PHYSICAL EDUCATION OF STUDENTS

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Defining the standard levels of spontaneous cognitive flexibility among master's students

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Abstract

Background and Study Aim: Research has shown that sports and physical activities have a positive influence on cognitive flexibility. Cognitive flexibility is the ability to adapt and switch between tasks, thoughts, or strategies, and it is considered an important factor in enhancing spontaneous cognitive flexibility. The main purpose of this study is to determine the standard levels of spontaneous cognitive flexibility among master's students.

Material and Methods: In this study, we used a descriptive approach. The research sample included 50 master's students studying sciences and techniques of physical and sports activities, with an equal number of males and females. Among them, 25 students specialized in education, and the other 25 specialized in training. To measure the level of spontaneous cognitive flexibility, we utilized the Cognitive Flexibility Scale as the designated scale.

Results: At the end of the study, the results showed a high level of spontaneous cognitive flexibility among students studying sciences and techniques of physical and sports activities. Furthermore, no significant differences were observed in spontaneous cognitive flexibility and its sub-skills based on the students' specialization (education and training).

Conclusions: Spontaneous cognitive flexibility, a type of cognitive flexibility, can be enhanced through sports and physical activities. Engaging in physical activities often requires individuals to focus on body movements, coordination, and balance. This connection between the mind and body strengthens neural pathways between motor skills and cognitive processes, resulting in improved cognitive flexibility and its sub-skills.

Keywords: sports, physical activities, spontaneous cognitive flexibility

Introduction

There is a full consensus that the development of both the mind and the body is essential for individuals and society to achieve optimal health, balance, happiness, longevity, success, and productivity [1]. Despite this, sports and physical activities have often been marginalized within educational settings, even though there is a consensus on their importance for the healthy development of young people [2]. Notably, mental health holds significant importance in relation to sports, and participation in sports is known to contribute to physical fitness and mental strength [3, 4].

Emphasizing the application of sport-specific stimuli and responses within cognitive diagnostics can be instrumental in detecting expertise-related differences [5]. Many instruments have been developed to assess cognitive flexibility, including performance-based measures such as the Wisconsin card sorting test and the Stroop color and word test [6]. These instruments allow researchers to examine cognitive flexibility in a controlled setting and compare performance across different populations.

Over the past fifty years, there has been a widespread implementation of physical education, exercise science, and sports programs [7]. Increasingly, physical activity is being recognized as a crucial factor influencing cognitive and neural functioning during middle childhood and adulthood, in addition to its physiological and psychosocial benefits [8]. It is also important to highlight the role of neurofeedback in professional sports [9].

Cognitive flexibility refers to the human ability to adapt cognitive processing strategies in response to new and unexpected environmental conditions. This ability can be acquired through experience and involves the adaptation of cognitive strategies that govern problem-solving processes. Cognitive flexibility is not limited to discrete responses but encompasses changes in complex behaviors [10]. In the context of cognitive neuroscience and neuropsychology, cognitive flexibility is often measured by the detection of sudden and implicit shifts in reward contingencies based on external feedback [11]. It involves the ability to adapt to changing tasks or problems and to restructure prior knowledge to suit new situations [12, 13]. Individuals with satisfactory cognitive flexibility can effectively handle new and challenging situations, generate alternative opinions and ideas, and cope with

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internal and external stressors [14].

Cognitive flexibility is an inherent property of the cognitive system, operating at both cognitive and individual levels. At the cognitive level, it involves the interaction of various cognitive components such as executive functions, attention, representations, perception, and coordination of task parameters with goals. At the individual level, cognitive flexibility is influenced by contextual factors, task demands, and other variables [15]. Additionally, cognitive skills, such as thinking, reasoning, and memory, allow students to realize their full potential, while non-cognitive skills, such as motivation, integrity, and interpersonal interaction, are influenced by environmental factors [16]. Cognitive flexibility is believed to activate different cognitive processes needed to handle challenging situations and prevent interference [17].

Cognitive Flexibility Theory emphasizes the flexible use of an individual's existing knowledge. According to this theory, the required knowledge should be organized, taught, and presented through various mental approaches [18]. While most studies examining the relationship between physical activity and cognitive functioning have focused on older adults, there is growing evidence supporting these findings in young people as well [2, 19]. Furthermore, behavioral interventions targeting cognitive function should ideally be conducted regularly rather than sporadically [20].

Purpose of the Study: The study purpose was about knowing the standard levels of spontaneous cognitive flexibility among master's students of staps.

Materials and Methods

Participants

The research society consisted of 614 students studying sciences and techniques of physical and sports activities. The research sample comprised 50 master's students, 25 specializing in education and 25 in training. They were both males and females aged 22-24 years (table 1).

Table 1. Students stats

Variable	Educational level	
Research Society	614 students of sport	
Participants	50 students of sport	
Level	Master	
Specialization	Education	Training

Note: - Human field: 50 students of sports. - Spatial field: Algeria. - Temporal field: from 10/12/2022 to 12/05/2023.

These students were actively studying at Mohamed Boudiaf M'sila University during the academic year 2022-2023. The selection of participants was done randomly, and all students agreed to take part in the study. The study protocol received approval from the Ethics Committee of the University Mohamed Boudiaf M'sila Algeria.

Research Design

As the topic of the research revolves around spontaneous cognitive flexibility within the cognitive field, we opted for a descriptive approach in conducting the current study.

In this study we employed the cognitive flexibility scale [21] as instrument, the scale used to specify spontaneous cognitive flexibility level (scale of three degrees (disagree, agree, strongly agree) was distributed for the purpose to knowing the level thinking among students of sciences and techniques of physical and sports activities.

We calculated the psychometric characteristics of the questionnaire [22] before we distributed to the sample of this research, where the stability coefficient was 0.670 and the honesty coefficient was 0.818

Statistical Analysis

We used version 26 of the SPSS program to obtain accurate results, including mean, standard deviation, percentage, T-score, and T-test.

Results

Table 2 presents the results of standard levels of spontaneous cognitive flexibility among students of sciences and techniques of physical and sports activities.

Based on Table 2, it is observed that the T scores for the level of spontaneous cognitive flexibility among the research sample (N=50) indicate a good level. The T score corresponding to this level had the highest frequency within the research sample, with 22 repetitions. The raw scores representing the lower and upper values of this level are 24.897 and 29.700, respectively. The percentage of repetitions for this level was 44%, which is higher than the expected percentage in a normal distribution. This information allowed the researcher to conclude that the overall level of spontaneous cognitive flexibility among the research sample is at a good level.

We can also determine the general framework for the remaining levels. The average level and the weak level were found in the second and third levels based on T scores and their repetitions. The second level had a range of (40-50) with 14 repetitions, while the third level had a range of (30-40) with 7 repetitions. Additionally, the percentage of students in the second level was 28% and in the third level was 14%. These percentages were lower than what would be expected in a natural distribution, which is 34.13% and 13.59% respectively.

For the other levels they were in this order (very good, excellent, acceptable) which represents these repetitions (4, 2, 1) respectively, and for their

Table 2. The standard level of spontaneous cognitive flexibility of sport students:

Levels	T scores	Raw grade	Percentage, %	Percentage supposed in natural distribution	Repetitions
Excellent	70-80	34.505- 39.308	4	2.14	2
Very good	60-70	29.701- 34.504	8	13.59	4
Good	50-60	24.897- 29.700	44	34.13	22
Average	40-50	20.093- 24.896	28	34.13	14
Weak	30-40	15.289- 20.092	14	13.59	7
Acceptable	20-30	10.485- 15.288	2	2.14	1

Table 3. The results of spontaneous cognitive flexibility among students of sciences and techniques of physical and sports activities according to their specialization (Educational/ Training)

Significant Differences	Mean	Std deviation	Df	Signification level	P-Value	Statistic decision
Educational	30.36	3.83	48	0.05	0.33	There is no statistical significance
Training	29.04	5.60				

percentage supposed in natural distribution it was dissimilar between those levels.

Based on this, comparisons were made between the levels to determine the final level of spontaneous cognitive flexibility within the research sample (tabl. 3). This final level represents the actual field of research sample levels and helps in making decisions related to a statistical variable, considering the natural distribution of the data.

According to the table N3 we note that (P =0.33> 0.05), P value was 0.33 and its greater than signification level which was 0.05 in Df 48 that's what interprets the lack of statistical significance in spontaneous cognitive flexibility between educational specialization and training specialization.

Discussion

As a results of this research where the Students of sciences and techniques of physical and sports activities have a good level in spontaneous cognitive flexibility which plays a big role in raising performance.

Sports and exercise seem to play an important role in contributing to brain health and function [23].

This aligns with the findings of the study by Hilal Kazu and Serkan Pullu [24], where preservice teachers showed high levels of cognitive flexibility. Both studies indicate that individuals in educational contexts possess a certain level of cognitive flexibility, which is beneficial for their adaptability and problem-solving skills

However, a notable difference arises regarding the impact of gender and specialization background. In the study by Hilal Kazu and Serkan Pullu [24], female preservice teachers exhibited higher cognitive flexibility levels compared to males. Conversely, my study did not find any significant differences in cognitive flexibility based on specialization background (educational and training). This suggests that the relationship between cognitive flexibility and these variables may vary across different educational domains and populations.

Additionally, my study focused on spontaneous cognitive flexibility and its standar levels among students of sciences and techniques of physical and sports activies, while the other studies examined cognitive flexibility in broader terms. This highlights the importance of understanding different facets of cognitive flexibility and their relevance to specific educational contexts.

It is interesting to note that my study, along with the study by Ayşem Seda Önen and Canan Koçak [25], both found significant relationships between cognitive flexibility and other constructs. my study revealed a positive association between cognitive flexibility and study attitudes, while the study by Ayşem Seda Önen and Canan Koçak [25] found a significant relationship between cognitive flexibility and teaching self-efficacy perception. These findings reinforce the idea that cognitive flexibility is intertwined with various aspects of educational experiences, influencing attitudes, self-efficacy, and adaptive functioning.

Moreover, the study by Orly Harel, Alla Hemi, and Einat Levy-Gigi [26] highlighted the role of cognitive flexibility as a protective factor against stress in school environments. This finding aligns with the broader understanding of cognitive flexibility as a valuable skill that supports adaptive functioning and well-being, as demonstrated in the previous studies.

In a study conducted by Salem Ali Salem Algharaibeh [27], statistically significant differences were found in alternative flexibility based on specialization background. Literary background students showed a greater level of alternative flexibility compared to students from scientific

backgrounds. The differences in alternative flexibility favoring literary disciplines can be attributed to the nature of the courses taught in the literary branch, which emphasize principles and scientific facts that are less open to change or substitution [27]. This contrasts with my study where no significant differences in cognitive flexibility were observed based on specialization background. This suggests that the educational background or field of study may influence certain aspects of cognitive flexibility, specifically alternative flexibility.

In conclusion, while there are some similarities and differences between my study and the previous studies, they collectively emphasize the importance of cognitive flexibility in educational contexts. The findings underscore its positive associations with various constructs, including study attitudes, teaching self-efficacy, and well-being. It is crucial to consider these findings together to gain a comprehensive understanding of the role of cognitive flexibility in education and its potential implications for educators and students

Conclusions

As in the current studies, in this study spontaneous cognitive flexibility emerged at a good level among students of sciences and techiniques of physical and sports activieties, additionally there were no differences in this cognitive between educational students and training students.

To obtain more comprehensive findings, conducting new research using different questionnaires to measure spontaneous cognitive flexibility would be beneficial. Additionally, it is recommended to propose programs aimed at developing this ability.

Suggestions

The study makes the following recommendations:

- Encourage students or people to engage in diverse sports exercises to improve their fitness levels and enhance their competence in the nervous system.
- Create supportive environments for physical activities that motivate individuals to participate in sports; these environments should contribute to the rejuvenation of the nervous, physiological, physical, and psychological functions.
- Prioritize the importance of health and emphasize the relationship between sports and brain function; this understanding can guide individuals towards practicing sports that have a positive impact on various body functional systems, particularly the nervous system.

These recommendations are based on the findings of the study and aim to enhance the understanding and application of spontaneous cognitive flexibility in the context of sports and physical activities.

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Conflict of interest

The authors declare no conflict of interest.

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