

"T" value at the significance level (23, 0.05)= 1.71 (one-tailed)

It is evident from Table (10) that there are statistically significant differences between the pre and post measurements for the research sample in physical, skill and digital variables at a significance level of 0.05.

Discussion

1. **Discussion of the first Hypothesis:**

The first assessment indicates statistically significant differences between the pre-test and post-test means for some of the mental variables in favor of the post-test, as revealed in Table (10). The t-table value was (1.71), which is lower than the calculated t-values at a significance level of 0.05, indicating that these differences were statistically significant in favor of the post-test. These differences were observed in the variables of attention concentration, relaxation ability, and various aspects of mental visualization, including visual imagination, auditory imagination, kinesthetic sensation, emotional state visualization, the ability to control visualization, and internal perspective visualization. This suggests that the mental capabilities training program led to an improvement in the mental variables under research.

The researcher attributes these statistically significant differences in the mental variables of the research sample, including mental visualization, attention concentration, and relaxation, to the positive impact of the mental capabilities program and its effective role in enhancing the players' performance. This aligns with the findings of Osama Rateb and Ali Zaki (2014) who emphasized the significant role of mental capabilities in achieving sports achievements. They also mentioned that muscular relaxation results in less muscle response to nerve stimulation, leading to longer, more flexible, and thinner muscle

appearance, which conserves energy, reduces heart and blood vessel pressure, prevents stress, and slows down respiration. This contributes to reducing anxiety and tension while enhancing attention. [21: 345]

The researcher believes that this significant progress in the mental variables can be attributed to the impact of the mental training program. This program influenced the mental visualization of the players, helping them create new and positive mental scenarios. This, in turn, contributes to raising their athletic performance.

The researcher sees that this sudden advancement in mental variables can be attributed to the influence of the mental training program. This program affected the players' mental visualization, aiding them in forming new and positive mental scenarios, which, in return, contributes to the enhancement of their athletic performance.

The aforementioned findings align with what Mohamed Shamon suggested in 2016, that mental visualization involves the reconfiguration or retrieval of past experiences in the mind. Mental visualization goes beyond merely reliving past events; it extends to new scenarios that have not occurred before. An athlete may create mental images of specific points in their mind and attempt to respond to them, even if they haven't competed against that particular opponent. The mind, therefore, has the capacity to create new scenarios. The physiological basis for mental visualization lies in the processes that occur in the sensory organs' parts present in the brain. [12: 50,218]

Therefore, the first hypothesis, which states that "there are statistically significant differences between the pre-test and post-test means of the sample in the level of some mental variables (mental imagery, attention concentration, relaxation) in favor of the post-test," is confirmed.

2. **Discussion of the second Hypothesis:**

As for the second hypothesis, which suggests "the existence of statistically significant differences between the pre-test and post-test means of the sample in terms of skill performance (technical performance in the backstroke swimming phase) in favor of the post-test,

Based on the statistical results comparing the pre-test and post-test performance in the skill variable (technical performance in the backstroke swimming phase), the data analysis, as shown in Table 10, indicates the presence of statistically significant differences between the pre-test and post-test means in favor of the post-test for the sample. The table demonstrates that the critical "t" value (1.71) was smaller than the calculated "t" value, indicating statistical significance at a 0.05 level for the post-test.

These results suggest a noticeable improvement in the skill level of the young swimmers, particularly in their technical performance in the backstroke swimming phase. This improvement can be attributed to the mental training program, which positively impacted their technical skills and, subsequently, their overall achievement.

This outcome aligns with the notion that mental training can enhance an athlete's skill performance by improving their concentration, visualization, and relaxation techniques. These mental skills are crucial for enhancing their overall athletic performance.

Hence, the results confirm that there were statistically significant differences between the pre-test and post-test means of the sample regarding skill performance (technical performance in the backstroke swimming phase) in favor of the post-test.

In conclusion, the mental training program played a significant role in enhancing the skill performance of the young swimmers, particularly in the technical aspects of backstroke swimming.

This is consistent with the findings of Mohamed Shamaon (2016) who highlights the importance of training athletes in psychological and mental skills, such as visualization, attentional focus, and relaxation. Training athletes in these mental skills can assist them in achieving their best levels of physical and skill performance. Additionally, these skills can be utilized to develop the psychological and mental capabilities of athletes, helping them make appropriate decisions and think effectively in various situations during both training and sports competitions. [12: 371]

What has been discussed aligns with a study by Briddell W. in 2019, which emphasized the positive role of mental training programs in enhancing the skill level and technical performance of backstroke swimmers in their turning phase. [3: 260]

With this, the second hypothesis is confirmed, which states that "there are statistically significant differences between the pre-measurement and post-measurement means of the research sample in the level of skill performance (technical performance in the backstroke turning phase) in favor of the post-measurement."

3. **Discussion of the Third Hypothesis:**

As for the third hypothesis, which indicates the existence of statistically significant differences between the pre-measurement and post-measurement means of the research sample in the digital level (achievement level) in favor of the post-measurement.

The results from Table 10 show a significant difference between the pre-measurement and post-measurement mean times of the research

sample in 25m backstroke swimming. The pre-measurement mean time was 22.90 seconds, while the post-measurement mean time was 21.54 seconds. The difference between them was statistically significant at the 0.05 significance level, as the calculated "t" value (2.11) was greater than the tabulated "t" value (1.71). This indicates that the post-measurement showed an improvement in the achievement level (digital level) of the research sample.

The researcher attributes this result to the impact of the mental training program, which led to the development of the swimmers' digital level. This, in turn, resulted in improved speed and, subsequently, improved digital achievement level, as indicated by the results in Table 10.

This reaffirms what "Mohammed Shamon, Abdelnabi Al-Gamal (2010)" have emphasized, that mental capabilities play a crucial role in achieving sports accomplishments. Neglecting this role and not paying attention to it can significantly harm performance. It's essential to emphasize the significance of mental capabilities and their effective role in reaching the state of ideal performance. [12: 45]

Therefore, the researcher attributes this progress in the digital level to the effectiveness of the mental training program, which had a positive impact on the numerical scores of the research sample. This is evidenced by statistically significant differences in the measurement results (pre- and post-training) shown in Table (10). This aligns with the study conducted by Kelly A.E. in 2017, which emphasized that mental training has a positive effect on the performance and digital level of swimmers. [7: 175]

This confirms the third hypothesis, which states that "there are statistically significant differences between the pre-measurement and post-measurement means for the research sample in the digital level (achievement level) in favor of the post-measurement."

Conclusions

- The proposed training program has a positive impact on the development of mental variables (cognitive perception, attention concentration, relaxation) in backstroke swimming for swimmers under 13 years of age.
- The proposed training program has a positive effect on improving the skill performance level (technical performance in the backstroke phase) in backstroke swimming for swimmers under 13 years of age.
- The proposed training program has a positive effect on improving the digital level (achievement level) in backstroke swimming for swimmers under 13 years.

Recommendations

- Work on implementing the mental training program for its positive impact on the development of mental, skill, and digital variables in backstroke swimming for swimmers under 13 years.
- Apply the results of this study in the field of coaching in general and backstroke swimming in particular.
- Conduct similar studies in other swimming styles (such as breaststroke, butterfly, and freestyle) using the mental training program.

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A training program based on mental abilities and its effect on some mental variables and improving the skill and digital performance of young swimmers (under 13 years)

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This study aimed to design a training program based on mental abilities and investigate its effect on some mental variables (mental imagery, attention concentration, relaxation) and the improvement of skill and digital performance levels in backstroke swimming for swimmers under 13 years old. The researcher used an experimental approach with a single experimental group design. The study was conducted on a sample of 24 young swimmers from the Cairo Sporting Club (ages 12-13) in the 2021 training season. The results indicated that the proposed training program using mental abilities had a positive effect on development of mental variables under research, improving skill performance (technical performance in the rotation phase) and the level of digital achievement in backstroke swimming.

Keywords: Mental abilities, Skill performance, Digital level/achievement, Backstroke swimming.

برنامج تدريبى للقدرات العقلية وتأثيره على تنمية بعض المتغيرات العقلية وتحسين الأداء المهارى والمستوى الرقمى للسباحين الناشئين تحت 13 سنة

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هدفت الدراسة إلى تصميم برنامج تدريبى قائم على القدرات العقلية ومعرفة تأثيره على بعض المتغيرات العقلية (التصور العقلى، تركيز الإنتباه، الإسترخاء) وتحسين مستوى الأداء المهارى والمستوى الرقمى فى سباحة الظهر للسباحين الناشئين تحت 13 سنة، واستخدمت الباحثة المنهج التجريبي باستخدام التصميم التجريبى ذو المجموعة التجريبية الواحدة، وأجريت الدراسة على عينة مكونة من (24) سباح من ناشئى نادى القاهرة الرياضى (المرحلة السنية 12-13 سنة) فى الموسم التدريبى 2021م، وأشارت النتائج إلى أن البرنامج التدريبى المقترح بإستخدام القدرات العقلية له تأثير إيجابى على كل من تنمية المتغيرات العقلية قيد البحث وتحسين مستوى الأداء المهارى (الأداء الفنى لمرحلة الدوران) ومستوى الإنجاز الرقمى فى سباحة الظهر.