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ARTIFICIAL INTELLIGENCE AND ITS ROLE IN ANALYZING PSYCHOLOGICAL PERFORMANCE IN A GYMNASTICS CLASS FOR STUDENTS OF THE COLLEGE OF PHYSICAL EDUCATION AND SPORT SCIENCES

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ABSTRACT

Artificial intelligence applications have developed significantly and have become a cornerstone for development in both education and sports training. In sports such as gymnastics, psychological readiness has been a key factor in determining performance success. This is due to the need for a delicate balance between physical and mental states. This study aims to identify the role of artificial intelligence techniques in analyzing and improving the psychological performance of students enrolled in gymnastics courses at the College of Physical Education and Sports Sciences. An analytical descriptive research design has been adopted. The research tool used has been the Questionnaire of Psychological Performance in Sports. This tool has been administered to a sample of 150 second- and third-year students at the University of Mosul. The results were then interpreted with the help of ChatGPT technology. The results showed a statistically significant difference between the psychological performance levels of the students before and after applying artificial intelligence techniques. This shows that artificial intelligence has been successful in assisting the psychological states of the students. It has also been successful in enhancing self-confidence and self-efficacy while performing gymnastics skills. It has also been concluded that the adapted Psychological Performance Scale has been valid and reliable for use with Iraqi students. It has also been concluded that artificial intelligence techniques have a positive impact on enhancing psychological performance, self-confidence, and self-efficacy while performing gymnastics skills.

KEYWORDS: Artificial Intelligence, Psychological Performance, Gymnastics.

1. INTRODUCTION

The modern world is witnessing a tremendous growth rate in the application of artificial intelligence (AI) technologies, especially in the fields of education and sports. AI technologies are now considered to be integral tools for supporting the teaching, training, and evaluation procedures by analyzing the behavioral and psychological data of the students and athletes. These technologies are helping to improve the performance of the students while promoting the cognitive, emotional, and psychological developments of the students.

Gymnastics is considered to be one of the most demanding academic and physical disciplines because of the high level of integration required between the physical performance and the psychological preparedness of the students. Gymnastics is a sport that demands the performance of highly precise physical skills, requiring the students to show high levels of concentration, self-confidence, and emotional control during the performance of the skills. Any lack of psychological preparedness is likely to affect the motor learning skills of the students, making the learning of skills more difficult.

In spite of the great achievements made by sports psychology research and the increasing interest in the application of AI in the analysis of physical and technical performance, research that focuses on the application of AI in the analysis of psychological performance within the context of a practical gymnastics class has been limited. Most research has been focused on motion analysis or the development of physical and technical performance. Moreover, little emphasis has been placed on psychological and cognitive

engagement during motor performance or the role that intelligent feedback can play in the development of psychological readiness and self-confidence.

Thus, the need for research that incorporates artificial intelligence and psychological performance analysis within a sports education context at a university level has been identified. This research aims to fill the gap by applying AI as a tool that can help measure and analyze psychological performance within a gymnastics context. This approach incorporates standardized psychological performance measurement and analysis with intelligent feedback that can help improve psychological performance within a motor performance context.

Thus, the current research aims to explore the impact of applying AI techniques on the analysis and evaluation of psychological performance among students at the College of Physical Education and Sport Sciences within a gymnastics class. Moreover, the research aims to evaluate the effectiveness of the translated psychological performance scale within the Iraqi context and identify the differences between psychological performance levels before and after applying AI analysis.

2. METHODS

2.1 Participants and Sampling Procedure

The study population was the students enrolled in the second and third stages of the College of Physical Education and Sport Sciences at the University of Mosul for the academic year 2024-2025. The total population was 434 students, of whom 328 students (75%) were second-year students, and 106 (25%) were third-year students.

Table:1 Distribution of the Research Population

No.	Research Population	Total Number of Individuals	Percentage
1	Second-Year Students	328	75%
2	Third-Year Students	106	25%
Total		434 Students	100%

A sample of 150 students was selected, representing 34% of the population, using the simple random sampling method to ensure that all samples are equally represented and that sample

selection bias was avoided. The selected sample was further divided into three subgroups:

1. Reliability group: 30 students
2. Pilot study group: 20 students
3. Main application group: 100 students

Table 2: Distribution of the Research Sample for the Psychological Performance Analysis Scale in Gymnastics

Student Category	Pilot Study Sample	Application Sample	Reliability Sample	Total per Category
Second-Year Students	10	50	15	75
Third-Year Students	10	50	15	75
Total	20	100	30	150
Percentage of Total Sample	13.33%	66.66%	20%	100%

Both male and female students were selected, ranging from the age group of 19 to 22 years, all of

whom were studying the course of practical gymnastics as part of their academic curriculum.

The study was carried out after the students were made aware of the research aims, procedures, and ethics involved, on a voluntary basis. The research study adhered to the ethical considerations of the University of Mosul.

2.2. Psychological Performance Scale

2.2.1 Description and Scoring

The Psychological Performance Scale has 34 items, consisting of 25 positive statements and 9 negative statements. These 34 items measure psychological performance, mental toughness, and self-efficacy. The rating scale is a five-point Likert scale consisting of Always, Often, Sometimes, Rarely, and Never. The range for the positive scale is 5 to 1, while the range for the negative scale is reversed. The range for the total score is 34 to 170, with a theoretical mean score of 102.

2.2.2 Artificial Intelligence Technique

The researchers used a conversational artificial intelligence tool called ChatGPT as an analysis tool. This tool aided the researchers in interpreting the answers given by the students based on the Psychological Performance Scale. This method also served as a psychological reinforcement tool. This tool gave the students feedback that aided their self-awareness and understanding of their emotional and cognitive states while performing gymnastics skills.

2.3. Psychometric Properties of the Scale

2.3.1 Translation Validity of the Psychological Performance Scale

Since the Psychological Performance Scale, as created by Aleksandrs Astaficevs et al. (2020), was originally designed using a non-Arabic language, the translation and cultural adaptation of the Psychological Performance Scale are conducted to make the Psychological Performance Scale more appropriate for the academic context of Iraq. The translated form of the Psychological Performance Scale was reviewed by five experts in the field of English language, translation, and educational and psychological sciences at the University of Mosul. The comparison between the original and translated Psychological Performance Scale was conducted to ensure the equivalence of the concepts, clarity, and cultural adaptability of the Psychological Performance Scale. The result of the review by the experts showed a high level of agreement, at a rate of 90%, and some linguistic modifications are made based on the recommendations of the experts.

2.3.2 Scale Validity

2.3.2.1 Face Validity

Face validity was also established to examine the level of accuracy at which the scale measures the desired psychological dimensions without measuring other irrelevant dimensions. In this regard, according to Eble (1972), one of the best ways to check face validity is the expert judgment method. Therefore, the translated scale was administered to seven experts in educational and sports psychology to check the appropriateness of the items. It was confirmed that all the items reflected the psychological dimensions that were supposed to be measured.

2.3.3. Reliability

Reliability, on the other hand, is concerned with the consistency and stability of the results obtained over time (Al-Nabhan, 2004). This is an essential requirement for ensuring the credibility of any assessment tool (Farhat, 2001). In order to check the reliability of the results obtained, two statistical methods were employed:

2.3.3.1. Test-Retest Method

This technique of evaluation of temporal stability involves the use of the same scale for the same group of people under the same circumstances twice over a period of time. The scale was administered to a sample group of 20 students and re-administered ten days later under constant circumstances. The results showed a high degree of stability using the Pearson correlation coefficient, which yielded a result of 0.81.

2.3.3.2 Cronbach's Alpha Coefficient

For internal consistency, Cronbach's Alpha coefficient, developed by Cronbach in 1951, is used. It is a measure of the average correlation between all possible item pairs in a given scale. Analysis of the data has been conducted by using SPSS, and those items with low and negative discrimination indices were removed. The ultimate result for Cronbach's Alpha coefficient is 0.89, a high level of internal consistency and reliability for the Psychological Performance Scale.

2.3.4 Artificial Intelligence Integration

Another significant feature of the study was the use of ChatGPT as a means of analysis in psychology. The use of the AI technology analyzed the responses of the students to the Psychological Performance Scale, and the students received immediate feedback from the technology. The significance of the use of the technology lies in

the fact that it helps the students to become more aware of their psychological states while doing gymnastics. It can be considered a new use of the AI technology, especially in sports education, including gymnastics.

3. RESULT

3.1. Presentation and Discussion of the First Research Objective: Adaptation and Translation of the Psychological Performance Scale for Gymnastics Students

The results of this study have shown the successful adaptation, translation, and cultural validation of the Psychological Performance Scale (QPPSI) for its application with students at the College of Physical Education and Sports Sciences and its gymnastics courses. This has been achieved

Table 3: Mean, Standard Deviation, Theoretical Mean, and Calculated t-value of the Research Sample on the Psychological Performance Scale

Variable	N	Mean	SD	Theoretical Mean	t (calculated)	Significance
Psychological Performance Scale	100	93.98	3.508	102	-7.78	Not significant

Significant at $\alpha \leq 0.05$, $df = 99$; critical t-value = 1.658 (Al-Rawi, 2000, p.456).

The results show that there was no significant difference, and this means that the average psychological performance of the students was below the theoretical mean.

This means that the psychological performance of the students in the sport of gymnastics was low due to the high physical and mental demands of the sport. The sport of gymnastics requires balance, precision, flexibility, and courage, and all these factors add to the mental pressure that the students are subjected to. The fear of failing, getting injured, and being evaluated by fellow students may have affected the students' confidence and willingness to perform, especially for the ones who are not used to the sport. The emotional pressure from the evaluation and

Table 4: Differences in Mean and Standard Deviation of Students' Psychological Performance Scores Before and After Applying AI Techniques

Variable	Mean (Before AI)	SD (Before AI)	Mean (After AI)	SD (After AI)	t (calculated)	Sig. (p)	Significance
Psychological Performance Scale	98.93	3.5	122.5	19.27	11.97	0.000	Significant

Significant at $\alpha \leq 0.05$, $df = 99$; critical t-value = 1.98.

The results reveal a statistically significant improvement in psychological performance following the introduction of artificial intelligence tools, where $p < 0.001$. This improvement is linked to the interactive and personalized learning environment provided by AI tools, which enabled the students to obtain instant feedback and self-monitoring capabilities. These aspects may have played an important role in enhancing psychological performance by fostering self-

through a systematic translation approach and a rigorous psychometric evaluation, as discussed in Chapter Three. Thus, the first research aim has been totally achieved.

3.2. Presentation and Discussion of the Second Research Objective: Assessing the Level of Psychological Performance among Gymnastics Students

To evaluate the psychological level of performance for the students, the researchers compared the theoretical mean score for the scale, which is 102, with the arithmetic mean score for the participants, which is 93.98 ± 3.508 . A t-test for a single sample was used to check whether the difference between the two means was statistically significant.

comparison of the performance of the students also affected the low levels of psychological performance.

3.3. Presentation and Discussion of the Third Research Objective: Comparing Psychological Performance Before and After the Application of Artificial Intelligence Techniques

To identify the difference in students' psychological performance before and after integrating AI, the researchers computed the means and standard deviations for both states, using a paired sample t-test to check for significance.

efficacy and emotion-regulation skills during skill performance.

On the other hand, traditional learning methods may fail to provide an adaptive and responsive learning environment, which may result in low levels of student engagement and psychological preparedness. The study confirms the effectiveness of integrating AI tools, such as ChatGPT, as an important psychological support mechanism, which may enhance the psychological

performance of the students during complex motor learning performance.

In addition, AI analytical tools may provide educators with important information regarding the psychological and emotional responses of the students, which may be useful in providing personalized motivational and learning approaches that may facilitate the simultaneous development of psychological and physical performance within the sports education context.

4. CONCLUSIONS

The results of the present study showed that the Psychological Performance Scale, following translation, cultural adaptation, and validation for the Iraqi context, could be used as a valid and reliable tool for the assessment of psychological performance among second- and third-year students of the College of Physical Education and Sport Sciences for the gymnastics course. In addition, the results of the present study showed that the application of artificial intelligence techniques could have a positive and statistically significant effect on the psychological performance of the students, as reflected in the improvement of the psychological performance of the students from the pre-test to the post-test. Thus, the integration of the feedback system based on

artificial intelligence could enhance the self-confidence and self-efficacy of the students, which in turn could enhance the psychological performance of the students.

In light of the above findings, the present study recommends the following: First, the Psychological Performance Scale could be used as a standardized tool for the assessment of psychological performance among students of the gymnastics course in physical education settings. Second, the psychological preparation of the students could be emphasized in physical education settings, especially in gymnastics, due to the complexity of the skills required in gymnastics. Third, the academic staff in the university and the coaches in physical education settings could benefit from continuous professional development in the field of sport psychology and artificial intelligence in educational settings. Fourth, the integration of artificial intelligence in the teaching and assessment processes could enhance the psychological and physical performance analysis of the students and improve the quality of the educational process in physical education settings in accordance with the latest scientific and technological advancements.

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APPENDIX 1

The final form of the Sports Psychological Performance Scale

No.	Items	Always	Often	Sometimes	Rarely	Never
1	My thinking remains positive during competition and practical skill performance.					
2	I can maintain a strong flow of positive emotions while performing motor skills.					
3	My self-talk during gymnastics performance is negative.					
4	I lose confidence in myself quickly during the practical performance of gymnastics skills.					
5	I can turn crises into opportunities during performance and competition.					
6	I can change my negative mood into a positive one by controlling my thoughts during performance.					
7	I practice mentally before performing my motor skills.					
8	I can easily recall motor images of gymnastics skills.					
9	The goals I have set for myself as a student-athlete motivate me to train diligently during performance.					
10	I can quickly get rid of mixed emotions and regain my focus during performance.					
11	Practicing gymnastics gives me a real sense of satisfaction and accomplishment.					
12	I lack the willpower and motivation to train and perform seriously.					
13	My determination would give anything to achieve the potential of being a good gymnast.					
14	I visualize my performance during the most challenging competitive situations.					
15	I am able to make decisions confidently and commit to them under performance pressure.					
16	I take responsibility for setting my psychological performance challenges as goals.					
17	I worry about unexpected and uncontrollable events during performance.					
18	I feel anxious about my weak performance in gymnastics.					
19	I am committed to completing the performance tasks required of me in gymnastics.					
20	I give up easily in difficult performance situations in gymnastics.					
21	I get angry when my actual performance does not go as I planned.					
22	I have genuine confidence in my performance abilities.					
23	I become easily distracted and lose concentration during gymnastics performance.					
24	I can handle difficult performance problems if I make enough effort.					
25	When I face problems during performance, I can usually find several solutions.					
26	I am willing to do whatever it takes to reach my full potential in gymnastics performance.					
27	I can stay calm when facing difficulties because I can rely on my ability to adapt.					
28	It is easy for me to stay committed to my goals during performance and achieve them.					
29	I am confident that I can effectively handle unexpected events during performance.					
30	I am willing to give everything necessary to reach my full potential as a student and athlete.					
31	I imagine my performance in difficult situations before competitive skill execution.					
32	I have unwavering confidence in my ability to perform skills.					
33	I possess qualities that distinguish me from my peers in the gymnastics course.					
34	I am dominated by self-doubt regarding my motor abilities.					