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Multiple intelligences: another personalized approach to cognitive stimulation in university students

Inteligencias múltiples: otra mirada personalizada para la estimulación cognitiva en el estudiante universitario

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Abstract

Intelligence can manifest itself in diverse forms and contexts due to the complexity of human cognitive functioning, which encompasses multiple and diverse abilities, knowledge, skills, and potential. This study aimed to characterize the types of multiple intelligences most commonly used in the educational process of the Physical Culture and Sports major at the University of Granma. The methodology was developed using a quantitative approach, a non-experimental descriptive-correlational design. The estimated population included 1,432 students, with 200 selected as an intentional sample. A questionnaire-type instrument was used for data collection, which was validated and had a reliability of 0.88. Spearman's correlation analysis yielded a value of R=0.816 with a significance level of p‹0.005, demonstrating that the high level of self-management in learning was 76.5%, and the multiple intelligences variable accounted for 53% of the total. It is concluded that the analysis demonstrates a considerable positive correlation of 0.726 of the coefficient.

Keywords: Cognitive performance; University education; University student; Professional skills; Multiple intelligences; Educational process

Resumen

La inteligencia puede manifestarse de diversas formas y contextos debido a la complejidad en la actuación cognitiva del ser humano el cual tiene múltiples y diferentes habilidades, conocimientos, destrezas y potencialidades. Este estudio tuvo como objetivo caracterizar los tipos de inteligencias múltiples más empleados en el proceso formativo de la carrera Cultura Física de la Universidad de Granma. La metodología se desarrolló bajo el enfoque cuantitativo, diseño no experimental de tipo descriptivo – correlacional. La población estimada abarcó 1432 estudiantes, seleccionándose como muestra intencional 200 estudiantes. Se empleó un instrumento de tipo cuestionario para la recolección de los datos, el cual fue validado cuya confiabilidad resultó 0.88. Como resultado, el análisis de la correlación de Spearman arrojó un valor de R= 0.816 con un nivel de significación p ‹ 0.005 lo que demuestran que en la variable autogestión del aprendizaje el nivel alto fue 76,5%, la variable inteligencias múltiple fue 53% del total. Se concluye que el análisis demuestra una considerable correlación positiva de 0,726 del coeficiente.

Palabras clave: Desempeño cognitivo; Educación universitaria; Estudiante universitario; Habilidades profesionales; Inteligencias múltiples; Proceso formativo

INTRODUCTION

Among the most relevant cognitive aspects today, the study of intelligence is recognized as a manifestation of the individual's cognitive activity, which has its epistemological foundation in the Theory of Multiple Intelligences, proposed by Howard Gardner (2004, p. 217), which visualizes the enigma of the mono-factorial nature of the existence of types of intelligence; it exposes the need to transcend human life through various types of intelligence and their interconnection in human behavior, declaring several types of intelligence, which do not contradict the intelligence scientific definition, such as the "ability to solve problems or create valuable goods."

On the other hand, the renowned researcher, De Luca (2004, p. 2) demonstrates through his research findings the existence of eight different and independent intelligences, which are interconnected and interact dialectically in each individual behavior and are classified in relation to each context of action. The eight examples of intelligences are: Logical-Mathematical Intelligence; Linguistic Intelligence; Spatial Intelligence; Bodily-Kinesthetic Intelligence; Musical Intelligence; Intrapersonal Intelligence; Interpersonal Intelligence; Naturalistic Intelligence.

The pre-professional training that university students receive becomes increasingly complex over the years, promoting professional competencies and attitudes that involve these types of multiple intelligences. However, not all university students develop the same competencies; therefore, not all of them learn in the same way or under similar conditions (González and Pardo, 2018).

It is significant the apprehension of this complex situation of cognitive character in the university learning context, multiple intelligences are associated to the use of methods increasingly more active and productive in university teaching, or that allow, stimulate and oversize the diverse alternatives for giving solution to the diverse problems of learning that typify each subject through integrative contents: the students must build their knowledge and learning in the search of significant to the creativity in its cognitive performance, instrumenting through its strategies of learning and metacognitive, other types of intelligence as base for the formation and development of the abilities and capacities of professional character, the systematization of these instrumentations from the metacognitive, allows an approach to the interrelation with the people that surround it and with itself" (Suárez, Maíz and Meza, 2010, p. 89).

The above-mentioned means the relevant nature of resuming the link between the cognitive and the aptitude as elements of the student's competent performance from personalized and reflective practice, socialized through a socio-cultural context" (Sarsarabi and Soroiri, 2016, p. 1480). Precisely, the identification of the cognitive needs and expectations required by each student immersed in their learning process determines the "urgency" of an updating and integrative teaching of knowledge and opportunities for comprehensive training, taking as a foundation the previous cultural matrix of each student.

The study of this subject matter and its application in various generalizing and active methodologies allow university students not only to acquire knowledge but also to go further in their cognitive learning process, work in groups, and complement their learning through the development of integrative skills and professional competencies (González, 2017, p. 89).

In this regard, recent research has explored how multiple intelligences can be applied in various educational and professional contexts. For example, Bermejo et al. (2021) evaluated a university experience, highlighting how this pedagogical approach can promote the development of interpersonal and bodily-kinesthetic intelligences. Similarly, Ahlskog (2021) points out that physical exercise in human aging can stimulate bodily-kinesthetic intelligence, which would have beneficial effects on brain health and cognitive performance in older adults.

Furthermore, Aduvire (2022) examines professional competencies and research skills in students, highlighting the importance of logical-mathematical intelligence and linguistic intelligence in the development of research skills. Vickers (2022) in his study on perception, cognition and decision-making training, retaking the significance of adapting strategic approaches to each individual intelligences to improve performance in complex

tasks, and how this knowledge can be applied in diverse fields, from sports to medicine. These studies, among others, support the idea that this theory offers a valuable framework for understanding the diversity of human talents and abilities, and for designing educational and professional interventions that dimension the cognitive development of students.

By providing cognitive stimulation to students in the Physical Training program, it is possible to identify these differences from two perspectives. These two perspectives are evaluable within the training dynamics and provide valuable information for teachers through their professional performance and for students through their cognitive performance: multiple intelligences and cognitive preferences for learning. The variables reported in this paper correspond to: learning self-management, multiple intelligences, and student cognitive performance.

Recognizing them as an ideal situation for the stated problem will be a valuable contribution to the development of students in the Physical Training program and their academic performance. These intelligences enhance learning and generate in students the autonomy of physical activity for life, in practice. Learning through multiple intelligences seeks to acquire skills linked to the natural and real development of everyday situations, thus achieving capacities specific to educational psychology that provide individuals with flexibility and creativity when facing new challenges.

Currently, the use of these types of intelligence in the student's training process and its application in the various university contexts would be unquestionable in the educational process of higher education, with the teacher being its main supporter in the stimulation and facilitation of its contextual implementation with a view to resizing the academic, work and research context in a professional and pedagogical manner (Mesa, 2018).

The above-mentioned allows posing the research question: How do multiple intelligences influence self-management of learning among students in the Physical Training program at the University of Granma? In this regard, the research objective was to characterize the types of multiple intelligences most commonly used in the educational process within the context of the Physical Training program at the University of Granma.

METHOD

The research was contextualized in the Faculty of Physical Culture and Sports major, University of Granma, Cuba. The study was approached under the descriptive-correlational quantitative approach (Huanca-Arohuanca, Sapana, et al., 2021), since it seeks to determine the degree of relationship between the variables multiple intelligences and learning self-management . This approach seeks to examine in detail and contextualize how the theory of multiple intelligences is implemented in student learning self-management and is perceived in the university educational environment (Galarza, 2023).

The scope of the study is focused on 1432 students based on the formula for representative samples of finite populations proposed by Sierra (2008), with a margin of error of 5%, selecting 200 students as an intentional sample.

Data were collected using a questionnaire-type instrument, which was validated and its reliability determined, obtaining a Cronbach's alpha factor equivalent to 0.86. For data processing, the Kolmogorov-Smirnov normality test was used, which determined that the data did not fit a normal distribution. Therefore, to establish the relationship between the variables, the nonparametric Spearman's Rho correlation test was used (Sánchez and Reyes, 2015). The software used was the Statistical Package for the Social Sciences (SPSS) version 24.

A survey was administered to collect data through questions which answers provide insight into the problem studied. This technique allowed for the use of questionnaires as an instrument; in this case, the Likert scale was applied to each variable. The items were 20 for each type of multiple intelligence and 18 for self-management of learning as a manifestation of the formative process of students in the Physical Culture and Sports major. It was preliminarily validated by expert judgment, and this test was administered to students of the faculty in 2022, obtaining a reliability of 0.904 for the Cronbach coefficient, which lends robustness to the instrument.

RESULTS

Multiple Intelligences in Higher Physical Training

In the current context, cognitive teaching styles in Higher Physical Training are recognized as cognitive stimulants that foster an integrative and multidisciplinary learning process, not only in terms of achieving academic objectives but also in terms of the psychological environments generated by physical exercise and university sports in psychomotivational aspects related to the educational process of university students. Specifically, the various theories of multiple intelligences allow Higher Physical Training to rethink the path toward cognitive and instrumental diversity.

In this sense, cognitive teaching styles in Higher Physical Training can be classified into two large groups: autonomy-supporting and controlling styles; both have different repercussions on the way students respond to their learning behaviors in class, since scientific literature relates them respectively to the satisfaction or frustration of students' basic psychological expectations. According to self-determination, the satisfaction of these needs (autonomy, competence, and relationships with others) stimulates intrinsic or self-determined motivation, which in turn leads to more positive behaviors for academic learning and other behaviors related to their development.

The implementation of these types of multiple intelligences in the classroom refers to the feelings and cognitive behaviors that a teacher provides to identify, nurture, and develop internal cognitive and instrumental resources in university students; among them, the need for cognitive autonomy, intrinsic motivation, cognitive interests, intrinsic learning objectives, and self-approved values.

University Physical Training professors who provide this support influence cognitive motivation and outcomes related to the development of specific professional competencies; this influence is promoted through the teacher's motivational style (Reeve et al., 2018). Physical training, due to its multiple qualities that empower professional performance, undoubtedly constitutes a multidimensional space that directs intelligence in its intercurricular framework, transcending other university settings.

Student learning cognitive activity is called this way because the teacher uses those resources or teaching strategies that involve increasing student's level of self-management, as well as their sense of competence and their relationships with the class group, while developing more self-determined behaviors, such as doing extracurricular physical activity (Reeve, 2009; Salazar and Gastélum 2020). This work style seeks to encourage student decision-making in motivational processes (Castañón-Rubio et al., 2020), elements that will be described below, although briefly.

On the other hand, the controlling style is related to the cognitive behavior or conduct that the teacher exerts on the student, as it seeks, from their perspective, to model or create a specific behavior (Reeve, 2009). This can occur in the form of pressure, demands, and threats, which can lead the student to lose confidence in their own abilities, since the teacher is the only one in charge, who usually manages the group dynamics through great behavioral, verbal, and nonverbal rigidity. According to the aforementioned author, despite the fact that there is an agreement through a large body of current research that determines that the controlling teaching style is harmful because it is linked to undesirable results for students, it is still necessary to explore some effects and relationships of the controlling style.

In this sense, Salazar-Ayala (2022) comments that it should be understood that this style is not located at the other end of the continuum with respect to the autonomy support style, but has its own itinerary within the student's motivational process, and can occur in two types of pedagogical approaches: direct or indirect control. For example, when the teacher uses individual and rigid criticism with the intention of devaluing and belittling the student's competence, they exercise an action of direct control. Meanwhile, the manifestation of indirect control refers to tactics used by the teacher that subtly affect the student's internal behaviors (self-esteem) in a negative sense. Furthermore, according to Haerens et al. (2015), an active control style on the part of the teacher leads to the frustration of basic psychological needs and a decreased level of autonomy support.

Within Self-Determination Theory, the term cognitive need, represented by multiple

intelligences, is defined as a basic psychological nutrient for adjusting a student's cognitive performance during class (Vansteenkiste et al., 2020). On the other hand, a basic psychological need is considered when its cognitive satisfaction not only leads to the well-being of students but is also essential for them. This situation, when linked to educational contexts that support autonomy, benefits from less directive or controlling teaching intervention dynamics that stimulate the most appropriate type of motivation for academic, professional, and personal achievements, such as self-determined or intrinsic motivation, which, although it comes from within the student, has been shown to be positively or negatively affected by environmental factors (Salazar-Ayala and Gastélum-Cuadras, 2020).

Within the very dynamics of the teaching-learning process of Higher Physical Training, the stimulation of intelligence stands out as a special quality of the university student's personality, as well as the solution of learning problems through increasingly productive teaching methods where the problematization of teaching constitutes a stimulating and mediating element in the implementation of each of the multiple intelligences. Precisely the student-teacher; student-student; and student-learning group relationships materialize in an ideal scenario nuanced by multiple integrative interrelationships that go beyond the classroom and serve as support for the different contexts of university student performance.

The results of the quantitative analysis of the predominant types of multiple intelligences in the educational process of students in the Physical Training program at the University of Granma are presented. The results are organized according to the multiple intelligence variables assessed, allowing for the identification of trends in the selected sample.

Table 1. *Results of the variable Self-management of learning*

Levels	Self-management of learning		Cognitive Dimension		Procedural dimension		Dimension Attitudinal	
	F	%	F	%	F	%	F	%
Low	7	3.5	7	3.5	4	2.0	3	1.5
Mid	124	62.0	72	36.0	43	21.5	46	23.0
High	69	34.5	121	60.5	153	76.5	151	75.5
Total	200	100	200	100	200	100	200	100

As it can be seen in Table 1, taking the variable Learning Self-Management as a reference, the highest percentage identified at the high level (76.5%) is represented by the second of its dimensions, the procedural one; followed by the third, the attitudinal one, with 75.5%; and finally the first, the cognitive one, with 60.5%. This indicates that the respondents have favorably developed, and to a greater extent, Learning Self-Management using procedures for learning, closely followed by the remaining dimensions, since all four show high percentages of high achievement in all respondents, which amount to 157 out of the total of 200 students who made up the sample.

At the mid-level of proficiency, the first dimension accounts for 36.0%; then the third, at 23.0%; and the second, at 21.5%. From these data, it can be inferred that, among the total number of surveyed people, the cognitive dimension under analysis has average proficiency, the highest percentage identified, which shows that few individuals have poor proficiency in these cognitive abilities.

Regarding the low level, this is found in minimal percentages, since it is typical of a number of 3 participants in the selected sample, such that

they range between 3.5% of the first and 2.0% of the second dimension. It is concluded that the variable Self-management of learning has a high level of development in 78.50% of the sample, while 20% at the intermediate level compared to only 1.50% with low mastery, which demonstrates the applicability of the current study. It is necessary to strengthen this variable in students, since they have full mastery of it, allowing them to move along the path of academic performance in their professional training.

Table 2. *Results of the multiple intelligences variable*

	Multiple intelligences		**Cognitive Dimension**		**Procedural dimension**		**Dimension Attitudinal**	
Levels	F	%	F	%	F	%	F	%
Low	9	4.5	51	25.5	12	6.0	6	3.0
Mid	85	42.5	92	46.0	80	40.0	61	30.5
High	106	53.0	57	28.5	108	54.0	133	66.5
Total	200	100	200	100	200	100	200	100

Regarding the multiple intelligences variable, Table 2 shows the highest number of surveyed people with a high level of development in each of its dimensions, since it includes 106 of the 200, representing 53% of the total; here the researchers observe values of 66.5%, 54.0%, 53.0% and 28.5% respectively, in the order established for the tables in this research, with the highest percentage identified in the attitudinal dimension and the lowest in the cognitive dimension, an aspect that demonstrates the need to continue working on the procedural aspect, justified by the use of active methods, strategies and procedures for learning.

Table 3. *Results of the student cognitive performance variable*

	Cognitive performance		**Cognitive Dimension**		**Procedural dimension**		**Dimension Attitudinal**	
Levels	F	%	F	%	F	%	F	%
Low	7	3.5	7	3.5	4	2.0	3	1.5
Half	124	62.0	72	36.0	43	21.5	46	23.0
High	69	34.5	121	60.5	153	76.5	151	75.5
Total	200	100	200	100	200	100	200	100

Source: Own elaboration

As it can be seen in Table 3, the results are very similar to those of the cognitive dimension, demonstrating that the attitudinal dimension constitutes the potential to promote multiple intelligences as a personalized mediator for cognitive stimulation in university students.

A correlational analysis of the study variables demonstrates that the coefficient value of 0.726 is significant. The results show a direct relationship between the multiple intelligences variable and the remaining variables, evident in the significant quantitative coefficients: 0.534; 0.684; 0.620; and 0.719.

The relationship between the variables studied consistently reveals that strategies based on multiple intelligences not only improve understanding and address future contextualized research in Physical Training, but also help create an inclusive environment where every university student feels that their professional skills in training and development are recognized and valued, leading them to their fullest expression: professional competencies. This personalized approach not only addresses intellectual diversity in the Physical Training classroom, but also emphasizes the importance of recognizing and cultivating each university student's individual strengths.

As part of the study's characterization of the most commonly used types of multiple intelligences in the Physical Training program at the University of Granma, several important results were highlighted that support the objectives of this study. Raising awareness among teachers and specialists in this area is now a challenge for the higher Physical Training discipline. It has been shown that teachers who adopt approaches focused on multiple intelligences foster a more inclusive learning environment, valued for their diverse abilities.

The ability of active and productive teaching methods to adapt to different types of intelligence has increased university students' self-esteem, which has contributed to creating an environment of cognitive diversity. However, a significant challenge was also identified regarding the availability of resources and teacher training. The lack of access to tools and the need for more specialized training can hinder the full application of multiple intelligences in some educational contexts.

DISCUSSION

The implementation of teaching strategies based on multiple intelligences in the Physical Training program at the University of Granma, and the implication of multiple intelligence theories in the educational context of higher education, allows reconsidering the gap regarding the cognitive dimension in physical activity. As it is seen in this article, there is an urgent need to take into account the different potentials of each university student in today's globalized world, to understand and comprehend that human beings are complex and that their mental learning processes vary accordingly. Therefore, Gardner (1999) recognizes the existence of diverse intelligences, which presumes to consider different resources for each learning style.

The Theory of Multiple Intelligences opens the opportunity for teachers of the Physical Culture and Sports major at the University of Granma to apply active, problematizing and integrative strategies so that students strengthen cognitive knowledge schemes and acquire a different vision to assume each learning task in the relationship between cognitive activity and physical exercise; physical capacities and specific professional competencies in their training process (Posso, et al., 2022).

Martínez Aguilera (2022) highlighted the importance of creating an inclusive environment in Physical Training lessons, where students can express their skills and abilities through multiple intelligences. This reveals commonalities with the analysis carried out in the present research because it broadens the scope of content and teaching strategies, offering students several opportunities to learn comprehensively and meaningfully.

The current Physical Culture and Sports major seeks ways and spaces for the stimulation of its students cognitive development, it promotes the use of knowledge and technology in the solution of diverse professional problems; raises the need to expand students active participation in projects that stimulate the elaboration of proposals for solutions to problems, in which the exchange of ideas, dialogue, and evaluation of the results of the application of ideas in practice are favored. Blázquez (2017); Bermejo (2021) focus on the development of thought, and offer various techniques for its stimulation, however, they do not

analyze the multidimensionality of biological and physical factors, to achieve this purpose in the teaching-learning process and its treatment in the major.

There is a prioritization of specific cognitive techniques, but this research demonstrates that synergy between physical activity and teaching strategies based on multiple intelligences is necessary to generate significant improvements in academic performance.

Since the study was limited to students in the Physical Training program, it is appropriate to evaluate this synergy in other academic disciplines with control groups.

Deler (2020) emphasizes the need to stimulate cognition from the curriculum itself, while Pereira do Nascimento (2021), Vickers (2022), and Cañizares (2023) give an important role to motivation for physical activity and emphasize the role that teachers play in cognitive stimulation and its development in students; however, their proposals are limited to the use of ways to develop physical activity in the major, generally using problem-solving as a teaching-learning method.

Cognitive stimulation in higher education, particularly within the Physical Training program, transcends the mere acquisition of knowledge and focuses on the development of metacognitive skills that enable students to learn how to learn, reflect on their own thought processes, and adapt their learning strategies to different contexts. In this sense, the Physical Training program becomes a privileged setting for implementing innovative pedagogical approaches that combine physical activity with mental training, promoting holistic student development.

This is how studies such as that of Pereira do Nascimento, (2021) reinforce this idea, by demonstrating cognitive capacity, especially in human aging, which suggests that cognitive stimulation through Physical Training can generate long-term benefits for brain health and cognitive performance. The author delves into the principles of cognitive stimulation; future graduates in Physical Culture and Sports major will be trained to work with diverse populations, adapting their interventions to what each person requires.

On the other hand, university professors are viewing cognitive stimulation in physical rehabilitation programs with the aim of accelerating the recovery of patients with injuries or disabilities, as well as in health promotion programs that can improve and promote healthier lifestyles. Likewise, cognitive stimulation can be an action to improve athletic performance by strengthening concentration, memory, and the ability to make quick and accurate decisions in high-pressure situations.

The foundation of these Teaching Strategies in the Physical Culture and Sports major is the multiple intelligences used as a way to stimulate cognitive activity in the teaching and learning environment. This allows to move away from traditional teaching and provide a more appropriate response to the new demands of the educational model in the context of Higher Education. Students prefer this methodology because it is more playful, creative, and personalized, and because it adapts to their preferences, skills, and abilities (Martínez, 2022).

CONCLUSIONS

The study showed that it is vital to consider that multiple intelligences constitute leading elements in the dynamics of the Higher Physical Training process in the same way that it dimensions the development of professional skills and the training and development of professional competencies in the university student.

The need to recognize and apply the different types of learning in university education is emphasized, and especially in the Physical Culture major, since the present study describes other forms or types of intelligence that in the field of Physical Culture and Sports major must be taken into account by teachers in the teaching-learning process in order to enhance the development and growth of students during class: Individualized games, reflections, personal connections, self-esteem activities, goal-setting sessions, visualization, self-exercise and relaxation.

Finally, the Physical Culture and Sports major with this study at the University of Granma, was able to recognize the importance of encouraging its students' cognitive activity through creativity in solving professional problems. This motivates the pursuit of goals in this university setting, which has been little addressed from a specific perspective. This opens a new line of research to explore

pedagogical strategies that impact and strengthen the cognitive development of future Physical Training professionals.

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