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ASSOCIATION BETWEEN INVOLVEMENT IN BASKETBALL AND COGNITIVE FUNCTIONING OF ELITE MALE AND FEMALE BASKETBALL LEAGUES PLAYERS IN NIGERIA

Aderonmu Kehinde ADEBAYO¹ 

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ABSTRACT. Sports are physical activity that consists of rules, competition, challenge, entertainment and uncertainties. Competitive sports could be seen as those sports governed by a set of rules or customs, which serve to ensure fair competition, and allow consistent adjudication of the winner. This study ascertained the association between level of involvement in basketball and cognitive functioning of elite male and female basketball premier league players in Nigeria. Descriptive survey research design was adopted for the study. The population comprised of male and female basketball players in Nigeria. A total of 240 (120 males from the Premier League and 120 females from the Zenith league) basketball players in Nigeria selected using simple random sampling technique. A self-constructed 15 item questionnaire titled Involvement in Competitive Sports and Cognitive Functioning (ICSCF) was used to elicit information on from the level of cognitive functioning of elite basketball players in Nigeria. The results showed that there are two groups of items. The first group is made of 15 items while the second group is made up of 15 items. The mean of first group was 3.1 ± 1 while the mean of group two was 2.1 ± 0.7 . $df = 28$ and $P\text{-value} = -0.20$. $P < 0.05$ this indicated that there was a significant association between the level of involvement of respondents in basketball and their level of cognitive functioning. The study concluded that coaches and trainers should combine both the practical and mental mode of trainings when preparing their athletes for competition for optimal performance outcomes.

Keywords: *Elite; Competition; Basketball; Premier Leagues; Cognitive Functioning*

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INTRODUCTION

In Nigeria, the history of basketball dates as far back as the late 1950s when Walid Zabadne served as the first basketball coach to train Nigerians. At the time, Nigeria's only basketball court was situated in the Syrian Club. Walid Zabadne continued teaching young Nigerians to become basketballers. He took them to several basketball competitions across Africa. In view of his role as the pioneer of basketball coach in Nigeria, Walid Zabadne has been deemed "father of Nigerian basketball". Also worthy of note is that Zabadne was later made the president of the Nigerian Basketball Federation (NBF). Nigeria's national basketball team joined FIBA in 1964. Recently, the team has enjoyed successes, due to an increasing number of talents from Nigeria as well as an orchestrated recruitment of American college and professional players of Nigerian descent. Nigeria is the only African nation to ever qualify for the Summer Olympics through the FIBA World Olympic Qualifying Tournament. This was accomplished at the 2012 Event when Nigeria beat the world elite teams of Lithuania and Greece. In 2015, Nigeria won its first crown as basketball champion of Africa. A team dominated by Nigerian-Americans qualified for the 2006 FIBA World Championship, marking only the second time in the country's history that they qualified to the FIBA World Cup. In March, 2021, the global governing body FIBA ranked Nigeria as Africa's top men's basketball nation. Over the course of the years, the NBBF has produced a significant number of professional basketballers which include: Olumide Oyedeji, Aminu Farouk, Femi Solomon (male category); Rashidat Sodiq, Uju Ugoka, Rosalyn Gold – Onwude (female category). Nigeria features two basketball leagues every year: the Nigerian Premier League Basketball League for the male category and the Zenith Women Basketball League for the women category. The Nigerian Premier League Basketball league, is the preeminent men's professional basketball league in Nigeria. Later it was called Kwese Premier Basketball League for sponsorship reasons after the expiration of the deal with Dstv. Joshua, O. (2017). The league consists of sixteen teams which are categorized into two conferences based on the geographical location. These conferences are Savannah and Atlantic. The league usually spans from March till mid-year. Each team plays a total of 14 games in a regular season after which the top four teams qualify for the Final Eight Playoffs which usually takes place at the National Stadium, Surulere, Lagos. The team at the bottom of the table in each conference is relegated from the league. Towards the end of the year, the Division 1 championship is held to determine who will be promoted to the NPL for the new season (Joshua, 2017). The teams in the NPL for the last competition include Bauchi Nets (Bauchi) Kano Pillars (Kano), Gombe Bulls (Gombe), Plateau Peaks (Jos), Mark Mentors (Abuja), Defenders (Abuja), Niger Plotters (Niger) and Kada Stars

(Kaduna) for the Savannah Conference while for the Atlantic Conference, the teams included Oluwole Warriors (Ibadan), Hoops & Read (Lagos), Royal Hoopers (Rivers), NAF Rockets 4 (Lagos), Delta Force (Asaba), Nigeria Customs (Lagos), Police Baton (Lagos) and Kwara Falcons (Kara) (Premium Times, 2015).

The National Women Basketball League, known as Zenith Women Basketball League for sponsorship reasons in the top-level women's basketball club competition in Nigeria. It is the women's version of Nigeria Premier League organized by the Nigeria Basketball Federation (NBBF). The league also determines the Nigerian representatives at FIBA Africa Women's Clubs Champions Cup (Premium Times, 2015). It was founded in 2004 and inaugurated in 2015 (Edward, 2017). The league is composed of 16 teams divided into two groups. The league is played in three phases. The first phase sees one team out from each of the two groups in the league. The first phase runs for about 8 to 9 days. The second phase sees the teams in the two groups reduced to fourteen. Matches continue in the third phase until the two best teams emerge. Teams in the Zenith Women's League include First Bank (Lagos), Dolphins (Lagos), 1st Deepwater (Lagos), Plateau Rocks (Jos), FCT Angels (Abuja), IGP Queens (Lagos), Nigeria Customs (Lagos), GT 2000 (Kaduna), Oluyole Babes (Ibadan), Nasarawa Amazons (Nasarawa), Ekiti Angels (Ekiti), Taraba Hurricanes (Taraba), Delta Force).

Evidently, there may be a relationship between involvement in intense physical activities on a competitive level that may have significant effect on the cognitive functioning of an athlete. Aiguang (2013) posited that competitive sports are physical activity that consists of rules, competition, challenge, entertainment and uncertainties. Competitive sports could be seen as those sports governed by a set of rules or customs, which serve to ensure fair competition, and allow consistent adjudication of the winner. Competitive sports involve not only contests but it also advances as the central tenet that the athlete or team will continually seek progress and advancement to a higher level.

Cognitive functions include: memory, attention, visual-spatial, and executive functions, while complex cognitive processes include: thinking (abstract, cause and effect, creative thinking, and planning) and language functions. The brain is a part of the body that is involved in every activity we do. It is tremendously important to ensure that we are properly exercising the brain in order to enhance our memory, focus and daily role. Without the optimal function of the brain, daily activities can be negatively impaired. This can range anywhere from absentmindedness and inattentiveness to poor decision making. With that being said, improving our cognitive abilities is essential for performing well in tasks such as decision making, motor skills and sports performance.

Cognition is the ability for an individual to understand their surroundings and act appropriately based on the environment.¹ Cognitive abilities are brain-based skills that everyone uses to carry out tasks that are both simple and complex. Specifically, in relation to sports, cognitive skills refer to the ability to identify and acquire environmental information and integrate this with current knowledge. For athletes, this refers to the ability to process live information when playing a sport and then respond to this information quickly.

The seat of cognition functioning in any organism is the brain, with different parts responsible for different aspects (Timmons, Leblanc & Carson, 2012). Participation or execution of a sport is one of the various domains in which physical ability plays a crucial role along with cognitive functioning. Training in competitive sports is a blend of physical and cognitive training. Processes of attention and concentration are even more important for competitive contact team sports like basketball where the objects of attention are constantly moving and mental strategies need to be revised according to new incoming information. In the world of competitive sports, cognitive functioning is a major component.

It was hypothesized by Hillman, Erickson & Kramer (2018) that involvement in competitive (intense) sports has positive effect on cognitive functions, which is partly due to the physiological changes in the body. It is also suggested that an athlete's motor skills may influence cognitive development given that motor and cognitive skills have several common underlying processes, including sequencing, monitoring and planning (Roebers & Kauer, 2016).

In a study that Chang et al., (2012) did on 36 healthy adults in college to determine if there were is a relationship between acute exercise and cognition. The participants had to finish a 49 Physical activity Readiness Questionnaire (PARQ) and a Health Screening Questionnaire (HSQ) a maximal exercise test to determine in which fitness group the fitted. The participants were categorized in low, medium and high cardiovascular fitness. The group described as having poor, good and super fitness for men and poor, excellent and superior for women according to American College of Sports Medicine guidelines. The results showed that all the participants were better at the cognitive test after the exercise in all fitness levels. A similar study was conducted by Garry (2015) to assess the level of training and cognitive functioning of 746 of college basketballers. The study reported that a high number of the respondents practiced free throws daily, majority practiced chest-pass daily, majority engaged in suicide runs and all of the respondents practiced run up exercises on a monthly basis.

The findings of the study also revealed that there was a high level of cognitive functioning regarding the difficulty they have in acquiring new skills, understanding explanations and instructions and throwing and catching the

ball. The level of cognitive functioning was moderate on the difficulty they face in perceiving what other people say, comprehending orientation and spatial direction and judging distance or size; the level of cognitive functioning of respondents was however low on their ability to move fast and with energy, ability to pay close attention to details or make careless mistakes; sustaining attention in tasks or sport activities; organizing tasks and activities and maintaining attention despite extraneous stimuli.

A study conducted by Lubans et al. (2016) examined the relationship between physical activity and cognition. The participants were recruited as part of a bigger study on adult brain function and genetics of cognition where 626 adult twins and their non-twin siblings were asked to do a protocol of cognitive function testing. To narrow it down and avoid correlating results from family resemblance, only one participant from each family was chosen. In total 47 the study had 241 individuals between the ages of 15-71 participated in tasks requiring executive function such as Eriksen flanker task, intelligence testing such as Wechsler Adult Intelligence Scale (WAIS) and a physical activity assessment that was measured in sweat index ranging from 1-4 that indicated how many times a week they were doing a physical activity: Once a week (code 1), twice a week (code 2), three times a week (code 3) and four times a week or more often (code 4). The participants had to report their physical activity by rating 1- 4. The participants were asked to do a 4,5 hours of cognitive functions tests for 2 hours where they alternated with the WAIS test and Eriksen flanker task, then the participants did a 2, 5 hours of EEG testing that was conducted by trained assistants. In the analyzed data they controlled for age, sex and IQ. After controlling for confounding variables, the scientists found that age was associated with a general decrease of reaction time speed over conditions of the Eriksen flanker task. They also found that physical activity had a significant correlation with improvements in reaction time speed over conditions of the Eriksen flanker task. This research suggests that physical exercise can be beneficial for cognitive functions during early, middle and later part of a human's lifespan and may protect from age-related loss of cognitive function during older adulthood. Scharfen & Memmert (2019) investigated the relationship between cognitive functions and soccer-specific motor skills in soccer players ranging from 11 to 13 years of age. The attention window was positively correlated with dribbling skills, and working memory was positively associated with dribbling, ball control, and ball juggling skills. Interestingly, the cumulated score of the cognitive tests was positively related to the cumulated score of the motor tests. This finding supports the close interplay of motor and cognitive skills, suggesting a connection between physical and cognitive domains in youth athletic development.

According to Policastro, Accardo, Marcovich, Pelamatti & Zola (2018) in their study of the correlations between motor and cognitive skills in young basketball players. The study identified the cognitive functions of the player in attentions shift, inhibition, planning, working memory and emotional regulation. Generally, the responses of respondents were high for each of the cognitive functions. The findings of the study further revealed that there is a significant relationship between the level of involvement of respondents in basketball and their cognitive functioning. A similar study conducted by Diamond & Ling (2016) on intentions, programs and approaches for improving cognitive functions recommended physical activity like basketball for improving cognitive functions. Preparation of athletes for competitive activities is a combination of both physical and mental processes. Peak performance is not limited to the preparation of the motor senses, it also encompasses the training of “the seat of control” for effective functioning. Cognitive function is an important determinant of the performance outcome in sports especially competitive sport. However, many coaches believe in the physical preparation of the athletes at the expense of mental preparation. There tends to be a paucity of research on the influence of involvement in intense physical activity (like playing basketball at a very competitive level) on cognitive functioning among male and female league basketball players in Nigeria.

OBJECTIVES OF THE STUDY

The objective of the study is to ascertain the association between involvement in competitive basketball and the cognitive functioning of the Amateur basketball players in South Western part of Nigeria.

HYPOTHESIS

There will be no significant difference in the level of cognitive functioning of male and female Southwestern elite male and female basketball league players.

METHODS

A descriptive survey research design was adopted for this study. The population comprised of male and female basketball players in Nigeria. A total of 240 (120 males from the Premier League and 120 females from the Zenith league) basketball players in Nigeria selected using simple random sampling

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AND FEMALE BASKETBALL LEAGUES PLAYERS IN NIGERIA

technique. A self-constructed 15 item questionnaire titled Involvement in Competitive Sports and Cognitive Functioning (ICSCF) was used to elicit information on from the level of cognitive functioning of elite basketball players in Nigeria. Using a four Likert scale a test-retest pilot study with a two-week interval was carried out using basketball players in the Nigeria Division one League. Using the Pearson Moment Correlation coefficient to analysed data collected a 0.78 co-efficient alpha was returned. Data obtained was analyzed using means score and standard deviation to test the hypothesis. Oral consent was obtained from each respondent before administering the instrument for assessment in conformity with the declaration of Helsinki.

RESULTS

Table 1a. Mean Scores Statistics for Respondents' Involvement in Basketball

ITEM	VO = 4	O= 3	R = 2	N= 1	Scores
How often do you train in a day?	201	39	0	0	3.8
How often do you train in a week?	220	20	0	0	3.9
How often do you participate in state competitions?	25	23	0	192	1.5
How often do you participate in National Competition?	05	10	03	222	1.2
How often do you engage in high intensity basketball training?	119	73	32	16	3.4
How often do you play in Nigerian Amateur Basketball League?	240	0	0	0	4
How often do you practice skills in passing?	201	36	03	0	3.8
How often do you practice free throws?	191	38	11	0	3.8
How often do you practice in international competitions	0	5	0	235	1.0
How often do you engage in suicide exercises?	191	35	14	0	3.7
How often do you engage in run up exercises?	205	20	15	0	3.8
How often do you visit the gym?	102	100	25	13	3.2
How often do you play full time during competitions?	143	82	6	7	3.6
How often do you participate in other basketball leagues	45	50	72	73	2.3
How often do you train in a month?	221	18	0	0	3.8
MEAN SCORE					3.1±1

VO = Very often, O = Often, R = Rarely, N = Not at all

Table 1b. Mean Scores Statistics for Respondent’s Level of Cognitive Functioning

ITEM	VO = 4	O= 3	R = 2	N= 1	Scores
I have difficulty acquiring new skills	4	3	70	163	1.4
I have difficulty understanding explanations and instructions	0	4	37	199	1.2
I have difficulty perceiving what other people say	31	23	82	104	1.9
I have difficulty comprehending orientation and spat direction	31	23	82	104	1.9
I have difficulty judging distance or size	14	74	31	121	1.9
I seem slow, inert or lacking energy	56	62	112	10	2.6
I often fail to pay close attention to details	32	45	152	11	2.4
I have difficulty sustaining attention in tasks	41	55	109	35	2.4
I have difficulty organizing tasks and activities	91	82	63	4	3.1
I am distracted by extraneous stimuli	109	98	26	7	3.3
I have difficulty throwing and catching ball	0	0	9	231	1.0
I am forgetful in daily activities	24	15	106	95	1.9
I have difficulty completing sequential tasks	22	27	115	76	2.0
I am over sensitive to touch	17	19	123	81	1.9
I have difficulty remembering what skill was taught recently	24	22	99	95	1.9
MEAN SCORE					2.1±0.6

VO = Very often, O = Often, R = Rarely, N = Not at all

Table 1c. Standard Deviation Measure of the Association Between Levels of Involvement and Cognitive Functioning of Elite Basketball Players

Item	N	Mean	S.D	df	P value
Involvement in Basketball	15	3.1	1	28	0.20
Cognitive Functioning	15	2.1	0.6		

Table 1a and 1b shows the scores for the respondent’s level of involvement in basketball and the respondent’s level of cognitive functioning respectively based on the four-point Likert Scale. Table 1c shows the relationship between the level of involvement of the respondents in basketball and their level of cognitive functioning. Table 1c showed that there are two groups of items. The first group is made of 15 items while the second group is made up of 15 items. The mean of first group was 3.1±1 while the mean of group two was 2.1±0.7. df =28 and P-value = -0.20. P < 0.05 then, there is a significant association between the level of involvement of respondents in basketball and their level of cognitive functioning.

DISCUSSION OF FINDINGS

The finding of this current study revealed that there was a significant association between involvement in basketball and the cognitive functioning of elite basketball players in the Nigeria Basketball League. This finding is consistent with the findings of Policastro et al. (2019) in their study on the correlations between motor and cognitive skills in young basketball players and identified the cognitive functions of the player in attentions shift, inhibition, planning, working memory and emotional regulation. The study reported that the responses were high for each of the cognitive functions and that there is a significant relationship between the level of involvement of respondents in basketball and their cognitive functioning. A similar study conducted by Diamond & Ling (2016) also recommended that intentions, programs and approaches for improving cognitive functions should include physical activity especially basketball. Formenti, Trecroci, Duca, Vanoni, Ciovati, Rossi & Alberti (2020) in their study posited that a combination of both physical and motor performance with basic cognitive functions should be considered to depict a complete portrait of athletes' abilities. (Trecroci, Duca, Cavaggioni, Rossi, Scurati, Longo, Merati, Alberti, & Formenti, 2021) maintained that athletes with superior basic cognitive functions present better sport-specific physical performance.

CONCLUSION



Based on the findings of the study it was concluded that there was a significant association between involvement in basketball and cognitive functioning of elite male and female basketball players in the professional basketball leagues in Nigeria. The following recommendations were also inferred:

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ASSESSING THE QUALITY OF TEACHING AND LEARNING IN HIGHER EDUCATION: PERSPECTIVES FROM A SOUTH AFRICAN UNIVERSITY

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ABSTRACT. This research investigates the notions of quality teaching and learning at Mandela University, centering on lecturers and students as pivotal stakeholders. Using Schindler et al.'s model, the study explored how these internal groups perceive quality in higher education (HE). A qualitative, participative, and visual methodology, inspired by the Mmogo-method® and grounded in social inclusion theory, was employed. This approach fostered an interactive environment for a collective understanding of HE quality through collaboration and participation. The results revealed differing views between lecturers and students on what defines quality. Lecturers viewed it as an action-oriented process, emphasizing tangible elements such as inputs, outputs, policies, and strategic areas. In contrast, students perceived quality more subjectively, focusing on intangible aspects, particularly the attitudes within the lecturer-student relationship. The practical implications of the study suggest the potential for a comprehensive evaluation process to foster a quality-driven culture at Mandela University. It underscores the significance of collaboration, communication, cooperation, and meaningful engagement among all stakeholders during both development and implementation phases. Although the context's influence on defining quality in HE was not markedly different, notable references included Africa's challenges and the graduates' commitment to their communities. Overall, this study redefines perceptions of quality in higher education, highlighting the essential role of stakeholder involvement in nurturing a quality-focused institutional

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culture. By embracing diverse perspectives and committing to continuous improvement in teaching and learning, it proposes enhancing the overall quality of higher education at Mandela University.

Keywords: *Quality assurance; Higher Education, Teaching, Learning, Mandela University*

INTRODUCTION

The rapid changes brought about by the Fourth Industrial Revolution (4IR) have resulted in a significant gap between the skills that university graduates possess and the needs of employers. This discrepancy underscores the necessity of ensuring high-quality education in institutions of higher learning (Kim, 2018). Quality assurance, therefore, is crucial for ensuring that graduates possess the relevant skills and attributes gained from their degrees. It is defined as the systematic evaluation of an organization or curriculum to ascertain whether satisfactory educational standards are met (Calamet, 2022). Similarly, Cardoso, Rosa, Videira, and Amaral (2019) view quality assurance as a quality management measure that provides confidence that quality requirements are being fulfilled. This indicates that maintaining quality through regular assurance processes is essential for ensuring accountability in higher education.

According to the Council on Higher Education (2021), quality in higher education is a multidimensional and subjective concept. The perspective of the university needs to be understood within the context of the catchment community and the quality requirements of other stakeholders. Effective quality monitoring should, therefore, extend beyond traditional precepts to reflect local needs and realities, as well as the needs of stakeholders and resources (Leiber, 2019). Quality assurance in higher education is critical for students' achievement of significant objectives (2019). However, the quest for a universally accepted definition of quality has been unsuccessful due to the diversity of ideas about what quality entails (Elken & Stensaker, 2018). This study aims to develop a co-created working definition of quality in higher education rather than searching for a singular definition.

Historically, the discourse on quality assurance in higher education has been dominated by models mimicking industrial quality (Ekman et al., 2018). However, this approach is increasingly unsuitable for higher education, as human behavior is unpredictable, making it impossible to guarantee the quality of the product (graduate) (Duignan & Jackson, 2022). This research explores the author's experience as a quality practitioner in higher education in South Africa, specifically at Nelson Mandela University. The author's journey highlights the

challenges faced by the Council on Higher Education (CHE) in ensuring quality in higher education. The Quality Advancement Unit (QAU) at Mandela University revealed a systemic flaw in the Quality Advancement Conceptual Framework, which required evaluating quality based on input versus output. This led to a focus on quality assurance (QA) as accountability, emphasizing the quantification of institutional inputs and outputs. The term quality enhancement (QE) was introduced to promote good teaching practices and student experiences (Glaw et al., 2017). According to Rozsnyai (2010, p. 77), quality can be enhanced, controlled, assessed, evaluated, reviewed, assured, or simply managed; however, quality remains intangible. Various scholars assert that the complexity of determining quality in higher education arises because it is relative to the stakeholder involved. Different stakeholders across departments, disciplines, and faculties within the same or different institutions tend to perceive quality differently (Watty, 2005; Kleijnen, Dolmas & van Hout, 2011; Cardoso et al., 2013; Jungblut et al., 2015). Hence, this study focuses on the following research questions:

- What are student perspectives regarding the quality of teaching and learning at Mandela University?
- How do lecturers perceive the quality of teaching and learning at Mandela University?

PROBLEM STATEMENT

This study examines the significance of Quality Assurance (QA) in Higher Education Institutions (HEIs) in South Africa, which have diverse histories, student bodies, and faculties. It emphasizes the need for an institutional culture of quality that diverges from an industrial model unsuitable for human growth and development (Cheng, 2017). The study suggests that all activities, from curriculum planning to assessment, should aim to enhance quality. However, it has been observed that QA frameworks often do not consider the expertise of academics in relation to their relationship-building with students (Hauptman, 2020). This results in quality being driven by a context-specific, authentically created common understanding suitable for a constantly changing world of work (Loukkola et al., 2020). An alternative approach is needed where students are at the forefront of these conversations as active participants rather than passive recipients. The study proposes that an effective QA system for higher education should consist of various entities and processes, with the academy leading by inviting full participation from all stakeholders within the institution. Institutions must be proactive, or they risk intervention by the government or statutory bodies with a stake in the academic enterprise. This study represents a novel alignment of QA with the academic project of each university, considering the human element as primary in defining, framing, and authenticating quality.

THEORETICAL FRAMEWORK

Social inclusion is crucial in South Africa due to the apartheid history of exclusionary practices, particularly for persons of color (Vlăsceanu et al., 2004). Despite three decades of democracy, these vestiges persist, causing low self-worth, dignity, equality, and recognition for persons of color (Vroeijenstijn, 1991). Student protests, such as #FeesMustFall and #RhodesMustFall, highlight unresolved societal and political challenges faced by students (Watty, 2005; Watty, 2006). To address these issues, strategies to restore and include the dignity of all South African citizens are needed (Williams & Cappuccini-Ansfield, 2007). Gidley et al.'s theoretical framework offers an integrative approach to quality informed by social inclusion theory. The framework proposes three aspects of social inclusion: equitable access, engaged participation, and empowered success. As universities worldwide undergo massification and globalization, Gidley et al. advocate for liberating universities from neoliberal ideologies. The three circles represent the relationship between neoliberal, social justice, and human potential ideologies, with Empowered Success representing social inclusion in the broadest sense and engaged participation as the narrowest interpretation.

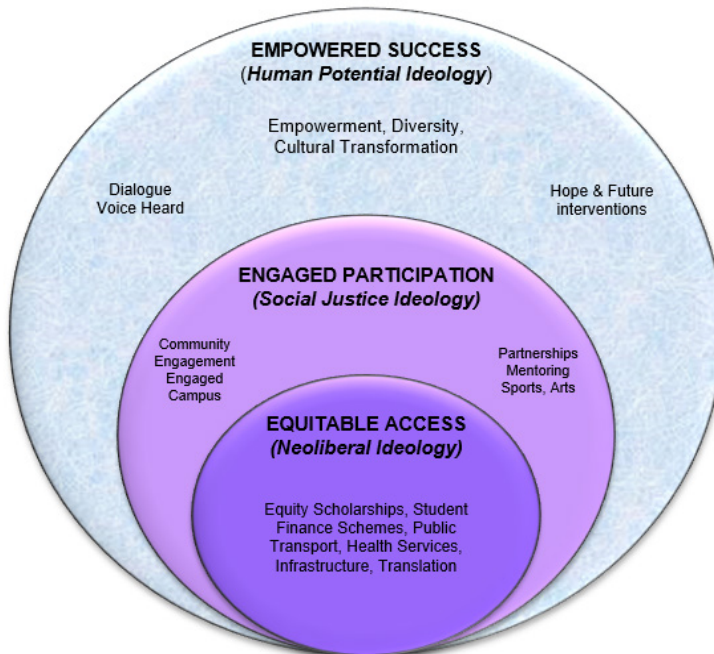


Figure 1. “Interventions of social inclusion theory that increase access, participation and success when situated within underpinning ideologies” (Gidley et al., 2010, p. 138)

Research Methodology

This exploratory study adopted a qualitative research approach to examine the perceptions of quality in higher education (HE) from both lecturers and students. Utilizing a phenomenological case study methodology, the investigation centered on Mandela University. Data collection took place in the natural environments of lecturers and students, emphasizing their views of the classroom as a community of teaching and learning practice. Visual participatory methods (VPMs) were employed, combining visual techniques with participatory approaches. This shift from the positivist paradigm of surveys and questionnaires facilitated engagement, dialogue, and practical outcomes for quality evaluation at Mandela University. The researcher-participant relationship was founded on active engagement, valuing the knowledge and insights contributed by the participants.

Two specific VPMs were utilized: collage-making and an adaptation of the Mmogo-method®, which originated in South Africa. The Mmogo-method® is effective for articulating subjective experiences that are challenging to express verbally and is sensitive to both context and culture, allowing for the exploration of symbolic and contextual meanings of lived experiences. This adaptation empowered participants, fostering a sense of safety and trust. The third sub-question was addressed through collage-making, where groups of lecturers and students collaboratively created collages. The selection of VPMs, particularly the Mmogo-method®, underscored the study's commitment to investigating quality through an indigenous South African research approach that was inclusive, respectful of participants' experiences, and acknowledged their valuable contributions. The second sub-question was answered through journaling, providing participants with a platform for personal reflection. This research explored how two internal stakeholder groups—lecturers and students—perceived quality in HE, specifically in the context of teaching and learning quality at Nelson Mandela University.

LITERATURE REVIEW

The literature review was structured around the following subthemes: quality assurance in higher education, lecturers' perceptions of quality assurance, and students' perceptions of quality assurance.

1. Quality Assurance in Higher Education

The absence of a universally accepted definition of quality in HE presents a significant challenge, affecting the quality of teaching and learning due to varying contexts, types of institutions, and geographical locations (Agar, 1980;

Ball & Wilkinson, 1994; Badat, 2016; Abukari & Corner, 2010). Quality assurance and quality in education (QE) are often conflated, yet they are distinct. Quality assurance is essential as it garners unanimous support, while quality pertains to the nature of learning (Badat, 2016). Quality assurance is an ongoing process to ensure that teaching, learning, and related activities meet established standards (Abukari & Corner, 2010). Conversely, QE involves continuous efforts to enhance the quality of education provided to students (Badat, 2016). Discussions on quality in HE often emphasize transformation, but university work tends to adhere to traditional QA methods, neglecting the impact on internal stakeholders responsible for policy implementation (Ball & Wilkinson, 1994). The ambiguity surrounding the evaluation of quality assurance is often overshadowed by technical and methodological debates aimed at refining the QA approach (Abukari & Corner, 2010).

Morosini et al. (2016) argue that fostering a university with quality necessitates creating spaces where the concept of a quality university can be collaboratively understood by both the community and the institution. Current research, academic publications, and QA agencies have predominantly focused on quality assurance processes, often prioritizing them over the improvement of quality teaching and learning. Quality in HE is a multifaceted concept with various interpretations, such as quality as exceptional, perfection, zero defect, or value-for-money. Quality as fitness for purpose is considered the most inclusive concept, yet it remains subject to change based on the institution's mission, vision, and strategic goals. Schindler et al. (2015) reviewed relevant literature to identify the challenges and strategies hindering a unified definition of quality, concluding that it is an elusive term, interpreted differently by various stakeholders.

2. Lecturers' Perceptions of Quality Assurance in Higher Education

Academics view QA as bureaucratic, an additional burden, and a means for institutional management to exert control (Costandius & Bitzer, 2014; Council on Higher Education, 2012, 2021; Lucander & Christersson, 2020; Lockett, 2006; Varouchas et al., 2018; Vettori, 2018; Winstone et al., 2022). They often regard the evaluation process as a superficial exercise (Council on Higher Education, 2021; Winstone et al., 2022). The focus on quantitative measures of quality has led academics to perceive QA as a passing trend, not to be taken seriously (Lucander & Christersson, 2020).

Quality evaluation is frequently seen as a 'tick-box' exercise, with institutions implementing policies and procedures to monitor effectiveness (Council on Higher Education, 2021; Varouchas et al., 2018). However, lecturers recognize the value of an effective and meaningful QA process that fosters collegial accountability

(Costandius & Bitzer, 2014; Winstone et al., 2022). Doctoral supervisors who receive Teaching Excellence Awards associate quality with transformative learning outcomes in their doctoral candidates (Winstone et al., 2022). Faculty members often find formal, institution-wide quality systems irrelevant to their primary responsibilities of teaching, administration, or research (Council on Higher Education, 2012, 2021; Luckett, 2006). This disconnect results in the QA system being neither integrated nor internalized by staff (Council on Higher Education, 2021).

Academics conceptualize quality in HE in terms of transformation, fitness for purpose, and exceptionality (Lucander & Christersson, 2020). They attribute university quality to competent lecturers, appropriate curriculum content, quality facilities, and strong international rankings (Council on Higher Education, 2021; Lucander & Christersson, 2020). Lecturers primarily associate quality with the teaching process rather than the content delivered (Council on Higher Education, 2021; Lucander & Christersson, 2020; Vettori, 2018). Challenges to quality include delays in replacing departed lecturers, large class sizes, insufficient resources, and student disengagement (Council on Higher Education, 2012; Luckett, 2006; Varouchas et al., 2018; Vettori, 2018). Qualitative issues faced by lecturers include excessive workload, administrative burdens, poor scheduling, inadequate laboratory facilities, and staff shortages (Luckett, 2006; Varouchas et al., 2018; Vettori, 2018).

3. Students' Perceptions of Quality Assurance in Higher Education

While research on quality in HE has traditionally focused on academic responses, the importance of the student experience in quality discourse has gained attention (Lucander & Christersson, 2020; Winstone et al., 2022). Quality in HE is a critical component of any strategic plan in a student-centered educational context (Council on Higher Education, 2021). Student evaluations are considered a key tool for promoting quality enhancement in universities (Council on Higher Education, 2021). Research has examined student perceptions of quality in HE (Dicker et al., 2019; Elassy, 2015a; Jungblut et al., 2015).

Students surveyed on teaching and learning processes highlighted the importance of lecturer quality and support services, including academic, emotional, and psychosocial support (Dicker et al., 2019; Elassy, 2015a). Quality teaching is perceived when students see the connections between learning, knowledge, and evaluations (Elassy, 2015a). However, students associate quality with academic teaching practices and their impact on learning outcomes (Dicker et al., 2019). They adopt a pragmatic view, seeing effective teaching as achieving learning outcomes rather than transformative experiences (Elassy, 2015a).

In a survey of students across five European universities, Jungblut et al. (2015) found that while students viewed themselves as customers, they preferred a quality perspective that centered on their needs but did not necessarily involve active participation. Elassy (2015a) noted that students equated quality with good teaching and well-qualified lecturers, emphasizing the importance of teaching and learning processes in HEIs.

Dicker et al. (2019) found that students perceived education as quality when staff were enthusiastic, approachable, and concerned about student success. Support services, such as libraries, IT, and career guidance, were viewed positively, whereas unapproachable staff had a negative impact. The quality of the teaching experience and the teaching-learning process, as well as the partnership between lecturers and students, depended on developing individual relationships.

DISCUSSION OF FINDINGS AND ANSWERS TO RESEARCH QUESTIONS

The discussion centered around key themes derived from the two research questions, focusing on the findings revealed during the study as follows: (1) What are student perspectives regarding the quality of teaching and learning at Mandela University? (2) How do lecturers perceive the quality of teaching and learning at Mandela University?

1. Responses of Student Participants

Student participants, who adopted a more relational approach, differed from lecturer participants by perceiving quality teaching and learning as personal experiences closely tied to their emotional and personal fulfillment. They highlighted aspects not raised by lecturer participants, such as racial and cultural differences, diversity and inclusivity in the classroom, and the development of a bond between lecturers and students when lecturers showed genuine interest in their students as individuals.

On a broader level, student participants' views on quality teaching aligned with those of lecturer participants in terms of content delivery, up-to-date notes, competency as graduates, and employability. However, on a more detailed level, students saw quality teaching as an interactive relationship with lecturers. They valued a learning environment where they could connect with lecturers, express opinions, engage in debates, ask questions, and participate in an interactive learning process that went beyond mere facts or extensive information.

Student participants considered assessment crucial to teaching and learning but did not view memorization of facts as a valid measure of learning, emphasizing that "without application of knowledge, it is all pointless" [S11],

[S1], [S9]. They distinguished between information and knowledge, often transitioning to knowledge unconsciously once understanding was achieved. Students were concerned with how information was presented; it should not be given without context. Lecturers' examples needed to be relatable; otherwise, students were left to self-study, resulting in the memorization of large volumes of information for exams.



Figure 2. Student conceptualisations and indicators of quality within the model of Schindler (Schindler et al., 2015)

This caused significant stress among students, leading many to be content with just passing a module. They often found themselves overwhelmed by the information, rendering it “redundant or useless” [S11]. When lecturers explained information using relatable examples, the concepts became knowledge

that students retained and could apply in other modules and future studies. Student participants made a clear distinction between quality teaching and mere teaching. They believed that while teaching produced employable graduates, it often limited them to specific tasks learned. They critiqued assessment based on memorization, which excluded individual thought and creativity. In contrast, they viewed quality teaching as assessing learning through the application and adaptation of skills, involving case studies and projects that required critical and creative thinking.

2. Perceptions of Lecturer Participants

Lecturer participants perceived the production of competent graduates as a direct outcome of effective teaching. They believed that the high demand for graduates served as a robust indicator of both quality teaching and quality learning. However, the teaching methodologies adopted by these lecturers tended to favor a technicist approach, characterized by a detachment from personal involvement. The quality of teaching was signified by the lecturer's mastery of their discipline, possession of necessary qualifications, and clear understanding of both their teaching role and the students' learning roles. Some lecturers recognized the importance of a collaborative journey between lecturers and students towards graduation [L10]. Conversely, other lecturers saw no systemic opportunities for such collaboration [L11], while others envisioned a reciprocal dynamic where lecturers and students alternated roles [L15], [L8], [L6]. Central to their perspectives was the act of teaching itself. Participants regarded the university as a pivotal entity in establishing and monitoring quality teaching and learning standards at Mandela University. They asserted that, without the support of management, along with relevant policies and guidelines, achieving quality was unattainable.

Lecturer [L11] strongly opposed the top-down approach of senior management dictating lecturers' actions and expectations. [L11] criticized the bureaucratic policies and procedures, referring to them as "red-tape" and arguing that they impeded quality by preventing a student-centered teaching approach. [L11] expressed that graduates from Mandela University were "spineless stooges," constrained by a curriculum overloaded with content, leaving no room for independent thinking. This time pressure forced lecturers to focus on delivering information and facts rather than fostering genuine teaching. Assessments predominantly tested memory recall, devoid of original student thought.

Lecturer participants viewed quality teaching and learning as encompassing all conceptions of quality proposed by Schindler et al. (2015). They further discerned that these conceptions effectively divided one aspect, quality as accountability, into two distinct conceptions: quality as value-for-money

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and quality as consistency, reflecting the five conceptions articulated by Harvey and Green (1993). The qualitative nature of the study aimed to capture the subjective understandings and experiences of the lecturers, thus precluding any quantification of which specific conceptions were most or least favored among the 15 participants.



Figure 3. Lecturer conceptualisations and indicators of quality within the model of Schindler et al. (2015)

Note: Dotted line represents the split in quality as accountable into quality as value for-money and quality as consistency.

CONCLUSION AND PRACTICAL IMPLICATIONS

The results of this study align with the most recent directives issued by the Council on Higher Education (CHE), which advocate for the development of an integrated quality management system within South African universities. The CHE's endorsement of integrating transformation and social justice with existing quality assurance (QA) processes in higher education institutions (HEIs) corroborates the study's findings and enhances confidence that these findings will be supported by the broader university community. The new QA framework aims to assess quality improvements based on each university's stated mission and values, thereby preserving the unique context of each institution and eliminating inter-institutional competition by avoiding comparative evaluations. This QA approach, endorsed by the CHE, aligns with the study's participants' suggestions and the theoretical perspectives on quality in higher education that integrate social inclusion with QA practices rooted in social justice and human potential. The CHE's emphasis on transformation as a component of quality conceptualizes quality as transformative, a view that both students and lecturers strongly associate with effective teaching and learning. Leveraging the lead author's expertise as a quality practitioner at Mandela University, this study aims to empirically test the adoption of diverse quality perspectives in higher education.

The study's research design is notably enriched by the use of the adapted Mmogo-method®—an indigenous method involving participants' visual representations interpreted by themselves. This method's creative nature allows participants to explore their subconscious thoughts, which may otherwise remain unarticulated. The structured four-phase approach facilitates individual reflection, uninterrupted sharing, and collaborative discussion of the visual constructions, enabling a collective understanding of quality teaching and learning. Adapting this indigenous method acknowledges the South African context of Mandela University and challenges the assumption that QA methods developed in economically advanced countries are universally superior. Such an approach allows universities in developing regions to select QA methods that align with their stakeholders' perspectives and contextual needs. The ontological and epistemological design of the study, employing participatory and visual methodologies and engaging participants as co-researchers, makes a significant contribution by disentangling quality from conventional academic interpretations through social inclusion theory.

A notable contribution of this research is the inclusion of participants as co-researchers, who interpreted their visual constructions, thereby eliminating the need for traditional member checking. By involving stakeholders in designing

an evaluation framework for quality teaching and learning, the study fosters the development of a meaningful conceptual framework collaboratively, rather than solely by the researcher. The study's findings suggest that Mandela University's internal stakeholders share the researcher's impression that the current evaluation of quality teaching and learning is insufficient and, in some cases, detrimental to teaching quality. This indicates that Mandela University could enhance its quality assessments. The research reveals that effective quality evaluation can be achieved through an inclusive and collaborative approach that both students and lecturers agree would significantly improve teaching and learning, thereby empowering students to achieve their potential and graduate with confidence in their ability to impact the world.

By employing an indigenous, participative, and visual research design, participants were prompted to critically evaluate the quality practices at Mandela University, fostering a shift towards a more effective quality evaluation system. If the participants' views are discussed at departmental or faculty levels, word-of-mouth could facilitate the establishment of an institutional culture of quality that aligns with principles of cooperation, collaboration, and transparency. Continuous reflective practices among both lecturers and students could enable the adoption and potential adaptation of the study's findings at Mandela University, supporting ongoing improvements in teaching and learning.

LIMITATIONS OF THE STUDY

The research encountered difficulties in data collection, such as managing 30 participants divided into two stakeholder groups, with workshops requiring a minimum of four hours each. Challenges included scheduling conflicts due to the academic calendar, exam periods, and breaks, which hindered the completion of data collection within the academic year. Additionally, students' reluctance to write in English in their reflective journals could have been mitigated by permitting the use of their preferred languages.

Although students valued the creative and visual elements of the workshops, lecturer participation was notably low during the final collage-making workshop. The study also faced constraints due to its part-time doctoral research status, the use of diverse data types, and the subjective nature of identifying intangible markers of quality. Measuring the impact of quality teaching and learning on student transformation remains inherently challenging.

POSSIBILITIES FOR FUTURE RESEARCH

Future research could expand by incorporating relevant materials from books, bulletins, government white papers, and gazettes, as this study was limited to academic evidence from peer-reviewed publications. Conducting cross-border studies to assess the effectiveness of government initiatives concerning quality assurance in higher education across various African regions would be valuable.

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OPEN-SOURCE SOFTWARE AS AN ALTERNATIVE MEANS OF BIOMECHANICAL ASSESSMENT

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ABSTRACT. In an attempt to gain more and more resources for dynamic assessment of movement, and especially more accessible ones, we tried to utilize open-source software like kinovea for data extraction and Python for automatization. By using these we can show the ease of creating patterns of investigation, after which further data is simply collected and manipulated on the system created. The best part about having these resources as means for biomechanical assessment is that they are cost free. We broke down the walking cycle into four main stages and extracted the data from those, after which we made it more comprehensible even for the trained naked eye. Video footage was taken from 10 healthy subjects. The hypothesis of this work was thus: If we modify the walking speed we can check out from low intensity to high intensity, we won't see bigger amounts of deviation at ankle level. After analyzing the data collected, we couldn't say that by increasing the walking we also increase the amount of deviation in the ankle

Keywords: *Assessment; Kinovea; open-source; Biomechanics; Python*

REZUMAT. *Software Open-Source ca mijloace alternative de analiză biomecanică.* Într-o tentativă de a depista și câștiga tot mai multe resurse de analiză biomecanică și mai ales cost eficiente, am încercat să utilizăm mai multe aplicații open-source precum Kinovea pentru colectarea datelor, dar și Python pentru automatizare. Folosindu-ne de acestea putem arăta cât de facil este să creăm șabloane de investigare, după care ne rămâne doar să extragem și manipulăm datele în funcție de obiectivele noastre în cadrul sistemului nou creat. Partea cea mai bună privind aceste mijloace este că sunt absolut gratuite. Am defragmentat ciclul mersului în 4 etape esențiale din care ulterior s-au

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extras datele necesare și au fost gestionate în așa fel încât acestea să devină mai comprehensibile chiar și văzute de un ochi liber neantrenat. Materialul video a fost obținut de la 10 subiecți sănătoși. Ipoteza de lucru presupunea că dacă modificăm de la intensitate mică spre intensitate mare a vitezei de deplasare, pe măsură ce vom crește intensitatea nu vom observa și o creștere a gradului de deviații de la nivelul gleznelor picioarelor. După ce au fost analizate datele colectate, nu putem afirma că prin creșterea vitezei de deplasare în cadrul mersului, favorizăm și introducerea unei cantități de deviere majore la nivelul gleznelor.

Cuvinte-cheie: evaluare; Kinovea; open-source; biomecanică Python

INTRODUCTION

Nowadays in the field of human movement regardless of specialty (physical education, sports, physical therapy, medicine etc.), an important aspect that is missing from it is objective yet accessible tools of assessing (Mahadas, Mahadas & Hung 2018). The laboratory is still considered the most valuable means of biomechanical dynamic investigation. The two biggest disadvantages of the lab consist of high cost and rigidity. And by rigidity, I mean the impossible task of investigating movement in the natural environment of where it's occurring (Requena, Requena, García, Villarreal, and Pääsuke 2012).

By being able to capture movement on film in its natural environment, and use open source for data extraction and data analysis, we can reduce the cost of this entire operation and get closer to the results we warrant (Paolino, Zampa 2023). Those results will in themselves mean better decision-making for a broad variety of specialists (Ang, Kong 2013). We can register measurements like length, distance, displacements, time, angles. Using this data, we can further calculate force, velocity, acceleration, mechanical work, power, torque and so on (Liu, Stewart, Wiens, Mcnitt-Gray, Liu 2022).

For data extraction we used Kinovea 0.9.5, an extremely intuitive user-friendly program. It can be calibrated, so that means we don't waste time with tedious camera placing. The data once extracted from the footage is then introduced into a spreadsheet. We used Excel for the dataset. For operating the data set we used Python, an open source very popular programming language.

Although the experience of a well-seasoned specialist with a lot of training, know-how, intuition is extremely valuable, that alone cannot produce the same level of results for the people the specialist works with. He or she has to use every resource available today in terms of comprehending the individuals and

groups that they are working with. If decision-making is based on objective information, then it goes without saying that thing will move towards progress (Van Hooren et al.2019).

1. Walking mechanics

Although when it comes to healthy individuals, walking seems to be to little of a challenge, but for those with walking disfunction (be it from a neurological nature or traumatic), this feat can be tiresome, and quite difficult. Pathological gait can bring the individual to a high-rate energy expenditure so much so that for the same feat, it cost them almost twice the energy or more, as it would a healthy within functional parameters individual (Lovejoy 1981). From a neurological standpoint it can cause difficulties when it comes to motor control, maintaining balance, or in creating the proper patterns for normal walking (Baker 2007).

A healthy walking pattern depends on a series of biomechanical walking traits, led by the central nervous system. But when it suffers and when varied lesions appear here, the result may manifest itself as considerable motor deficits, with detrimental consequences in terms of balance and energy expenditure. Understanding the role of biomechanics within the healthy population with relatively normal walking gait, can give us a better insight and grasp on the deficits in discussion and how to evolve from those (Kuo & Donelan 2009).

2. Goal

To observe if walking speed influences the amount of deviation in the segments monitored. So, if we were to increase walking speed, we would expect more deviation.

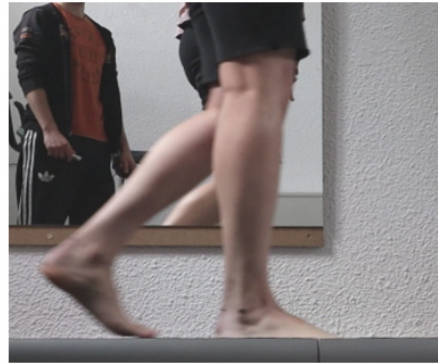
METHODS

1. Subjects

A number of ten healthy adult were monitored in this study. They were filmed in a physical therapy clinic on a basic treadmill. All were healthy within functional parameters, without accusing and prior traumatic incidents for more than a year timespan. For determining the level of plantar and dorsal flexion, the video footage was recorded from a frontal plane, and for determining the level of lateral incline, into either talovalgum or talovarum, the footage was recorded from a sagittal plane posterior wise.



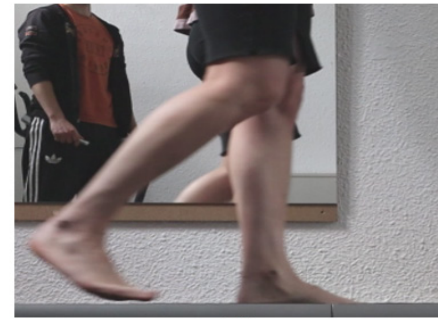
a. Green



b. Red



c. Yellow



d. Blue

Figure 1. a, b, c, d



a



b

Figure 2. a, b

Four key stages (figure 1) were spotlighted and from the four, in two of them, the distances between the two joints were noted also (figure 2).

2. Data Extraction

The program used for extracting the data was Kinovea 0.9.5, in its updated version, the whole process ran smoothly making the actual app very user friendly. Even without prior training, the operator can shortly get the hang of it. It works pretty good even with video footage as low quality as 25FPS (frames per second), but the less errors you'd like to have, the higher frame rate the camera capacities should be. We chose to film with two 50 FPS cameras which were stabilized on tripodes so movement would not compromise or creep errors with the data extraction process (Balsalobre-Fernández, Tejero-González, del Campo-Vecino & Bavaresco 2014).

This program has proven its utility and effectiveness when compared to other either open-source freeware or ones that are purchased. It was used in numerous and varied studies that had their aim in biomechanical analysis (Nor Adnan et al 2018).

The horizontal axis was calibrated in order to extract the data needed for the stages color coded green and yellow, for each of all of the 6 speeds tested. The calibration was made after the total length of the treadmill, that being 142.5 cm (figure 3).

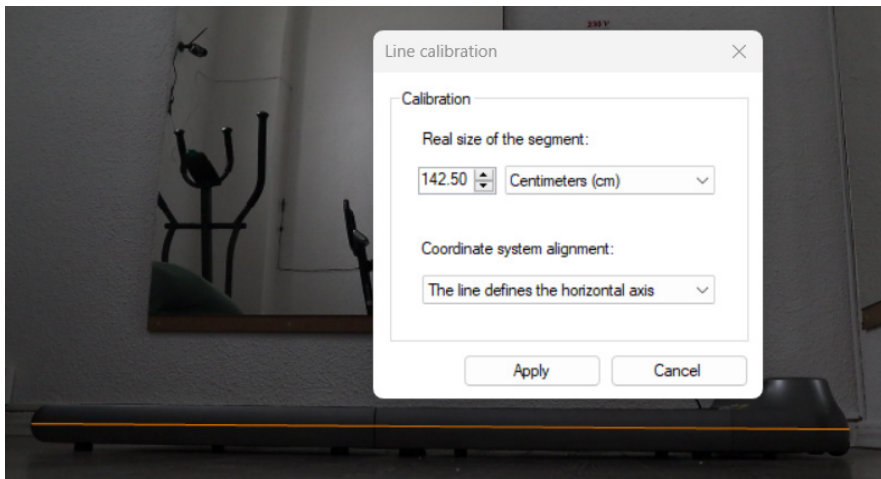


Figure 3. Calibration

We checked the level of plantar flexion from a frontal plane for each joint in each of the four stages for each of all of the six walking speeds. Thus, the recorded degrees for every color-coded stage: green (figure 4).

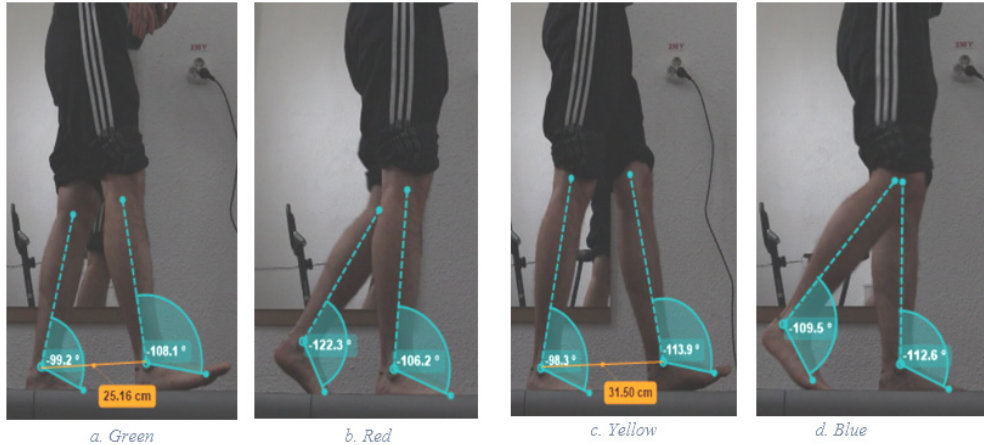


Figure 4. a, b, c, d

We checked for lateral ankle deviation having a posterior view from a sagittal plane. The recorded degrees for every color-coded stage were: green (figure 5).

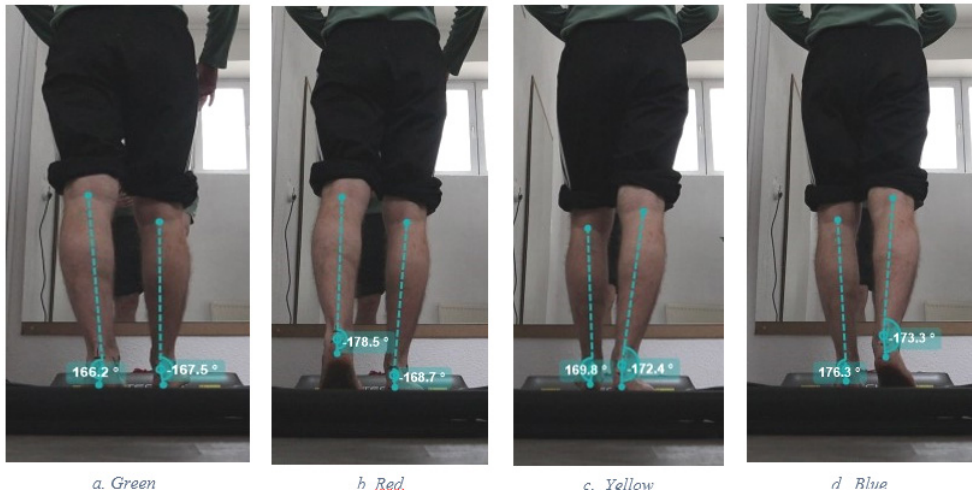


Figure 5. a, b, c, d

3. Database

We've built the data set in Microsoft Office's Excel. Seeing that the volume of data from the dataset even from such a small number of subjects is so considerable, we needed to manipulate it to make it more manageable (figure 6).

The first two columns will contain the ID and the gender of each subject. The third column will contain the independent variable, the moving speed. Then the later 22 columns will contain the multiple dependent variables.

We color coded the four key stages observed, and from that we had noted in column H the distance between the two ankles from the green stage and the same thing in column Q but for the yellow coded stage.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	
1	ID	Gender	Speed	Back	L Profile	R Back	R Profile	Distance	L Back	L Profile	R Back	R Profile	L Back	L Profile	R Back	R Profile	Distance	L Back	L Profile	R Back	R Profile	L standing	L swing	R standing	R swing
2	V.P	m	1.00	166.20	98.00	167.50	105.80	24.75	178.50	105.50	168.70	103.30	169.80	113.30	172.40	93.50	27.82	176.30	114.50	173.30	103.20	118.00	41.00	167.00	69.00
3	V.P	m	2.00	179.30	99.40	174.50	99.40	33.64	177.70	112.30	-177.10	107.10	179.10	110.90	171.40	97.30	40.84	178.20	113.40	180.00	108.90	77.00	34.00	73.00	37.00
4	V.P	m	3.00	179.50	97.10	179.10	103.50	38.89	-179.90	111.10	-179.50	108.00	179.00	108.20	172.00	99.40	50.01	-177.00	115.40	176.80	118.90	51.00	34.00	49.00	32.00
5	V.P	m	4.00	179.40	96.20	-178.20	108.00	49.45	-169.00	130.70	178.40	105.40	-177.90	110.80	170.00	97.40	52.22	-179.10	112.30	174.10	125.50	45.00	29.00	42.00	29.00
6	V.P	m	5.00	175.60	99.80	177.50	108.10	53.34	-173.20	117.70	175.80	107.80	179.00	111.40	177.90	112.80	57.89	-178.50	106.40	167.70	119.00	36.00	26.00	35.00	24.00
7	V.P	m	6.00	179.10	103.00	176.90	102.00	58.62	-177.90	131.70	165.70	105.90	-179.00	111.60	175.80	101.30	62.51	-177.10	106.00	165.10	119.90	31.00	24.00	31.00	23.00
8	I.B	f	1.00	174.80	108.60	173.80	107.30	16.62	-179.10	106.40	178.30	105.40	178.60	113.40	173.90	97.80	18.69	-177.80	108.20	172.20	99.50	63.00	21.00	65.00	23.00
9	I.B	f	2.00	179.60	105.00	178.10	111.60	29.22	177.40	125.10	179.80	107.10	176.50	115.40	177.80	97.40	22.44	-172.60	107.30	170.70	98.50	47.00	21.00	46.00	22.00
10	I.B	f	3.00	176.50	108.80	172.30	105.72	29.21	180.00	113.90	173.60	108.30	179.00	123.70	173.60	108.70	31.74	175.40	113.10	179.90	119.50	36.00	18.00	34.00	19.00
11	I.B	f	4.00	173.40	115.00	173.70	108.20	43.41	176.70	131.90	173.40	104.40	171.60	109.70	172.70	101.70	32.04	179.00	103.30	178.00	117.60	27.00	20.00	29.00	18.00
12	I.B	f	5.00	180.00	105.70	180.00	105.70	40.16	180.00	125.70	175.50	112.30	179.00	123.00	178.50	117.00	46.50	177.60	110.40	-176.50	126.50	27.00	21.00	27.00	17.00
13	I.B	f	6.00	180.00	115.60	174.30	110.80	41.96	180.00	126.00	175.40	104.80	-179.00	126.70	178.00	126.50	49.91	-179.30	100.70	180.00	122.10	21.00	20.00	26.00	18.00
14	M.O	f	1.00	178.10	111.30	178.40	109.60	21.33	-178.70	114.80	173.70	107.10	-178.60	120.10	173.90	99.10	27.86	178.20	118.00	176.40	100.00	103.00	44.00	103.00	46.00
15	M.O	f	2.00	178.40	108.00	-178.00	107.30	33.13	175.20	110.60	178.50	106.40	-173.80	123.40	170.60	100.10	38.89	174.60	121.20	-177.00	98.80	58.00	29.00	55.00	33.00
16	M.O	f	3.00	178.80	104.10	175.70	109.20	37.14	179.20	122.00	173.00	106.70	177.60	113.40	175.70	92.00	41.15	178.30	117.60	-176.90	100.90	45.00	25.00	46.00	25.00
17	M.O	f	4.00	179.50	101.90	177.30	110.30	41.65	-179.60	114.10	178.30	100.80	-178.10	115.20	178.10	92.40	48.94	177.70	117.50	177.30	109.00	36.00	22.00	36.00	25.00
18	M.O	f	5.00	178.20	103.20	177.40	111.50	45.44	179.20	117.30	177.90	103.20	-176.40	117.10	177.80	99.80	54.98	177.90	117.30	-173.30	114.90	33.00	21.00	33.00	23.00
19	M.O	f	6.00	175.30	109.10	-176.90	110.20	52.46	179.90	114.10	178.90	99.50	176.30	123.80	-177.20	101.20	57.25	-177.60	110.60	-176.70	119.50	29.00	20.00	30.00	19.00
20	CT	m	1.00	178.80	109.10	179.90	106.70	14.35	-175.30	104.80	179.20	102.00	-175.60	119.60	174.90	97.60	18.63	178.40	113.00	175.80	96.80	63.00	34.00	66.00	26.00
21	CT	m	2.00	177.70	109.70	177.20	109.30	31.52	-164.90	106.20	-179.20	100.90	-177.50	125.30	175.40	103.50	31.18	-178.80	116.70	-162.50	117.40	52.00	22.00	55.00	25.00
22	CT	m	3.00	177.40	106.90	173.10	110.60	34.29	177.00	101.60	176.90	128.00	177.20	117.90	174.80	101.00	37.20	-177.90	109.50	160.10	116.50	40.00	26.00	42.00	24.00
23	CT	m	4.00	178.50	110.90	176.40	113.10	39.14	180.00	125.80	179.80	103.90	-175.70	120.00	-178.20	109.90	47.08	179.60	117.60	-174.10	125.10	37.00	23.00	36.00	23.00
24	CT	m	5.00	177.20	127.50	171.10	108.30	49.72	-176.30	128.90	175.90	104.30	177.10	124.10	180.00	116.90	50.61	179.30	116.80	-179.30	126.80	33.00	21.00	33.00	22.00
25	CT	m	6.00	177.90	132.20	175.30	106.80	51.87	-160.40	129.60	168.30	103.50	-171.70	118.00	178.50	121.50	57.60	179.90	111.20	173.80	125.50	28.00	20.00	29.00	20.00
26	GA	m	1.00	179.40	106.30	177.80	111.40	31.42	-178.30	121.30	175.10	112.55	-172.40	118.10	168.30	99.80	23.46	179.80	117.80	177.60	108.10	180.00	50.00	148.00	47.00

Figure 6. Raw dataset

Column V, W, X, and Y represent the total time for an entire walking cycle for each lower limb in part, where V is the total time spent on the ground for the left leg in support phase and W is the total time spent in the air for the left leg in swing phase. The same principle applies for columns X and Y but transferred for the right lower limb. As can simply be observed, these last columns were color coded gray.

To make the data set more accessible using Python for automatization, we converted it into degrees. Since the values obtained are relatively high because of the possibilities of kinovea software, we will take as a neutral reference point the value 180°, and then we shall subtract the value obtained from initial dataset. Thus, we can observe the degree of deviation as it were if they started from 0° (figure 7).

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Speed	Lbackgreen	Lprofilegreen	Rbackgreen	Rprofilegreen	Lbackred	Lprofilered	Rbackred	Rprofilered	Lbackyellow	Lprofileyellow	Rbackyellow	Rprofileyellow	Lbackblue	Lprofileblue	Rbackblue	Rprofileblue
2	1	13.8	12.5	8	15.8	1.5	11.3	15.5	13.3	10.2	7.6	23.3	3.5	3.7	6.7	24.5	13.2
3	2	0.7	5.5	9.4	9.4	2.3	2.9	22.3	17.1	0.9	8.6	20.9	7.3	1.8	0	23.4	18.9
4	3	0.5	0.9	7.1	13.5	0.1	0.5	21.1	18	1	8	18.2	9.4	3	3.2	25.4	28.9
5	4	0.6	1.8	6.2	18	11	1.6	40.7	15.4	2.1	10	20.8	7.4	0.9	5.9	22.3	35.5
6	5	4.4	2.5	9.8	18.1	6.8	4.2	27.7	17.8	1	2.1	21.4	22.8	1.5	12.3	16.4	29
7	6	0.9	3.1	13	12	2.1	14.3	41.7	15.9	1	4.2	21.6	11.3	2.9	4.2	16	29.9
8	1	5.2	6.2	18.6	17.3	0.9	1.7	16.4	15.4	1.4	6.1	23.4	7.8	2.2	7.8	18.2	9.5
9	2	0.4	1.9	15	21.6	2.6	0.2	35.1	17.1	3.5	2.2	25.4	7.4	7.4	9.3	17.3	8.5
10	3	3.5	7.7	18.8	15.72	0	6.4	23.9	18.3	1	6.4	33.7	18.7	4.6	0.1	23.1	29.5
11	4	6.6	6.3	25	18.2	3.3	6.6	41.9	14.4	8.4	7.3	19.7	11.7	1	2	13.3	27.6
12	5	0	0	15.7	15.7	0	4.5	35.7	22.3	1	1.5	33	27	2.4	3.5	20.4	36.5
13	6	0	5.7	25.6	20.8	0	4.6	36	14.8	1	2	36.7	36.5	0.7	0	10.7	32.1
14	1	1.9	1.6	21.3	19.6	1.3	6.3	24.8	17.1	1.4	6.1	30.1	9.1	1.8	3.6	28	10
15	2	1.6	2	18	17.3	4.8	1.5	20.6	16.4	6.2	9.4	33.4	10.1	5.4	3	31.2	8.8
16	3	1.2	4.3	14.1	19.2	0.8	7	32	16.7	2.4	4.3	23.4	2	1.7	3.1	27.6	10.9
17	4	0.5	2.7	11.9	20.3	0.4	1.7	24.1	10.8	1.9	1.9	25.2	2.4	2.3	2.7	27.5	19
18	5	1.8	2.6	13.2	21.5	0.8	2.1	27.3	13.2	3.6	2.2	27.1	9.8	2.1	6.7	27.3	24.9
19	6	4.7	3.1	19.1	20.2	0.1	1.1	24.1	9.5	3.7	2.8	33.8	11.2	2.4	3.3	20.6	29.5
20	1	1.2	0.1	19.1	16.7	4.7	0.8	14.8	12	4.4	5.1	29.6	7.6	1.6	4.2	23	6.8
21	2	2.3	2.8	19.7	19.3	15.1	0.8	16.2	10.9	2.5	4.6	35.3	13.5	1.2	17.5	26.7	27.4
22	3	2.6	6.9	16.9	20.6	3	3.1	11.6	38	2.8	5.2	27.9	11	2.1	19.9	19.5	26.5
23	4	1.5	3.6	20.9	23.1	0	0.2	35.8	13.9	4.3	1.8	30	19.9	0.4	5.9	27.6	35.1
24	5	2.8	8.9	37.5	18.3	3.7	4.1	38.9	14.3	2.9	0	34.1	26.9	0.7	0.7	26.8	36.8
25	6	2.1	4.7	42.2	16.8	19.6	11.7	39.6	13.5	8.3	1.5	28	31.5	0.1	6.2	21.2	35.5
26	1	0.6	2.2	16.3	21.4	1.7	4.9	31.3	22.55	7.6	11.7	28.1	9.8	0.2	2.4	27.8	18.1

Figure 7. Converted dataset into simpler degrees

4. Data analysis

Once the new data set is created, it will be coded once more into python. This new coding framework will use simple digits (figure 8). Regardless of direction of deviation, for angles within 0° - 9.99° the code attributed shall be 1. For 10° - 24.99° , the code attributed shall be 2, and lastly for $\geq 25^{\circ}$ the code attributed shall be 3.

This third new dataset will again be color coded this time into Excel for each of the three codes. For 1 (0° - 9.99°) we used green, for 2 (10° - 24.99°) we used yellow and for 3 ($\geq 25^{\circ}$) we used red.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	Speed	Lbackgr	Lprofile	Rbackgr	Rprofile	Lbackre	Lprofilere	Rbackre	Rprofilere	Lbackyel	Lprofiley	Rbackyel	Rprofiley	Lbackblu	Lprofileblu	Rbackblu	Rprofileblu	
2	1	2	2	1	2	1	2	2	2	2	1	1	2	1	1	1	2	2
3	2	1	1	1	1	1	1	1	2	2	1	1	2	1	1	1	2	2
4	3	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	1
5	4	1	1	1	2	2	1	3	2	1	1	2	1	1	1	1	2	1
6	5	1	1	1	2	2	1	1	1	2	1	1	2	2	1	2	2	1
7	6	1	1	1	2	2	1	2	3	2	1	1	2	2	1	1	2	2
8	1	1	1	2	2	1	1	2	2	2	1	1	2	1	1	1	2	1
9	2	1	1	2	2	1	1	3	2	1	1	2	1	1	1	1	2	1
10	3	1	1	2	2	1	1	2	2	1	1	3	2	1	1	1	2	3
11	4	1	1	2	2	1	1	3	2	1	1	2	2	1	1	1	2	3
12	5	1	1	2	2	1	1	3	2	1	1	3	3	1	1	1	2	3
13	6	1	1	2	2	1	1	3	2	1	1	3	3	1	1	1	1	3
14	1	1	1	2	2	1	1	2	2	1	1	3	1	1	1	1	3	1
15	2	1	1	2	2	1	1	2	2	1	1	3	1	1	1	1	3	1
16	3	1	1	2	2	1	1	3	2	1	1	2	1	1	1	1	3	1
17	4	1	1	2	2	1	1	2	1	1	1	2	1	1	1	1	3	2
18	5	1	1	2	2	1	1	3	2	1	1	3	1	1	1	1	3	2
19	6	1	1	2	2	1	1	2	1	1	1	3	2	1	1	1	2	3
20	1	1	1	2	2	1	1	2	2	1	1	3	1	1	1	1	2	1
21	2	1	1	2	2	1	1	2	1	1	1	3	2	1	1	2	3	3
22	3	1	1	2	2	1	1	2	3	1	1	3	2	1	1	2	2	3
23	4	1	1	2	2	1	1	3	2	1	1	3	2	1	1	1	3	3
24	5	1	1	3	2	1	1	3	2	1	1	3	1	1	1	1	3	1
25	6	1	1	3	2	2	2	3	2	1	1	3	3	1	1	1	2	3
26	1	1	1	2	2	1	1	3	2	1	2	1	1	1	1	1	3	2
27	2	1	1	2	2	1	1	3	2	1	1	2	2	1	1	2	3	1

Figure 8. The 1,2 & 3 codes for degrees of deviation

In simple terms, following the variables this way, we can easily see the colored representation, of how speed influences the amount of deviation. If the influence truly exists, we should see that once we raise the walking speed, we shall move from green to yellow or even red. So, it is fairly simple to see the utility of handling the data as such

What is also extraordinarily useful in this whole process is the utility of the programming language interface, having implemented the lines already and the pattern being established, whenever I introduce new data, all the conversions that were previously made, will be automatically be done. So that is beneficial for us as specialists because this greatly reduces time and energy costs. This is a relatively small database, but if we were to continue adding to it and have a big database, without having such resources at our disposal, our work could be greatly impeded.

5. Statistics

The statistical package for the social sciences (SPSS) version IBM SPSS Statistics 20, was of great use for visual graphics as well as for the tests (Yang, Zhao, Liu, Zhou & Zhao 2015).

For testing normality of variable distribution, we used the Shapiro Wilk test. Seeing that the significance reveals a value of under 0.005 for every analyzed dependent variable (Donlin, Pariser, Downer 2022), skewness and kurtosis calculations were necessary. These aspects offer a perspective on the width of distribution. But these, however, do not offer us any information regarding characteristics of the shape of distribution frequency.

In the used tests for the normality of dependent variables distribution, we found out that it presents itself as ellipsoid, hence the skewness and kurtosis calculations. If values go above +1.0 are skewed right and the ones that go under -1.0 are skewed left. Those closer to 0 we can say that they don't present themselves skewed. For kurtosis, values that go above +1.0 are called leptokurtic and values that go under -1.0 are called platykurtic, and closer to 0 we do not have kurtosis (Barrett, Mills & Begg 2010).

The main purpose of the multivariate analysis is to establish if every level of the independent variable, meaning that the walking speeds from 1 to 6 km/h, have a statistically significant effect on any or all of the dependent variables, which constitutes the deviations from ankle level.

"Pillai's Trace" represents a value from 0 to 1. The closer you get to 1 the more we can state that the independent variable has an effect on the dependent variable.

Seeing the variables do not find themselves in a linear relationship and the values are not normally distributed, the correlation test chosen was Spearman.

RESULTS

Out of 16 variables, 8 present themselves visibly skewed to right, 1 to left, and the other 6 either to left or right only closer normal compared to the first 9. Now when we tested kurtosis, we found out that from the 16 variables, for 10 of them we will see that they will have a bigger tail, so they are leptokurtic. Another 3 will be platykurtic and the last 3 will get closer to normal when compared to the previous ones.

In “Pillai’s Trace” analysis, we observe that the value has a significance of 0.230. It is obvious that it is not enough to be able to state that our independent variable is not without effect on the dependent variable.

Because the dependent variable distribution was not linear, we used Spearman’s test, for establishing a correlation. Only 3 values proved a moderate relationship within 0.40. and 0.69. The rest of the variables did not show any strong relationship with the other variables. But this can be clearly observed by any specialist with experience by just watching the color coded “1,2,3” values tables.

DISCUSSION

Having considered the results of the statistical analysis the null hypothesis can be dismissed. So, we cannot state that just by raising walking speed, we increase the amount of ankle deviations.

The most important part after establishing this pattern of work, is that just by introducing new data, everything is automatized and the values shall be converted instantly. This is the benefit of having honed automatization in any programming language skills.

If the markers, as anatomical landmarks, are placed correct, the work for anyone that extracts data in the whole process gets greatly improved (Fernández-González, P., et al 2020).

In future studies it would be interesting to check out if by introducing another independent variable such as the subject’s comfort zone and establishing if that between this and the degree of ankle deviation as well as a comparison between it and the remaining other walking speed.

CONCLUSIONS

In this whole endeavor we have shown that just by utilizing accessible resources, that just cost you time, but not necessarily more financial ones, we can obtain a more objective tool for assessment, even comparable to other ones already on the market. We see an importance in alphabetizing movement specialists in creating, using, and improving these tools. Once we get to that stage the existing limits of all existing products will start to disappear, because new functions and patterns will always be conceived and implemented. Thus, every new study and work in this direction may lead to a torrent of new questions and investigations.

LIMITATIONS

Although we mostly achieved what we set out to do, there were inevitable limitations. The subject sample was fairly small, even though the dataset was considerable. In future studies this volume must increase considerably.

Also walking was monitored on a treadmill. This always inhibits results if we want to consider closer to “normal” conditions. But on the other part of this equation, having the test of an “in-field” walk would greatly impair our chances to control for speed intensity and the constancy of the exercise.

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STUDY ON THE PSYCHOLOGICAL FACTOR WITHIN THE MIDDLE SCHOOL FOOTBALL TEAM

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ABSTRACT. The psychological factor is one of the least exploited aspects of football. In sports, developing performance capacity is the primary objective of training. Maintaining motivation and achieving performance are the foundations of the educational-instructional process and have great value as outcomes both individually and for the team. **Research hypotheses. (H1).** It is assumed that the members of the national football team have average/above-average emotional intelligence (test score => 100), significantly different from the rest of the students in grades VII-VIII, because teamwork and the psychological training included in the preparation develop the mental qualities and properties of the students who play football. **(H2).** It is assumed that there is a significant correlation between emotional intelligence and the performance of students in the experimental group. **Research methods.** In the present research, the initial testing was carried out among students in grades VII-VIII and the national football team (February 2024 – May 2024). This research was conducted at “Sf. Ilie” General School in Toplița. The research subjects were 68 students, 35 females and 33 males. Quantitative and qualitative methods were used, and the following methods were chosen: observation, emotional intelligence test (Roco, 2001), performance test (ball sense, heading the ball, complex test, shooting at two goals, bilateral game), and statistical analysis (t-test). **Results.** The level of emotional intelligence of the students is 86 and 81 in the national football team, below average, which raises a red flag. At the level of the national football team, a strong self-awareness among the students is noted. This indicator has the highest score, 500, far ahead of empathy (-180) and very far ahead of social skills (-360). After applying to the middle school team's training program, we see a significant increase in

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the level of emotional intelligence. The correlation statistical test and the t-test show a correlation of $r=0.86$ and a significance of $p=0.00$ between the initial and final test results. The Pearson correlation shows a strong link between emotional intelligence and the bilateral game ($r=0.76$), but does not show a significant relationship between emotional intelligence and the other performance indicators. To confirm if the value of r is statistically significant, i.e., if the two variables are correlated, the t-value was calculated. **Conclusions.** This research confirms that the psychological factor cannot be absent from the preparation of school representative teams. It was confirmed that a high level of emotional intelligence improves the performance of football players, especially in team play, increasing group cohesion.

Keywords: *football, psychological factor, performance, athletes, school team*

REZUMAT. Factorul psihologic este unul dintre cele mai puține exploatate aspecte legate de fotbal. În domeniul sportiv, dezvoltarea capacității de performanță este principalul obiectiv al pregătirii. Menținerea motivației și obținerea performanței stau la baza procesului instructiv-educativ și au o valoare mare ca și rezultat pe plan individual și pe echipă. **Ipotezele cercetării.** (I1). Se presupune că membrii echipei reprezentative de fotbal au o inteligență emoțională medie/peste medie (scor test ≥ 100) semnificativ diferit de restul elevilor din clasele VII-VIII, deoarece lucrul în echipă și pregătirea psihologică inclusă în pregătire dezvoltă calitățile și proprietățile psihice ale elevilor care joacă fotbal. (I2). Se presupune că există o corelație semnificativă între inteligența emoțională și performanța elevilor la echipa reprezentativă gimnazială de fotbal. Cu cât elevul are o inteligență emoțională mare, cu atât poate să obțină o performanță mai bună. **Metodele cercetării.** În cercetarea de față testarea inițială s-a realizat în cadrul elevilor din clasele VII-VIII și echipa reprezentativă de fotbal (februarie 2024 – mai 2024). Această cercetare s-a realizat în cadrul Școlii Generale "Sf. Ilie" Toplița. Subiecții cercetării au fost 68 de elevi, 35 de sex feminin și 33 de sex masculin. Pentru efectuarea cercetării s-au utilizat metode cantitative și calitative și am ales următoarele metode: observația, test pentru inteligența emoțională (Roco, 2001), test de performanță (simțul mingii, lovirea mingii cu capul, proba complexă, șut la două porți, joc bilateral), analiza statistică (testul t). **Rezultatele cercetării.** Nivelul inteligenței emoționale al elevilor este 86 și 81 în echipa reprezentativă de fotbal, sub medie, ceea ce ridică un steag roșu. La nivelul echipei reprezentative de fotbal se constată o puternică conștiință de sine a elevilor. Indicatorul are cel mai mare punctaj, scor 500, la mare distanță de empatia (-180) și foarte mare distanță de aptitudini sociale (-360). După aplicarea programului de pregătire al echipei reprezentative, vedem o creștere semnificativă în nivelul inteligenței emoționale. Testul statistic de corelație și testul t arată o corelație de $r=0.86$ și o semnificație de $p=0.00$ între rezultatele testării inițiale și finale. Corelația Pearson arată o legătură puternică între inteligența emoțională și jocul bilateral

($r=0.76$), însă nu arată o relație semnificativă între inteligența emoțională și celelalte indicatori al performanței. Pentru a confirma dacă valoarea lui r este semnificativă statistic, deci dacă cei doi variabili sunt corelați, s-a calculat valoarea t . **Concluzii.** Cercetarea de față confirmă faptul că factorul psihologic nu poate lipsi din pregătirea echipelor reprezentative școlare. S-a confirmat că un nivel ridicat de inteligență emoțională îmbunătățește performanța jucătorilor de fotbal, mai ales jocul în echipă crescând coeziunea grupului.

***Cuvinte-cheie:** fotbal, factor psihologic, performanță, sportivi, echipa școlii*

INTRODUCTION

Football is a team sport where teams with very high performances exhibit high cohesion and efficiency. In football, all players have fixed positions, yet team members work together as a cohesive unit: each player aligns their specific positional efforts with those of the rest of the team, contributing collectively to the final outcome.

The psychological factor is one of the least explored aspects related to football. However, in specialized literature, there are references to the psychological preparation of players to carry out effective actions and achieve better results.

In the field of sports, developing performance capacity is the primary objective of training. Maintaining motivation and achieving performance form the basis of the instructional process and have significant value in terms of individual and team outcomes (Predoiu, 2016).

Sports psychologists have asserted that handling anger and anxiety appropriately, as well as maintaining confidence and focus, are as crucial on the football field as they are in the gym or classroom. It is evident that the psychological preparation of athletes is as important a factor as any other aspect of training (Ciolcă, 2013; Predoiu, 2016).

The concept of emotional intelligence has been studied for over 20 years. Empirical studies demonstrate the decisive role of emotional intelligence in achieving high outcomes and professional success (Nisevic, 2017). As we know, cognitive intelligence refers to abilities such as concentration, planning, and organization, focusing on the informational aspect of each person such as individual memory, visual coordination, and vocabulary.

Studies inform us that our level of emotional intelligence is not genetically determined. This intelligence can develop as we age, gain personal experiences, and mature (Goleman, 2004).

Emotional intelligence in the context of sports is increasingly receiving attention from sports psychologists. It has been noted that emotional intelligence is crucial not only in individual sports but also in team sports and can be a key factor in how well an athlete functions within a team (Goleman, 2004; Lott, 2017; Berry, 2013; Săftescu, 2015).

Ideally, psychological preparation is an important dimension in the training and instructional process because it helps shape the personality of students and their mental capacities (Balint, 2007). The goal of psychological preparation is for students to learn self-control, to exhibit appropriate behavior, to react effectively in difficult situations, and to adapt to competitive environments.

Research hypothesis

H1: It is hypothesized that members of the national football team have above-average emotional intelligence (test score ≥ 100), significantly different from the rest of the students in grades VII-VIII, because teamwork and psychological training included in their preparation develop the mental qualities and properties of students who play football.

H2: It is hypothesized that there is a significant correlation between emotional intelligence and the performance of middle school students in the national football team. The higher the student's emotional intelligence, the better their performance.

Research methods

In the current research, the initial testing was conducted among students in grades VII-VIII and the middle school team (February 2024 – May 2024). The emotional intelligence test was administered, and the test score, i.e., the emotional intelligence coefficient, was used as the independent variable. The sports performance test of the middle school team, which measured ball sense, heading the ball, complex test, shooting at two goals, and bilateral game, was used as the dependent variable.

After conducting control tests, the final testing of the middle school team was initiated using the same emotional intelligence test and performance test.

Subjects

This research was conducted at "Sf. Ilie" General School in Toplița. The subjects of the research were 68 students, consisting of 35 females and 33 males. All subjects are students in grades VII-VIII: 29 students are 13 years old and 39 students are 14 years old.

Research design

For this research, both quantitative and qualitative methods were utilized. The following methods were chosen: observation, emotional intelligence test (Roco, 2001), performance test (ball sense, heading the ball, complex test, shooting at two goals, bilateral game), and statistical analysis (t-test). In our research, we have a well-structured problem, which is why we approached it quantitatively. The qualitative component helps us in explaining the phenomenon.

Motor testing

Ball sense:

- *Exercise 1:* To enhance ball control, simulate movement with inflated balloons. The student must try to maintain the balloon in the air using alternate foot strikes.

- *Exercise 2:*

- *Variante 1:* with a ball in a hand, throw it to the foot, attempt to hit it once, then return the ball to its original position.

- *Variante 2:* Drop the ball on the ground, then kick it, and return the ball to hand.

- *Variante 3:* hit the ball twice with one foot or alternatively with both feet, then return the ball to hand.

Heading the ball:

- *Exercise 1:* simulate the execution movement without the ball. Student simulate heading the ball with their forehead.

- *Exercise 2:* each student with the ball in hand throws it in the air, then heads it.

- *Exercise 3:* throw the ball against a wall. Students positioned 3-4 meters from the wall throw the ball overhead towards the wall, then cleanly head it back with their forehead upon return.

Complex test:

- *Exercise 1:* Ball control. Each student with their ball covers the entire field surface, performing dribbling in all directions, including change of direction, acceleration, technical elements. At the teacher's signal, students are required to attempt executing a technical move or element while running.

- *Exercise 2:* In pairs 5-6 meters apart, execute passing and receiving the ball, hitting it with the instep.

- *Exercise 3:* At a distance of 6-7 meters from the goal, the teacher sits facing students with their back to the goal. Students start by dribbling towards the teacher, then execute a pass. The teacher then positions the ball for a shot on goal. The student must finish by accurately hitting the goal with the ball using the full instep, inside, or outside.

- *Exercise 4:* “Traffic light game”. Students are lined up at the goal line, and the teacher stands similarly at the opposite goal (or approximately 30 meters away) holding two colored flags, red (STOP) and green (START). When shown the green flag, students start sprinting towards the teacher, and upon the red flag, they must stop as quickly as possible. They then continue sprinting until reaching the teacher, following the rules indicated by the flag colors.

Shooting at two goals

- *Exercise 1:* Students grouped in pairs 6-7 meters apart, passing the ball between them with control, shooting with the instep.

- *Exercise 2:* Students grouped in pairs 10-12 meters apart, passing on the ground with lace or instep.

- *Exercise 3:* In pairs 12-14 meters apart, long passes in the air between them, using the full instep, inside, or outside of the foot.

RESULTS

To measure emotional intelligence, a coefficient was calculated reflecting self-awareness, self-control, motivation, empathy, and social skills. The level of emotional intelligence, the dispersion of values around the mean, minimum, maximum, and the sum of values obtained from the initial emotional intelligence testing are presented in table 1.

Table 1. Initial test (I.T.) for emotional intelligence

	MEDIA	STANDARD DEVIATION	MINIMUM	MAXIMUM
CONTROL GROUP (C.G.)	86	27	30	140
EXPERIMENTAL GROUP (E.G.)	81	25	40	145

The level of emotional intelligence among students is 86 and 81 in the representative football team, which is below average, raising a red flag. As indicated in specialized literature, the emotional development and emotional intelligence of students are crucial not only for academic outcomes but also for success in life.

In analyzing the test, we grouped questions in pairs for each component of emotional intelligence:

- Self-awareness: questions 1 and 4;
- Self-control: questions 6 and 7;
- Motivation: questions 3 and 10;
- Empathy: questions 2 and 5;
- Social skills: questions 8 and 9.

Table 2. The hierarchy of emotional intelligence indicators within the experimental group

Hierarchy of indicators	Score
Self-awareness (question 1 and 4)	500
Empathy (question 2 and 5)	320
Self-control (question 3 and 10)	280
Motivation (question 3 and 10)	220
Social skills (question 8 and 9)	140

For the representative football team school, there is a strong self-awareness among the students. This indicator has the highest score of 500, significantly higher compared to empathy (-180) and substantially higher compared to social skills (-360).

After implementing the training program for the representative team, we observe a significant increase in the level of emotional intelligence. The statistical correlation test and the t-test show a correlation of $r=0.86$ with a significance of $p=0.00$ between the initial and final test results.

The performance of the representative team was evaluated using the following indicators: ball sense, heading the ball, complex test, shooting at two goals, and bilateral game. The initial (I) and final (F) performance data are presented in the graph below, showing an improvement in each indicator (table 3).

Table 3. The *t* test for significance between the initial and final tests of emotional intelligence

<i>t</i> test: Paired Two Sample for Means			
	<i>Variable 1</i>	<i>Variable 2</i>	
Mean		81.05263	107.1053
Variance		604.386	564.7661
Observations		19	19
Pearson Correlation		0.861318	
Hypothesized Mean Difference		0	
df		18	
t Stat		-8.90244	
P(T<=t) one-tail		0.0000	
t Critical one-tail		1.734064	
P(T<=t) two-tail		5.18E-08	
t Critical two-tail		2.100922	

Table 4. The correlation between E.I. and the performance of E.G.

	Ball sense	Heading the ball	Complex test/sec	Shooting at two goals	Bilateral games	EI
Ball sense	1					
Heading the ball	0.705	1				
Complex test/sec	-0.131	-0.095	1			
Shooting at two goals	0.045	-0.304	-0.509	1		
Bilateral game	0.358	0.230	-0.359	0.596	1	
E.I.	0.287	0.303	-0.105	0.190	0.760	1

The Pearson correlation shows a strong relationship between emotional intelligence and bilateral game ($r=0.76$), but it does not indicate a significant relationship between emotional intelligence and the other performance indicators. To confirm if the value of r is statistically significant, indicating whether the two variables are correlated, the t -value was calculated (table 4).

Both the correlation test and the t -test demonstrate a strong and statistically significant relationship between emotional intelligence and one of the performance indicators, bilateral game ($r=0.76$, $p<0.05$).

Table 5. The *t* test for the significance between E.I. and athletic performance

<i>t</i> test: Paired Two Sample for Means		
	<i>Variable 1</i>	<i>Variable 2</i>
Mean	81.05263158	3.489474
Variance	604.3859649	0.634327
Observations	19	19
Pearson Correlation	0.75958957	
Hypothesized Mean Difference	0	
df	18	
t Stat	14.09595985	
P(T<=t) one-tail	0.00	
t Critical one-tail	1.734063607	
P(T<=t) two-tail	0.00	
t Critical two-tail	2.10092204	

The relationship between these two variables is very strong at a significant level of $p=0.00$. Bilateral games measures not only individual and collective tactical actions but also psychomotor preparation and collaboration among players (table 5).

RECOMMENDATIONS

Preparing the representative football team should include the psychological factor because emotional skills can be developed, and the emotional intelligence coefficient can rise above average. Knowing the level of emotional intelligence helps in choosing, planning, and implementing strategies for developing football players both personally and as a team.

It can be affirmed that students need to be helped to identify and differentiate their personal emotions, learn how to control their emotions and feelings, develop empathy, demonstrate self-awareness, recognize the importance of interpersonal relationships, and teamwork to increase group cohesion.

At the team level, for efficiency, team members must recognize and address personal and interpersonal issues. When teams do not work together effectively, differences and conflicts that are difficult to resolve can arise. Emotional intelligence and especially empathy are factors that help teams solve problems and support group dynamics and efficiency.

CONCLUSIONS

This research confirms that the psychological factor is crucial in the preparation of school representative teams. It has been confirmed that a high level of emotional intelligence improves the performance of football players, especially in team play, thereby enhancing group cohesion.

In the initial phase of the research, statistical data indicated a low level of emotional intelligence among the school football team. Although self-awareness was high, very low scores in empathy, self-control, motivation, and especially social skills pointed clearly to actions needed in developing and implementing the training plan for young footballers.

Following the implementation of the training plan for the representative team, the data showed a significant improvement in the psychological factor, closely linked to improvements in performance indicators, especially in bilateral game. Hypothesis H2 was supported, finding a strong and significant correlation between emotional intelligence and the sports performance of the representative team.

Consequently, as a next step following this research, the development of a program containing exercises, activities, and ideas for psychological training for middle school football representative teams could be considered.

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THE IMPACT OF COVID-19 PANDEMIC ON STUDENTS' SPORT ACTIVITY

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ABSTRACT. The rapid spread of COVID-19 virus in Romania has had a substantial impact on higher education, where almost all institutions have been closed and on-site teaching activities have been replaced by online courses (at the peak of the pandemic, 90% of the world's students were affected by the closure of institutions). International research papers show that these prevention measures have increased stress and anxiety levels and the number of cases of depression. This fact had a considerable effect especially among the students of the physical education faculties, who could no longer support their sports activities. As shown in the present study, 80.5% of the students confirmed that they were affected physically and mental/emotional by the COVID-19 pandemic. The research aimed to identify the current physical condition, but also to compare the physical condition before and during the pandemic and to understand the emerging negative effects of the pandemic on students of the Faculty of Physical Education and Sports at Babeș-Bolyai University in Cluj-Napoca.

Keywords: *physical activity, health, pandemic, lifestyle, influence, benefits*

REZUMAT. *Impactul pandemiei de covid-19 asupra activității fizice a studenților.* Răspândirea rapidă a virusului COVID-19 în România a avut un impact substanțial asupra învățământului superior, unde aproape toate instituțiile au fost închise, iar activitățile de predare la fața locului au fost înlocuite cu cursuri online (în perioada de vârf a pandemiei, 90% din studenții lumii au fost afectați de închiderea instituțiilor). Cercetări internaționale arată că aceste măsuri de prevenire

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au crescut considerabil nivelul de stres și anxietate și numărul cazurilor de depresie. Acest fapt a avut un efect considerabil mai ales în rândul studenților facultăților de educație fizică, care nu mai puteau susține activitățile sportive. După cum se arată în studiul de față, 80,5% dintre studenți au confirmat că au fost afectați fizic și psihic/emoțional de pandemia COVID-19. Cercetarea și-a propus să identifice condiția fizică actuală, dar și să compare condiția fizică dinaintea și în timpul pandemiei și să înțeleagă efectele negative emergente ale pandemiei asupra studenților Facultății de Educație Fizică și Sport din cadrul Universității Babeș-Bolyai din Cluj-Napoca.

***Cuvinte-cheie:** activitate fizică, sănătate, pandemie, stil de viață, influență, beneficii*

INTRODUCTION

Physical education and sports represent one of the most important components of a healthy lifestyle. Sport is a physical activity that takes place according to certain rules, assuming a specific training, based on obtaining results or performances. This activity influences a person's lifestyle, health and personality.

The COVID-19 pandemic has significantly influenced the well-being of students, as highlighted by multiple studies. For instance, Yotsidi et al. (2023) examined the mental distress and well-being of university students during the pandemic, revealing that students aged 18-20 experienced higher stress levels, and poor academic quality led to increased anxiety. Gratitude and resilience were positively correlated with improved relationships and well-being. Similarly, Lorini et al. (2023) found high levels of future anxiety and health complaints among Italian university students, with a sense of coherence and digital health literacy playing crucial roles in mitigating these effects. Siddiqua et al. (2023) reported that the pandemic exacerbated pre-existing mental health issues, with severe anxiety and stress prevalent among young students, particularly females. Furthermore, Younas et al. (2023) highlighted the importance of coping behaviors in alleviating the negative impact of the pandemic on students' physical and psychological health. Lastly, Seydooğulları (2023) identified various biopsychosocial, spiritual, and economic factors affecting students' well-being, emphasizing the need for targeted support to address these multifaceted challenges.

The above being considered, the onset of the pandemic has had a negative effect on the health and well-being of people around the world. The COVID-19 pandemic disrupted our lives in all its aspects: online education, homework,

social distancing, all of which had the greatest devastating impact on young people. With the limitation of travel, physical and social distance, the use of health protection measures, the prohibition of organizing activities, many young people were forced to give up sports, whether professional or amateur, thus affecting their mental, physical health and well-being. Through isolation, people were deprived of necessary information about their living environment, which caused a lot of anxiety.

Due to the introduction of measures to prevent the spread of the virus, the level of physical activity decreased and established a more sedentary lifestyle for students.

International research papers/documents show that these prevention measures have increased stress and anxiety levels and the number of cases of depression (Debowska, 2020). This fact had a considerable effect especially among the students of the physical education faculties, who could no longer support/practice their sports activities. As shown in the present study, 80.5% of the students confirmed that they were affected physically and mentally/emotionally by the COVID-19 pandemic.

The rapid spread of COVID-19 virus in Romania has had a substantial impact on higher education, where almost all institutions have been closed and on-site teaching activities have been replaced by online courses. In this context, the research aims to identify the status of the physical activity of students and compare data from before the pandemic to those during it in order to understand the emerging negative effects of the pandemic on students from the Faculty of Physical Education and Sports of the Babes-Bolyai University in Cluj-Napoca.

METHODS

The impact of the COVID-19 pandemic on the sports activity of the students of the Faculty of Physical Education and Sports was examined through a confidential form addressed to all students of the faculty. The form was distributed both physically and online, with a design that made it easy to fill in via phone, tablet or computer, and had an average completion/filling time of 15 minutes.

“Snowball sampling” was used - a useful procedure in characterizing a population with specific traits - so the form was distributed as a web link to faculty members and was later provided to students who were encouraged to fill it in. The questionnaire was available for completion for one month, at the end of the year 2021.

The first part of the questionnaire included sociodemographic questions such as: gender, age, faculty, level of education and academic year. The next part included 7 questions assessed on a Likert scale with a linear set of answers with

values between 1 and 5 where 1 represents "total disagreement" and 5 represents "total agreement". The resulting internal consistency of the answers is relevant, an alpha coefficient (Cronbach) was obtained on average of 0.77. The last part consisted of 2 questions where the students had to answer if they started practicing a new sport during the pandemic and how they were affected by it.

RESULTS

Response rates

The number of recorded answers was 87, representing both bachelor's and master's degree students. Subjects that at the time were from the 2nd year of studies were overrepresented in the sample, for this reason it must be taken into consideration that the results of the study should be examined dissociated from this aspect. However, the age groups are adequately represented.

Representativeness of the sample

The participants were 87 students with an average age of 20.87 years (standard deviation = 1.39) aged between 19 and 24 years. In terms of gender, 44 (50.6%) of the students reported male gender, and 43 (49.4%) reported female gender. The age difference between the genders is insignificant. 76 (87.4%) of the students are part of level 1 of higher education (bachelor's degree) and 11 (12.6%) are part of level 2 of studies (master's degree).

The situation before the pandemic

80.4% of the students say they had a good or excellent physical condition before the pandemic, while a small part (14.9%) only average.

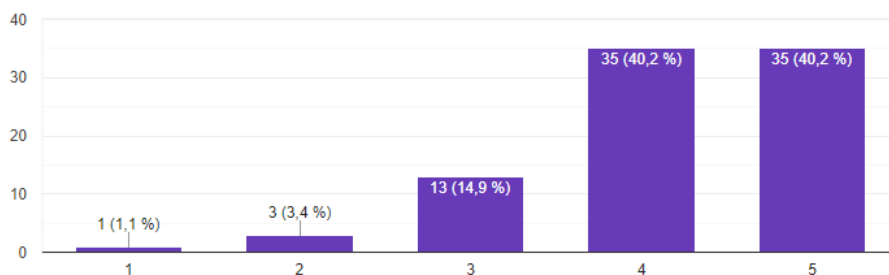


Figure 1. The level of the physical condition of students before the pandemic

Also, 79.3% of them practiced sports often and very often, which was to be expected. This fact further outlines the previous pandemic situation, when students had an active sports life.

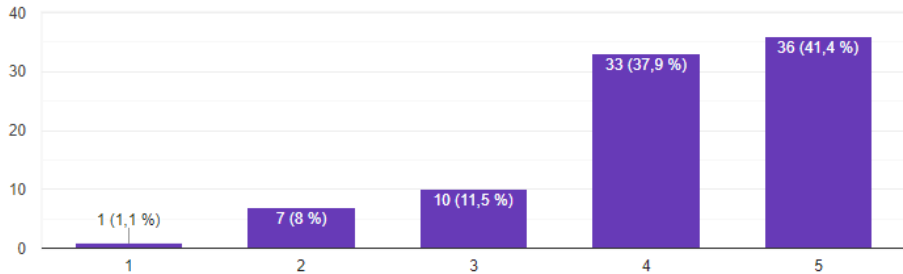


Figure 2. The level of the physical activity of students before the pandemic

The current situation

Currently, the physical condition of the students has decreased, but not very drastically. 41.4% of the students reported an average physical condition, 40.2% a good one, and a small part of them (13.8%) claim that they have a perfect physical condition. In the present, this fairly good physical condition (compared to that during the restrictions) of students may be due to the physical resumption of the faculty and the reduction of restrictions at the national level (reopening of gyms, etc.).

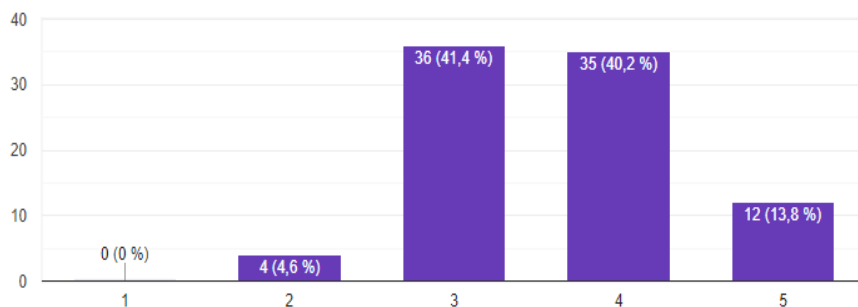


Figure 3. The level of the current physical condition of students

It should be noted that the time allocated to physical activities has decreased proportionally, on average a student currently does more than 20% less sports than he or she did before the pandemic.

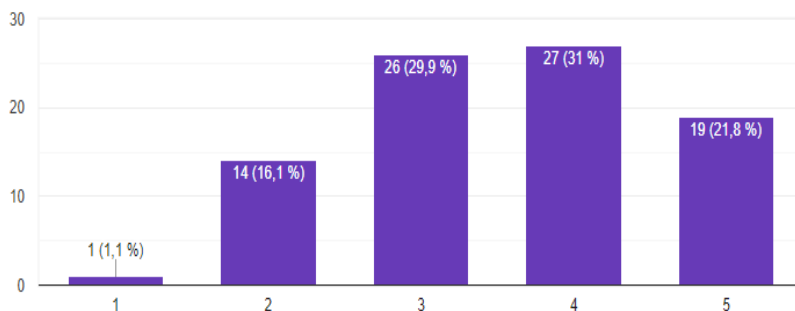


Figure 4. The level of the current physical activity of students

The situation during the restrictions

During the restrictions (quarantine, closed gyms, etc.) the situation of the students worsened, 45.9% of the students did little and very little sports.

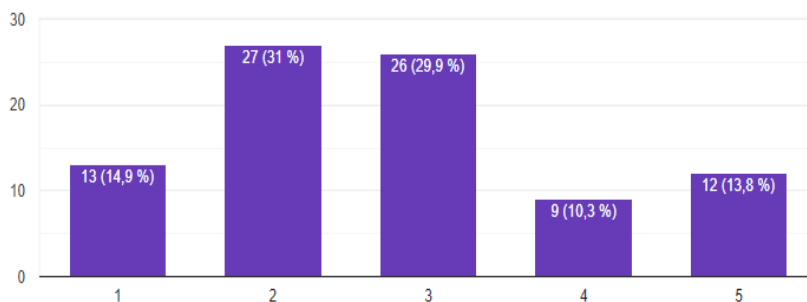


Figure 5. The level of the physical activity of students during the pandemic.

The pandemic caused by the spread of the COVID-19 virus has led to the creation of new measures such as isolation where the level of uncertainty has led to increased effects and negative emotions such as anxiety, depression, anger and stress (Tai et al., 2017). Other similar studies showed that participants had increased levels of stress, sleep disturbances, anxiety, and social dysfunction. Exposure to high levels of stress, anxiety, and depressive symptoms results in short- and long-term adverse effects on fitness, sleep quality, and athletic performance (Di Fronso et al., 2020).

The practice of physical activities has a great influence on the nervous system. By exercising regularly, we will have the pleasure of getting rid of the stress and constraints we face in our daily lives, because when we are active, we reduce the level of hormones that are responsible for producing stress. At the same time, exercise stimulates the production of endorphins, and we can keep stress and depression to a minimum.

Another important benefit that physical activities have on the body is the improvement of sleep quality. This is possible since sport requires physical effort. In this situation, the chances of falling asleep faster at the end of the day and having a deep and restful sleep increase. If we sleep better, we improve our memory, attention and concentration. Regular exercise requires the body to move, intensifying all activities in the human body: blood circulation in the lungs and other organs, respiration, exchange of nutrients in the tissues.

As highlighted in other studies, the health crisis has created new difficulties in the lives of students trying to combine academic study with a sports career, which has negative consequences on their emotional state. This can be explained by the emergence of new challenges in resuming activities and recovery, considering their dual careers (Abenza et al., 2020).

This was also reflected in the opinion of the students in the current study. 69% of them confirmed that the pandemic took a negative toll on their sports activity.

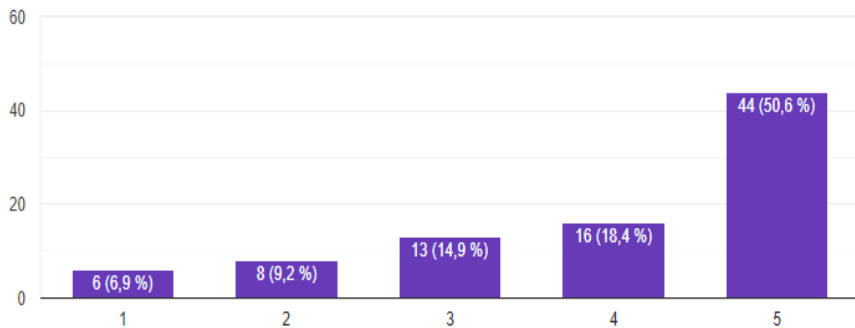


Figure 6. Perception of students regarding the negative toll of the pandemic on their sports activity

DISCUSSIONS

In the years before the pandemic, students used to learn and practice new sports on a regular basis. However, due to the conditions and the COVID-19 pandemic, 73.6% of the students claim that they have not started doing any new sport in the last 2 years, which is quite worrying.

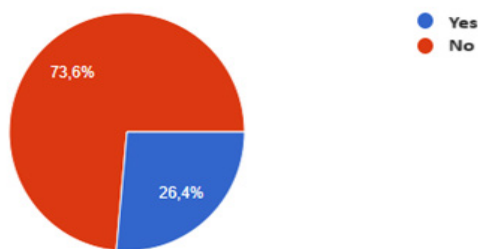


Figure 7. The practice of a new sport during the pandemic.

There are theories that try to explain the effects of physical activity from a psychological point of view on the motivation and behavior of the participants. The results show that constant physical training has effects, in addition to the physical and psychological benefits, on the attitude, motivation and intention of the candidates who often support a high emotional load (Waddington et al., 1997).

Also, 55.2% of the students admitted that, due to the sudden and prolonged change in the way they were used to doing sports, they were affected both physically and mentally/emotionally.

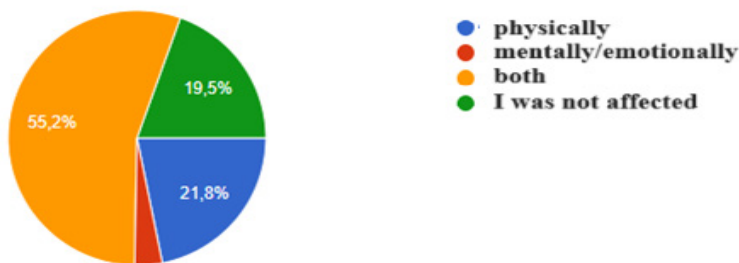


Figure 8. Self-perceived physical and mental impact of the pandemic.

Some of them (19.5%) claim that they were not affected at all, most of the unaffected students had an active sports life during and before the pandemic.

Maintaining a high frequency of physical training can be associated with positive effects compared to the previous pandemic period. Thus, physical activity can be protective for emotional well-being and for mental well-being.

As a result of the COVID-19 virus, quarantine and isolation measures have been applied in many parts of the world. Although their purpose was to reduce contamination, other health problems such as stress, anxiety and other mood disorders have emerged (Sanguino et al., 2020). In relation to the students from the faculties of physical education and sports, the measures had adverse effects, due to the limitation of the students' possibilities to participate in various competitions and sports championships but also to the performance of sports in general. These things affected the level of physical performance, resulted in feelings of anxiety and depression and in some cases the onset of exhaustion syndrome (Gupta et al., 2021).

CONCLUSIONS

The pandemic impact of the COVID-19 epidemic has undoubtedly affected higher education institutions. In order to study its effects on physical activity and the positive and negative effects of pandemic control measures such as quarantine, change of teaching and social physical distancing, the present study investigated the level of physical activity of students of the Faculty of Physical Education and Sports before pandemic but also during the pandemic. Based on the results obtained, it can be concluded that, in the case of the analyzed sample, maintaining a high frequency, intensity and duration of physical training during the pandemic can be associated with maintaining positive and negative effects similar to those before the pandemic.

The study seeks to highlight and identify different profiles of students because of the difficulties caused by the health crisis in their lives. Thus, some students with a pre-pandemic excellent physical condition - which may be associated with highly competitive or professional performance - suffer greater insecurity due to postponed competitions and other restrictions, which can result in decreased attention and of motivation during training, compared to the time before the crisis. Also, the level of stress remains high for all students due to the increased workload for physical and academic recovery.

Following the students' answers to the questionnaire, we concluded that many young people are aware of how important sport is in their lives, thus trying to make the best possible decisions regarding the practice of physical activities. With the onset of the pandemic, most young people have realized the strong impact that exercise can have on the human psyche and metabolism. So, whether it is a pandemic or not, sports should not be missing from the daily routine.

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OPTIMIZING SPORTS TRAINING LESSONS BY USING THE LED SYSTEM FOR BEGINNER BASKETBALL GROUPS

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ABSTRACT. Optimizing sports training lessons by using the LED system for beginner basketball groups. **Objectives.** This paper proposes the introduction into the training plan of the beginner basketball groups of some modern means, namely led systems for the development of reaction speed by making decisions to visual signals. The main purpose of this paper is to study the effects of this approach on the U13 players of the CSS Gheorgheni basketball team. **Materials and methods:** The subjects of the experiment were the athletes of the beginner basketball group born in 2010-2011, namely 16 girls. Initial tests were applied, then the players were subjected to specific training by applying some modern means, and at the end the same tests were applied again. **Results:** At the first test on execution speed, we notice that all the athletes managed to improve their results. From the point of view of mistakes, also in this test, we notice that almost all the participants in the experiment improved their performance, three of them managing not to make any mistakes. In the throwing test, they all improved their performance. In the combined test (changes of direction and throwing in the basket) 7 athletes finished the route without any mistakes, 7 girls improved their performance, and 2 girls had the same number of mistakes. **Conclusions:** based on the results obtained, we can say with certainty that by using exercises based on an LED system for the development of reaction speed by making decisions to visual signals throughout the season, the performance of the sportswomen under research has improved.

Keywords: modern means, LED system, reaction speed

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REZUMAT. Optimizarea lecțiilor de antrenament sportive prin utilizarea sistemului led la grupele de baschet începători. Obiective. Această lucrare propune introducerea în planul de pregătire al grupelor de baschet începători a unor mijloace moderne și anume sisteme led pentru dezvoltarea vitezei de reacție prin luarea deciziilor la semnale vizuale. Scopul principal al acestei lucrări este de a studia efectele acestei abordări pe jucătoarele U13 ale echipei de baschet CSS Gheorgheni. **Materiale si metode:** Subiecții experimentului au fost sportivele grupei de baschet începători născute în anul 2010-2011, și anume 16 fete. S-au aplicat teste inițiale, apoi jucătoarele au fost supuse unor antrenamente specifice prin aplicarea unor mijloace moderne, iar la final s-au aplicat din nou aceleași teste. **Rezultate:** La primul test, la viteza de execuție, observăm că toate sportivele au reușit să își îmbunătățească rezultatele. Din punct de vedere al greșelilor, de asemenea, la acest test observăm că aproape toate participantele la experiment și-au îmbunătățit performanța, trei dintre ele reușind să nu facă nicio greșeală. La testul de aruncări, toate și-au îmbunătățit performanța. La testul combinat (schimbări de direcție și aruncare la coș) 7 sportive terminând traseul fără nicio greșeală, 7 fete și-au îmbunătățit performanța, iar 2 fete au avut același număr de greșeli. **Concluzii:** pe baza rezultatelor obținute, putem afirma cu certitudine că prin folosirea unor exerciții bazate pe un sistem LED pentru dezvoltarea vitezei de reacție prin luarea deciziilor la semnale vizuale pe tot parcursul sezonului, prestația sportivelor aflate în cercetare, s-a îmbunătățit.

Cuvinte-cheie: mijloace moderne, sistem LED, viteza de reacție

INTRODUCTION

The uncertainties that “haunt.” The coach or the teacher can either be clarified or remain uncertainties. This process depends on the desire to know” (Roman, 2003, p.9)

The training session is the basic form of organizing and conducting the athletes' preparation process (EFS Terminology, 1973). The training session - from a pedagogical perspective: it is a "link" of the microcycles training that solves objectives of the most diverse, depending on the training period and the training component approached; - from a functional perspective: it represents a system of stimuli (tasks) designed in such a way (usually as a model) as to leave a "trace" in the athlete's body, producing, through accumulation, adaptation of different durations (C.A. Dragnea, 1993).

“Adapted to the specifics of high-level basketball, the conception of game and training is defined as a system of methodical-scientific knowledge, continuously formed and improved through information and each trainer's

own experience, applied in practical activity with the aim of achieving training objectives and competitive performance.” (Predescu, 2001, p.11) And a very efficient way to do this is through the LED system.

“The basketball players must act consciously, each action they undertake representing a response to the specific situation on the field at that moment, considering their relationships with opponents and teammates...” (Hrisca,1998, p.9). The LED system has aimed to decrease this response time, which is critical in resolving certain tactical situations and actions, both individual and collective, both in offense and defense.

LED-based systems of different colors have not been used in athletes’ training for a long time. They are produced by various companies, but the vast majority of them operate on the principle that the athlete will deactivate the LEDs either through complete contact or through proximity contact. I will present two of them.

The Fitlight Trainer System is based on the principle of HIIT (High-Intensity Interval Training Systems). This training has high applicability in different sports areas. It is a wireless equipment composed of 8 LED devices equipped with sensors and controlled by tablet. The system can be configured for all sports and types of training, the user being the one who will deactivate the LEDs either through complete contact or through proximity contact. It helps athletes improve their techniques and their ability to react in intense training conditions. At the same time, the system also provides a deep analysis of athletic performance. The system is perfectly adapted for intense physical exercises, to increase athletes’ performances. The flexibility of this system allows the creation of individual routines, applicable fitness exercises, or specific sports programs, both for athletes and coaches.

This system has the ability to analyze the user’s athletic abilities, thus allowing the setting of concrete goals for performance improvement. Reaction time, speed, flexibility, and acceleration can be easily measured with the help of the system, as this equipment has the ability to project specific exercises or programs that mimic real movements during training. Athletic capacity and movement fluidity can be measured in real-time with precise measurements and subsequently evaluated to improve athletes’ performances.

The Fitlight Trainer system can be used as physical therapy equipment for patient recovery following health problems, as well as for complex diagnostic establishment. Reax Lights PRO is a light system designed to develop interactive training programs, task combinations, and improve reflexes. The Reax Light Pro devices are based on patented technology created to enhance motor skills, cognition, peripheral vision, and reactivity. The Reax Lights Pro light system includes mobile LEDs that can be positioned on walls and floors, as well as a complete range of accessories for innovative cognitive training. Benefits:

increases reaction rate and coordination, improves performance and motor skills, defines muscles better, burns more calories, metabolic activation, faster recovery and functional medical rehabilitation.

“If there are connections between your life and other’s, you are an influential person but if, through these connections, you add value to others, you are a successful person.” (Maxwell, 2010). This system can bring value and growth to players if applied correctly, thus offering them the opportunity to improve their performances as players.

MATERIAL AND METHOD

The hypothesis of the research

This study starts from the hypothesis that by using exercises based on an LED system to develop reaction speed through decision-making on visual signals throughout the season, training sessions and players’ performances can be optimized.

The subjects and the research location

The subjects were 16 female basketball beginners from the Gheorgheni School Sports Club, Harghita county, during the school year 2022-2023.

Table 1. Subjects of the research

Nr.	Subjects	Gender	Year of birth
1	B.V.	F	2010
2	B.A.	F	2010
3	D.K.	F	2010
4	E.B.M.	F	2010
5	E.D.	F	2010
6	F.V.A.	F	2010
7	G.B.	F	2010
8	G.B.	F	2010
9	J.N.	F	2010
10	K.E.	F	2010
11	L.I.	F	2010
12	P.K.	F	2010
13	R.F.	F	2010
14	S.B.	F	2010
15	S.S.	F	2010
16	Z.T.	F	2010

The stages of research

For the experimental group, we designed a basketball-specific training program using LED system exercises twice a week - on Tuesdays and Thursdays - out of the 4 weekly training sessions, and we applied it from October 2022 to May 2023. We conducted three control tests at the beginning of October for the initial assessment of the athletes. We used the exercises described in the training sessions, and at the end of May 2023, we performed the final testing using the same control tests. We compared the initial results with the final results of the measurements to determine the athletes' progress.

The tests applied

Test 1 - Description of the exercise: Four LED cones are placed along the court, two at the three-point lines and two at the center circle. The athlete starts from the baseline. When approaching within one meter of a cone, the color of the LED changes. Green light indicates a change of direction with the ball passing in front. Red light indicates a change of direction with the ball passing behind. White light indicates a change of direction with a spin. Blue light indicates a change of direction with the ball passing between the legs. The route is performed 4 times (Figure 1). The time is measured, as well as the number of errors.

Top of Form

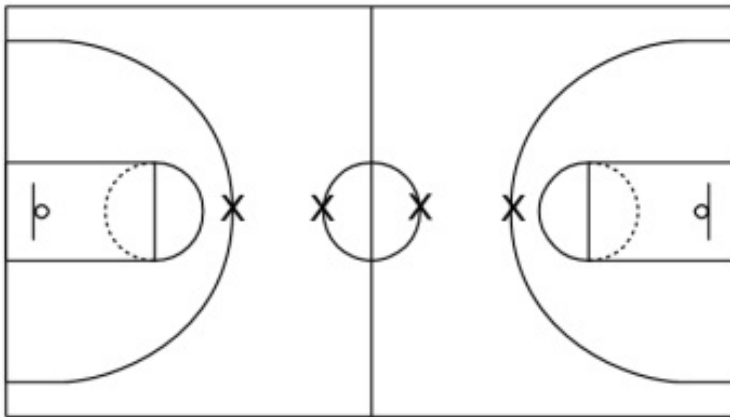


Figure 1. First test

Test 2 - A LED cone is placed on the free-throw line. The athlete starts from the three-point line. When approaching within one meter of the cone, the color of the LED changes. Green light indicates shooting at the basket from dribbling with the right hand. Red light indicates shooting at the basket from

dribbling with the left hand. White light indicates shooting at the basket from a jump. Blue light indicates shooting at the basket from dribbling with a pass under the hoop. The route is completed 10 times. Only the baskets scored and thrown according to the LED color procedure will be numbered.

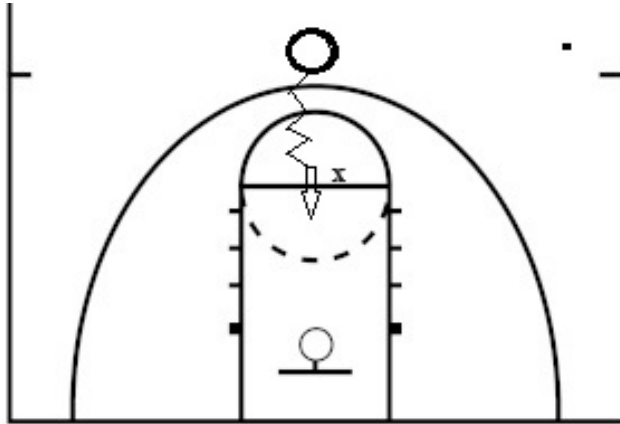


Figure 2. Second test

RESULTS

Tabel 2. The results of the test 1 (the execution speed)

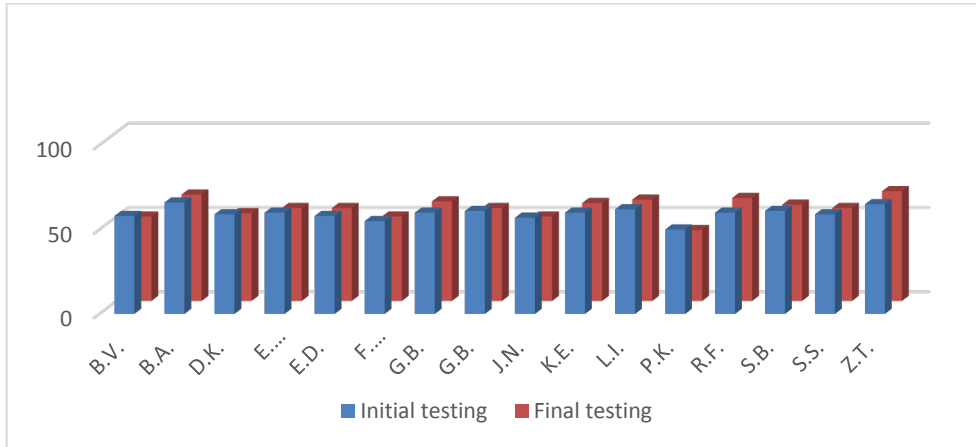
Nr.	Subjects	IT	FT
1	B.V.	58	50
2	B.A.	66	63
3	D.K.	59	52
4	E.B.M.	60	55
5	E.D.	58	55
6	F.V.A.	55	50
7	G.B.	60	59
8	G.B.	61	55
9	J.N.	57	50
10	K.E.	60	58
11	L.I.	62	60
12	P.K.	50	42
13	R.F.	60	61
14	S.B.	61	57
15	S.S.	59	55
16	Z.T.	65	65

Table 3. The results of the test 1 (the number of mistakes in execution)

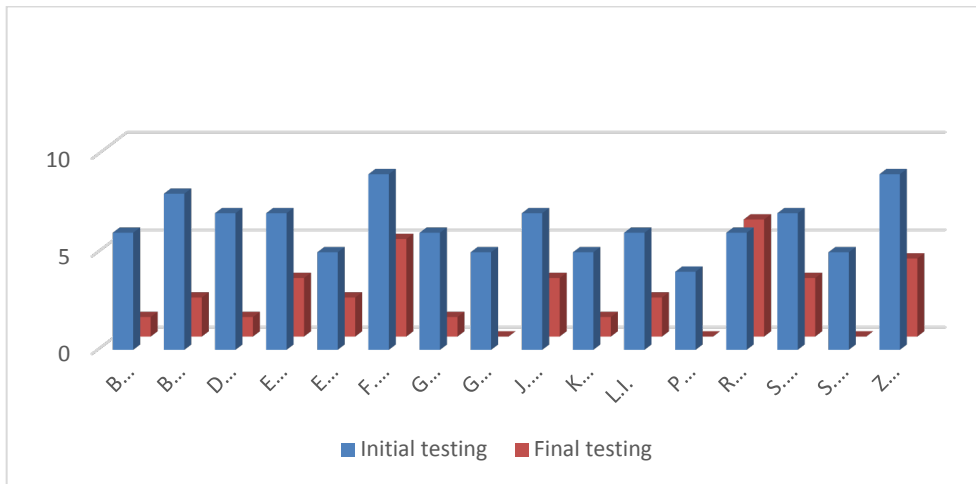
Nr.	Subjects	IT	FT
1	B.V.	6	1
2	B.A.	8	2
3	D.K.	7	1
4	E.B.M.	7	3
5	E.D.	5	2
6	F.V.A.	9	5
7	G.B.	6	1
8	G.B.	5	0
9	J.N.	7	3
10	K.E.	5	1
11	L.I.	6	2
12	P.K.	4	0
13	R.F.	6	6
14	S.B.	7	3
15	S.S.	5	0
16	Z.T.	9	4

Table 4. The results of test 2 (the scored number)

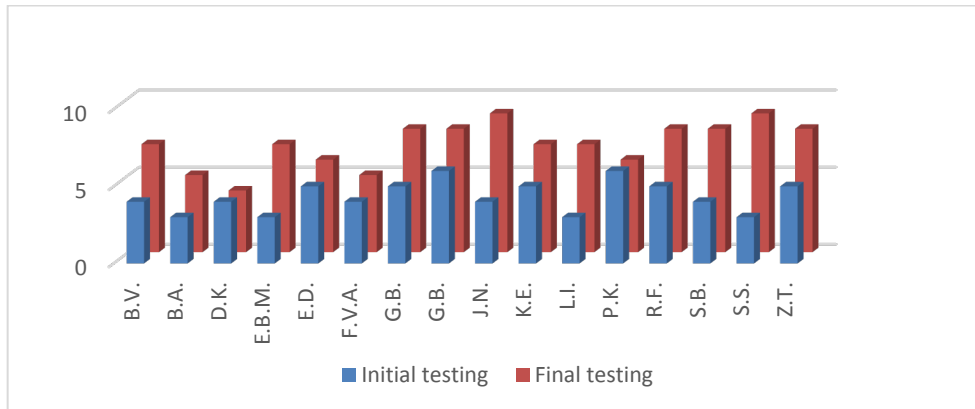
Nr.	Subjects	IT	FT
1	B.V.	4	7
2	B.A.	3	5
3	D.K.	4	4
4	E.B.M.	3	7
5	E.D.	5	6
6	F.V.A.	4	5
7	G.B.	5	8
8	G.B.	6	8
9	J.N.	4	9
10	K.E.	5	7
11	L.I.	3	7
12	P.K.	6	6
13	R.F.	5	8
14	S.B.	4	8
15	S.S.	3	9
16	Z.T.	5	8



Graph 1. The results of the test 1 (the execution speed of the route)



Graph 2. The results of test 1 (the number of mistakes in execution)



Graph 3. The results of test 2 (the scored number)

DISCUSSIONS

As can be observed in both the tables and the presented graphs, there are improvements in both tests performed by the players.

In test 1 (execution speed), with the exception of one player, all the others showed improvements in the speed of executing the route. The greatest difference between the initial and final testing was 8 seconds. In test 1 (number of mistakes in execution), except for one player, the players improved their performance, all managing to execute the procedure indicated by the LED correctly.

In test 2 (number of baskets scored), all players improved their performance in terms of the number of baskets made. It should be mentioned that a significant contribution was the reaction to the color displayed by the LED, rather than the execution technique of the shooting procedure.

Additionally, the increased number of successful shots may also be due to the fact that the attitude and seriousness towards the two tests were higher at the end than at the beginning.

CONCLUSIONS

As we can observe from the recorded data, the LED systems method has made a significant contribution to the development of reaction speed and the ability to make correct decisions in response to visual stimulus. The major advantage of this method is that athletes work with visual stimulus that will help them make decisions during matches. Due to the fact that I have a very good

relationship with the athletes, the research was conducted under very good conditions. Based on the results obtained, we can confidently state that by using exercises based on an LED system to develop reaction speed and decision-making skills in response to visual signals throughout the season, training sessions have been optimized. Tactical exercises with LED lights on the panel force players to constantly look at the basket, thus correcting a common mistake made by many beginners who tend to focus on the ball rather than the basket. Due to the possibility of diversifying exercises, they become more attractive, thus providing additional motivation for participation in training sessions. With a system of this type that can be programmed and equipped with proximity sensors to automatically record data, which could then be analyzed, I believe it would contribute to optimizing both tactical and technical and physical training, as well as psychological training by increasing attention and concentration.

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STUDY ON COACHES' AND ATHLETES' ATTITUDE TOWARDS THE CONSUMPTION OF DOPING SUBSTANCES

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ABSTRACT. Doping continues to attract the attention of specialists in the field of Sports Science due to its frequency of occurrence and the need for scientific substantiation of educational interventions. In all the conditional factors of doping behaviour, coaches and athletes are the key factors. Coaches are often identified as a potential enabler in athletes' doping, but precisely for this reason, they continue to be identified with their status as important potential agents in doping prevention. In turn, the athlete is the product of his own development and social-educational-cultural factors. The behavior of rejection or acceptance of the use of prohibited substances is determined by internal, subjective factors and external, social-environmental factors. An extensive model of risk factors, at international level, shows that interventions are needed at different levels for the educational effect to increase. In order to identify the attitude of coaches and athletes working in the Romanian sports system, between February and April 2022, online, with the help of Google forms, two questionnaires about anti-doping knowledge and attitudes were applied, one for athletes and one for coaches. The analysis of the results found that experienced coaches are better informed and have objective views on the impact of doping in sport. On the other hand, athletes resort to doping under peer pressure, lack of time required for training and as a result of competition pressure. Knowledge of these attitudinal peculiarities allows the formulation of recommendations on educational activities in the field of anti-doping education.

Keywords: *coaches, athletes, anti-doping, doping substances*

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REZUMAT. Studiu privind atitudinea antrenorilor și sportivilor față de consumul de substanțe dopante. Fenomenul dopajului continuă să atragă atenția specialiștilor din domeniul Științei Sportului care urmare a frecvenței de apariție a acestuia și nevoii de fundamentare științifică a intervențiilor educative. În ansamblul factorilor condiționali ai comportamentului doping, antrenorii și sportivii reprezintă factorii esențiali. Antrenorii sunt adesea identificați ca un potențial factor favorizant în fenomenul de dopaj al sportivilor, dar tocmai din acest motiv, ei continuă să fie identificați și cu statutul de agenți potențiali importanți în prevenirea dopajului. La rândul său, sportivul este produsul propriei dezvoltări și al factorilor sociali-educaționali-culturali. Comportamentul de respingere sau de acceptare a folosirii substanțelor interzise este determinat de factorii interni, subiectivi și factorii externi, sociali-ambientali. Un model extins al factorilor de risc, la nivel internațional, arată că intervențiile sunt necesare la diferite niveluri, pentru ca efectul educațional să sporească. Pentru identificarea atitudinii antrenorilor și sportivilor care activează în sistemul sportiv din România, în perioada februarie-aprilie 2022, online, cu ajutorul Google forms, au fost aplicate două chestionare despre cunoștințe și atitudini anti-doping, unul pentru sportivi și unul pentru antrenori. În urma analizei rezultatelor, s-a constatat că antrenorii cu experiență sunt mai bine informați și au opinii obiective privind impactul dopajului în sport. Pe de altă parte, sportivii apelează la dopaj la presiunea colegilor, a lipsei timpului necesar pentru pregătire și ca urmare a presiunii concursului. Cunoașterea acestor particularități atitudinale permite formularea unor recomandări privind activitățile educaționale în domeniul educației antidoping.

Cuvinte-cheie: antrenori, sportivi, anti-doping, substanțe dopante

INTRODUCTION

The UK Anti-Doping Agency's value-based model of doping risk factors upholds the principle of strict liability, meaning athletes are solely responsible for what's in their system, regardless of how it got there or whether there was any intent to cheat. The values are: passion, respect, integrity, determination and pleasure. Clean sport relies on all athletes playing according to the rules. *Spain* identifies key risk factors (ethical considerations of doping, basic relevant knowledge, sources of temptation, emotion settlement) and protection factors for doping substance use in adolescent and young athletes involved in sport. It evaluates the experiences of young people involved in fitness and recreational sports conditions, especially in terms of availability/access, promotion and purchase of doping substances. Working alongside experts in a wide range of fields, from psychology to nutrition, the US Agency's program offers evidence-

based content and engaging programs that reflect the Olympic spirit. The mission is simple and bold: to change the culture of youth sport by providing powerful educational tools to equip young athletes with the resources needed to develop their life skills and core values for success on and off the field. The model is based on three cornerstones: Sportsmanship: Win the right way – with respect and gratitude for teammates, coaches, parents and competitors. Character Building and Life Skills: Using sports experience to develop positive attitudes and behaviours throughout life: perseverance, courage, honesty, and more. Healthy Performance: Health-centred lifestyles that fuel athletic and personal success – in sports and in everyday life.

Following the studies conducted, ANAD *Romania* sets risk factors into three groups. (Table 1.):

Table 1. ANAD Risk Factors Model (2007)

1. Individual	2. Social	3. Situational
1.1. Personality traits and types 1.2. Performance motivation; Victory at any cost 1.3. Self-image 1.4. Specific attitudes 1.5. Level of culture and education	2.1. Group of membership: Family, Class or professional unit, Leisure group, Sports team, Sports club 2.2. Social environment - mass-media, civil society; social representations on sport and athletes' status	3. 1. Competition and the need for performance 3.2. Rivalry perceived as a threat 3.3. Uncertainty factors of the competition space

The aim of our study is to highlight the attitude of coaches and athletes in relation to the phenomenon of doping in sport. We believe that only knowing these attitudes can lead to the design of effective educational programs in the field of elite sports.

Research of conditional factors of doping behaviour

At international level, constant concerns can be identified regarding the study of the phenomenon of doping and its conditional factors.

The World Anti-Doping Agency (WADA) recently published the results of its athletes' vulnerabilities research project, which included a survey conducted between April and May 2021, to increase understanding of factors that can make athletes more vulnerable to accidental or intentional doping. The project analyses survey responses provided by 574 respondents (355 sports organisation employees and 219 athletes), representing 85 countries and 59 sports disciplines. The purpose of the survey was to gather information from those involved in sport on the types of athletes who may be more vulnerable to doping and the factors that cause the vulnerability; and, consequently, to enable international

federations and national federations to be more proactive in protecting vulnerable athletes. The results will also help WADA identify specific areas for further investigation and research.

Nine vulnerability factors were identified as “the most important” for both athletes and sports personnel, highlighting the need for educational programmes covering a wide range of topics and providing support to athletes through various means. Food supplements were considered the main area of concern by most sports personnel, while athletes referred to the physical demands of the sport and the need for rapid physical development and performance enhancement.

International male athletes were identified as most vulnerable to intentional doping and accidental doping. The coach has been considered to be the most influential staff throughout athletes' careers, especially at elite levels. Therefore, coaches have been put at the center of concerns about the need for education programs for coaches that provide them with accurate and up-to-date information and advice that they can pass on to their athletes. In addition, this aspect highlights that coaches can be the best placed to identify vulnerable athletes and be able to intervene, if given the necessary tools and strategies to do so.

Anti-doping education was considered to be the most effective way to support athletes who may be vulnerable to substance abuse, alongside traditional nutritional and psychological programmes.

The project *Examining coaches' experiences and opinions on anti-doping education* (UK) shows that there is a need for greater coherence and cooperation between relevant agencies in designing and implementing educational programmes. Programme delivery could be improved by integrating anti-doping education into coach education. Such integration of anti-doping education should be done through interactive methods (workshops and seminars) and promote the development of critical analysis competence (case studies, scenarios).

The coaches in the target group of the project *Examining coaches' perspectives on their role in doping and anti-doping* of Stirling University are a factor prohibiting doping, their role provides a solid basis for anti-doping, they recognized the limits of their own influence and the potential for influence from the “coach-controlled environment”. Some coaches felt they did not have enough knowledge to engage in anti-doping actions. Those for whom anti-doping was a higher priority engaged in structured, planned, practical anti-doping activities, coach education was a relatively low priority. However, more information is desired in relation to supplements.

The project *Understanding the role of high school athletes support personnel in Kenya in pursuing clean sport* investigates the anti-doping roles of athletes' support personnel in Kenya, especially coaches and team managers. To maximise the impact of this research on policy and practice, the research team will seek

to develop relationships with 'final users' (e.g. Kenya Anti-Doping Agency, Kenya Teachers' College Sports Association) and disseminate the findings at key events (e.g. African Union Anti-Doping Forum).

The project *Understanding and influencing global anti-doping education of coaches through the development of an international framework* (UK) aims to improve the effectiveness of anti-doping education and information delivery by developing an international framework for anti-doping education of coaches. This will be achieved by conducting a comprehensive audit and critical assessment of current global anti-doping education of coaches and conducting systematic consultations with coaches, education providers and policymakers worldwide.

Coaches' perceptions on their role in doping prevention (UK) provided a more nuanced aspect, understanding of what coaches "do" (or don't do) in practice when it comes to anti-doping and the factors that influence their (in)action in this context. The current study showed that coaches are not motivated to actively prevent doping in sports. Without institutional support and reinforcement to prevent proactive doping at the highest level, coaches are likely to remain passive actors in prevention efforts. At the same time as increasing the self-efficacy of coaches to prevent doping by improving knowledge and understanding, it is imperative that the sports community raises the profile and status of doping prevention and removes the stigma surrounding discussions about doping in sport. For athletes to participate in the anti-doping system, they must consider WADA, NADOs and other anti-doping partners as legitimate.

Perceptions of legitimacy, attitudes and acceptance among groups of athletes: a qualitative transnational investigation providing practical solutions of the University of Stirling. The athletes in this study were clearly in favour of anti-doping and even generally supported the testing and sanctioning system. However, they were also clearly skeptical about the system's ability to fairly test all athletes in countries and sports, as well as effectively detect and discourage athletes from engaging in doping. The athletes in this study, all of whom reported being against using any prohibited substances for enhancement, saw clear areas where the system was weak and open to abuse. This doesn't mean that these athletes are in any way looking to do so, but it's appropriate to conclude that a motivated athlete would likely have a better understanding and attempt to exploit vulnerabilities in the system.

The project *Identifying and analysing the role of athletes' support personnel attitudes towards doping* (Georgia) will be carried out using both qualitative and quantitative research methods to collect as much information as possible about attitudes towards doping. Research design for the project included data collection, measurement, analysis, and design of diagnostic research; as well as correlative and comparative analyses with previous studies conducted in 2019 and 2020.

Qualitative research in Georgian sport has shown that the level of awareness of athletes is quite low, many athletes do not try to become more informed about doping issues and have total confidence in the competence of medical staff. It is therefore appropriate to explore attitudes and knowledge, in particular of medical professionals. The results of the research will allow planning the necessary steps to be taken in the fight against doping, identifying priority groups and decision-makers for major anti-doping activities to reduce doping in athletes and improve clean sports behaviours and plan intervention projects. Research will allow to obtain information about cognitive, emotional and behavioural components of attitudes to drug use, clean sports, poor-quality food additives, drugs containing prohibited substances.

In Romania, from the research conducted by Vâjială et al. (2010), the risk of consumption is very high in junior athletes, especially those ranked second, third and below; When it comes to medication administration, athletes trust the doctor and coach the most; Older athletes are a “role model” for younger athletes and should be worked with in particular, even if they reject the idea of doping in others, when it comes to their self-image (physical and mental) they are willing to resort to doping.

Research design

Starting from the results presented above and responding to international trends, we organized a study in Romania, to identify the attitudinal particularities of coaches and athletes. The study aimed to identify answers to two questions:

- 1. What is the attitude of coaches towards the use of doping substances?*
- 2. What are the main factors considered responsible for athletes' anti-doping education?*

In this study we aimed to verify the following hypotheses:

H1. People in the athlete's entourage who are against the use of prohibited substances or methods influence the causes for which some athletes resort to doping.

H2. The type of sport, gender, age and context influence doping in sport.

Research methods

Between February and April 2022, two questionnaires on anti-doping knowledge and attitudes were applied online on Google-forms, **one for athletes and one for coaches.**

For data analysis, response frequency and factorial analysis (CFA) were used. CFA, in fact, is achieved through the use of models of structural equations (SEM). The factorial structure is constrained, respectively is defined a priori by the researcher (structural relations are not, however, the only parameters that can/should be constrained). The model will proceed to estimate saturations and therefore calculate a series of matching indices that describe how well the data model fits or, in simpler terms, how well the model is able to describe the observations. There are a large number of matching indices, which can generally be divided into absolute indices (such as the value of the Chi-squared test statistic - the only one that also allows the application of an inferential test) and RMR, SRMR or RMSEA, relative indices (such as NFI and TLI)

The application of these statistical tests was done with SmartPLS software that provides a series of tests that can be used to ensure a consistent factorial analysis and interpretation of data and to assume the results of the research.

Target groups

The 1st target group

A 22-question questionnaire was administered to coaches aged between 22 and 66. The average age of the group of coaches is about 40 years. Following the application of the questionnaire, 297 responses were received from coaches.

The characteristics of the group of coaches who completed the online questionnaire are presented below (Figures 1 - 3).

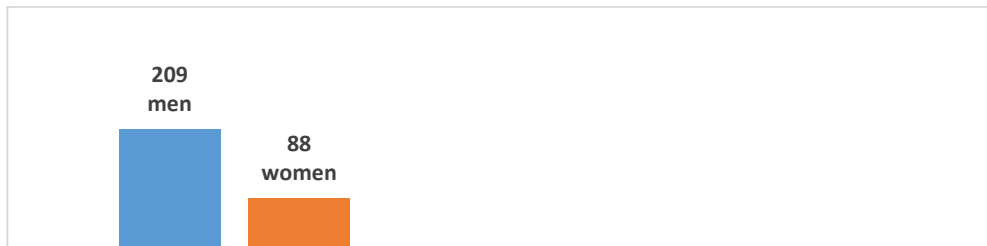


Figure 1. Gender of the coaches

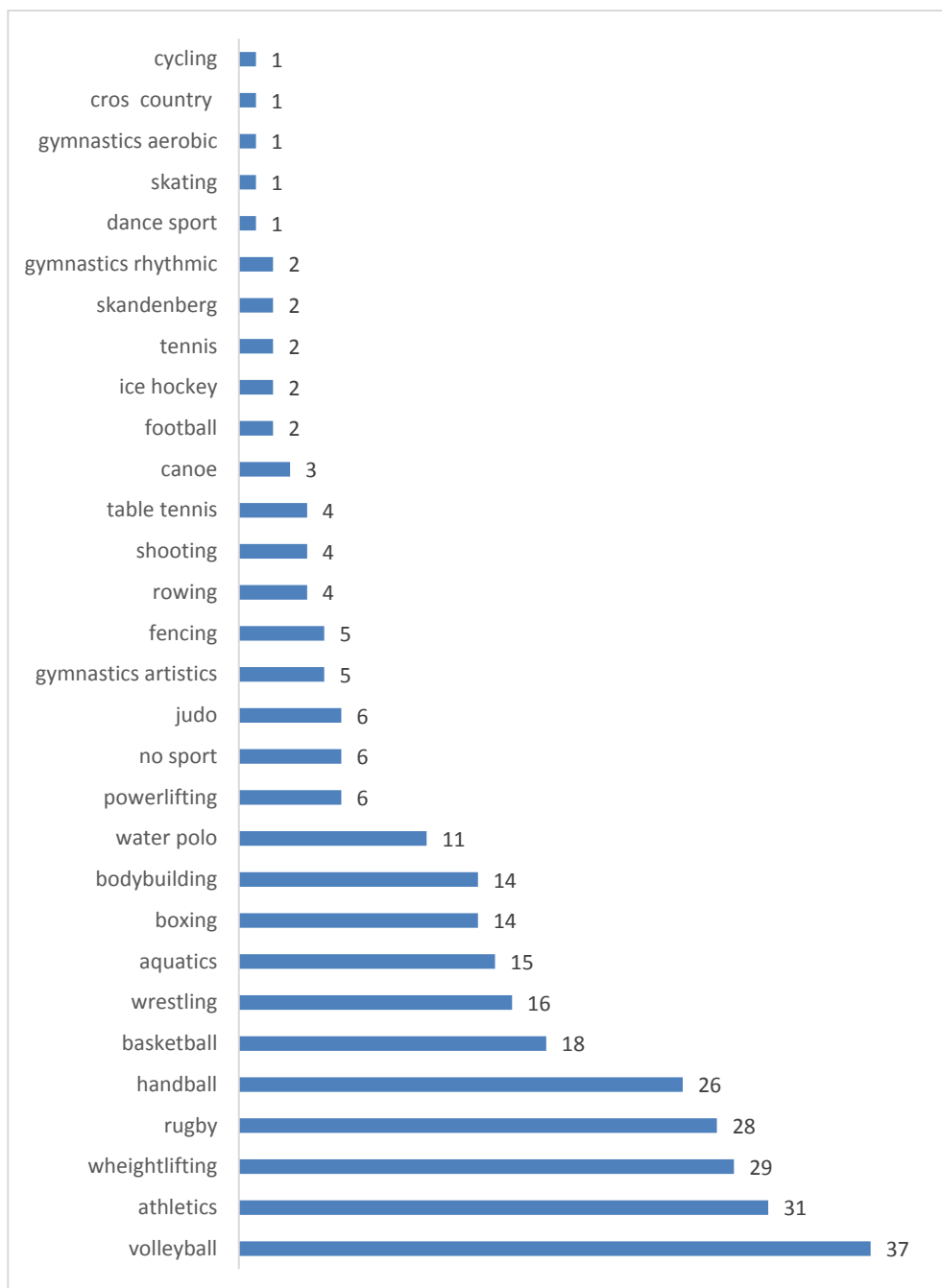


Figure 2. Categories of trained sports

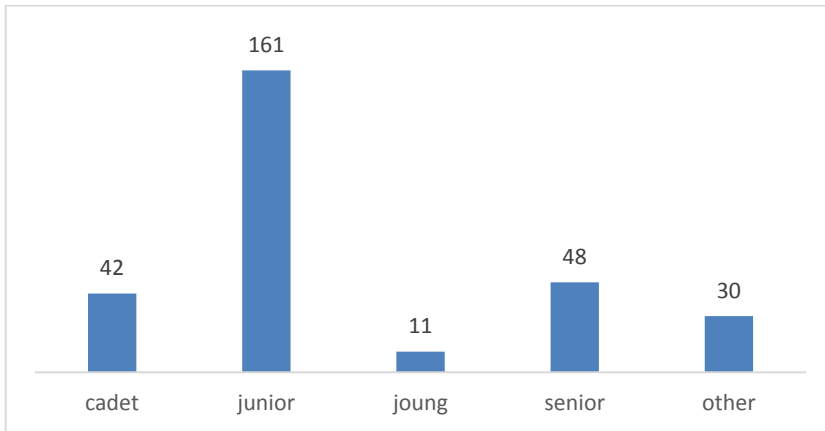


Figure 3. Categories of trained athletes

The questionnaire for athletes included 57 questions and aimed at knowing both the attitudes and behaviours specific to these “social agents” and how they are the product of the concrete socio-cultural conditions in which athletes developed. The questionnaire has 57 items and was completed by 350 athletes.

The questionnaire variables are:

- a) subjects' knowledge on the types of prohibited substances and their effects;
- b) knowledge of the sanctions that can be applied if they are caught using prohibited substances;
- c) attitudes of rejection or acceptance towards the consumption of prohibited substances;
- d) the reasons why the athlete may take the risk of using prohibited substances;
- e) proximity social environment (sports group, teammates) and media factors that can influence subjects' attitudes towards doping;
- f) suggestions for athletes and education of their entourage for rejecting doping;
- g) self-references to the use of prohibited substances and its consequences.

The 2nd target group

350 junior athletes, aged 10-30 years. The average age is 16 - 17 years (Figures 4 and 5)



Figure 4. Gender of the athletes

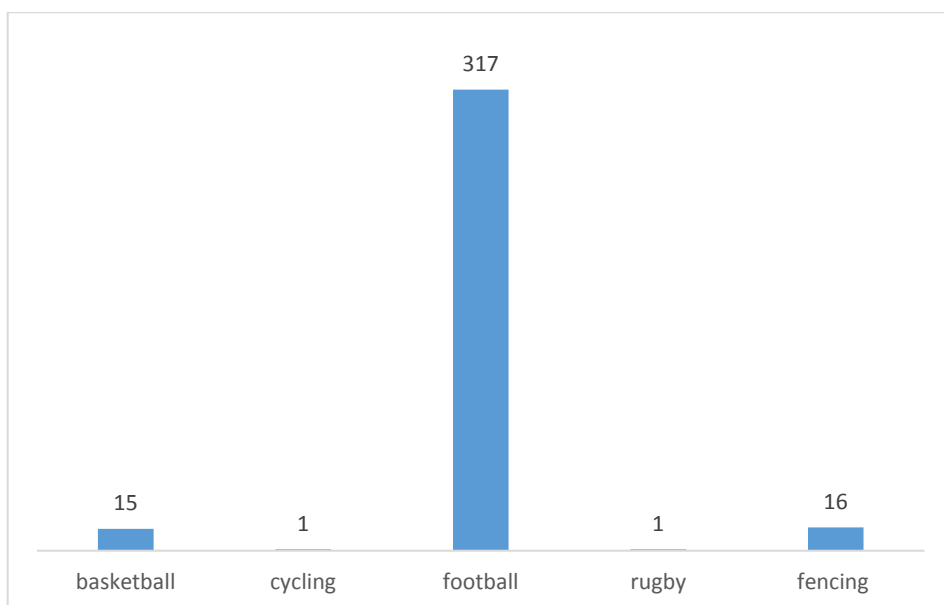


Figure 5. Sport practiced

RESULTS

For coaches: 297 responses from coaches aged 66 to 22, the average age of the coaching group is around 40.

Most coaches are aware of the provisions of official documents regulating anti-doping activity.

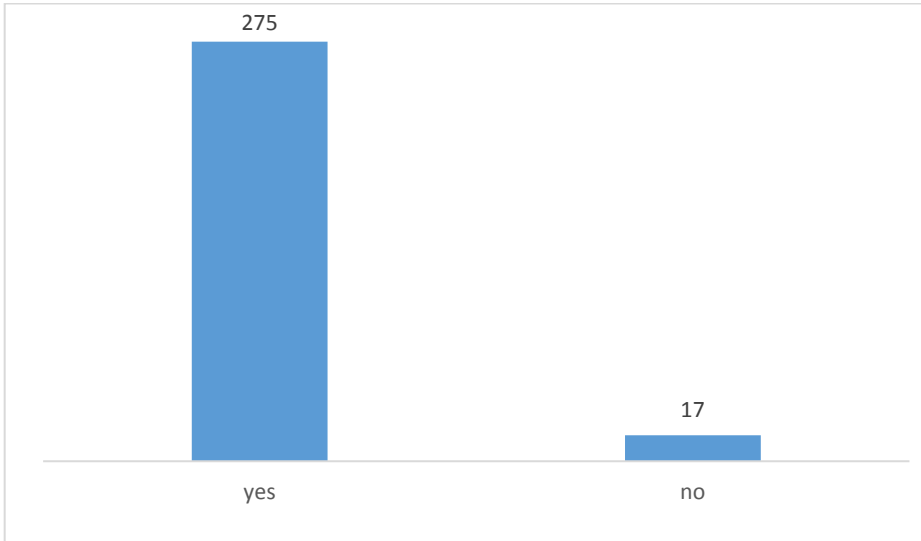


Figure 6. Knowledge of anti-doping rules

93.5% of coaches know the negative effects of substances use and agree with the sanctions that apply to athletes who test positive.

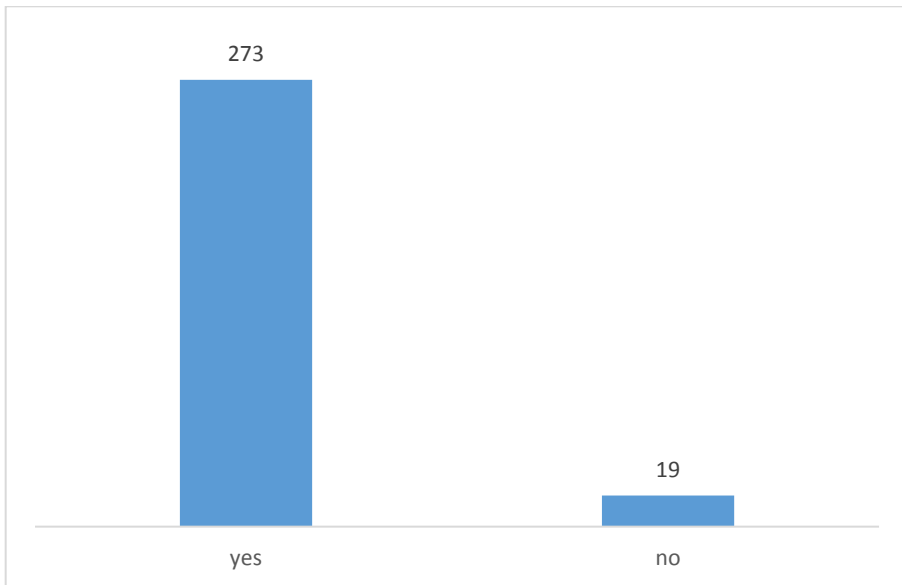


Figure 7. Knowledge of the prohibited substances effects over the body

There is a small difference, 40.3% to 59.7%, between coaches who know and those who do not know the conditions under which athletes can get therapeutic use exemptions.

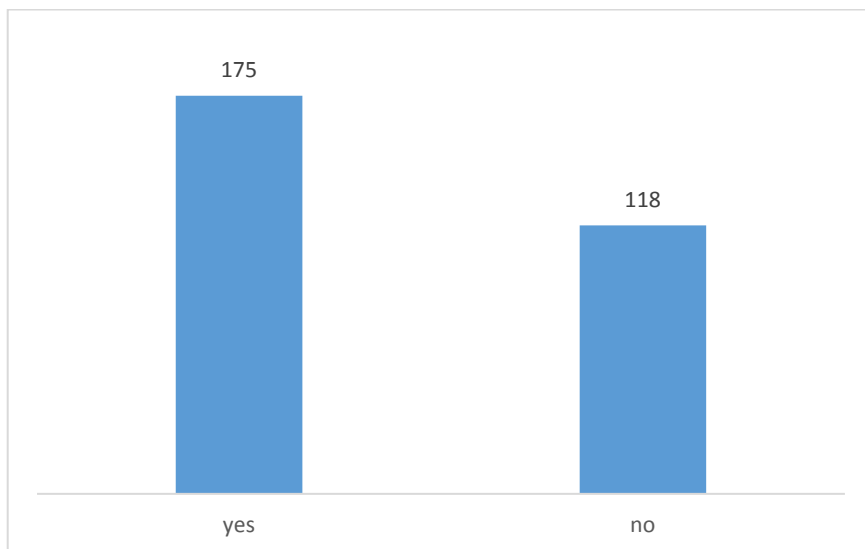


Figure 8. Knowledge of the conditions under which athletes can get therapeutic use exemptions

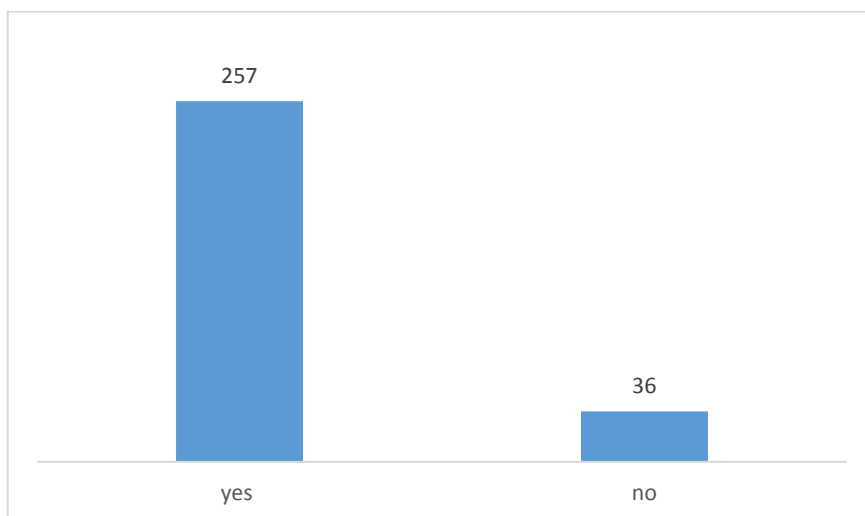


Figure 9. Transmission of information regarding the risks of using prohibited substances to athletes

Most coaches - 87.7%, provided athletes with information on the risks of using prohibited substances.

75.2% of coaches believe that everyone needs to be aware of the substances they use. There are, however, 11.9% of them who believe that athletes do not need to know what substances they use.

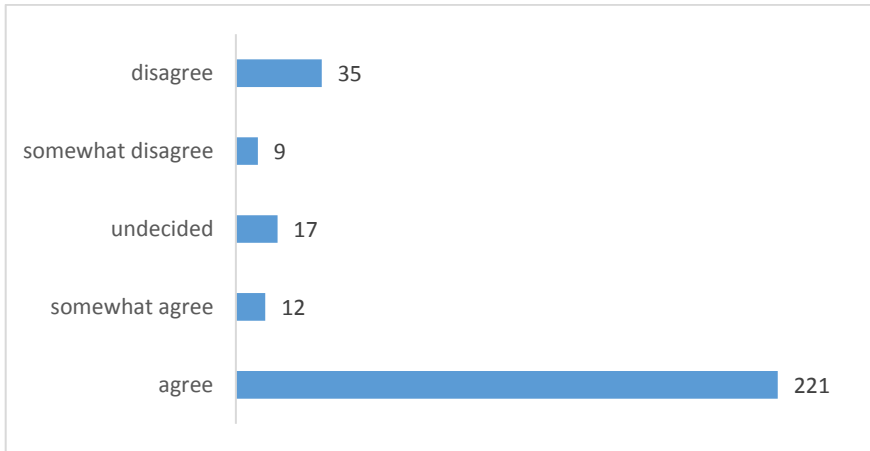


Figure 10. The coaches' opinion regarding the statement: everyone should be aware of the substances used to reach his/her goal

A large percentage - 84.4%, agree that if athletes are properly guided, it decreases the risk of being tempted to use prohibited substances.

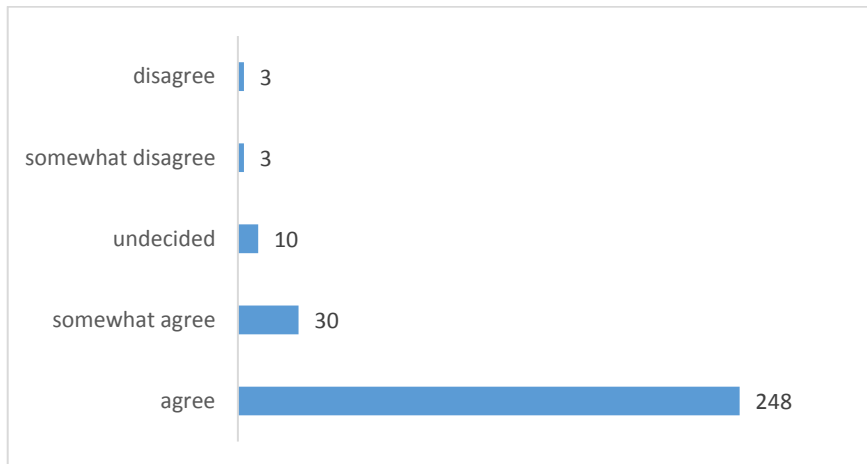


Figure 11. The coaches' opinion regarding the statement: If properly guided, the athletes won't be tempted to use prohibited substances

15% of the respondents believe that the disadvantages of using prohibited substances are exaggerated, 17.7% are undecided and 41.3% disagree. We believe that 15% is a high percentage in relation to this very important topic.

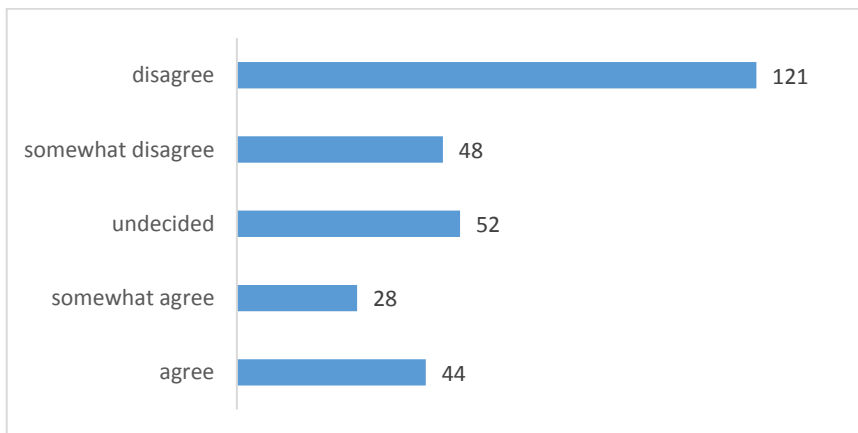


Figure 12. The coaches' opinion regarding the statement: the disadvantages of using prohibited substances are highly exaggerated

21.2% agree that schools/sports clubs are portrayed in a negative light if they pay attention to prohibited substances while 43% disagree. This percentage of 21.2% is high in relation to this assertion.

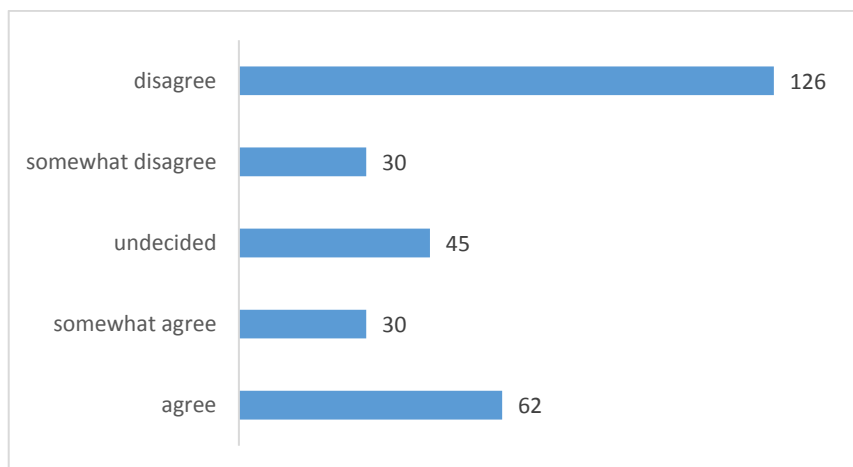


Figure 13. The coaches' opinion regarding the statement: sports clubs are portrayed in a negative light if they pay attention to the prohibited substances

For athletes: 350 junior athletes aged 10-30 years, the average age is 16-17 years.

Physical strength and health are among the most important reasons why athletes do professional sports, 63.6% and 59.5%, respectively.

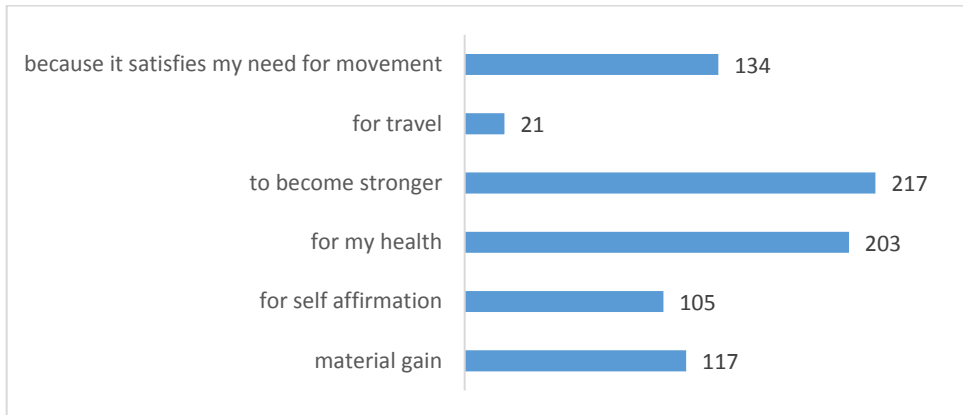


Figure 14. Reason for being professional athletes

Most of the athletes get their information from the internet and media, 65.1% and 53.1%, respectively, 46.3% from their coaches, 36.4% from physicians or other support personnel. Very few, 14.1%, take the information from educational actions.

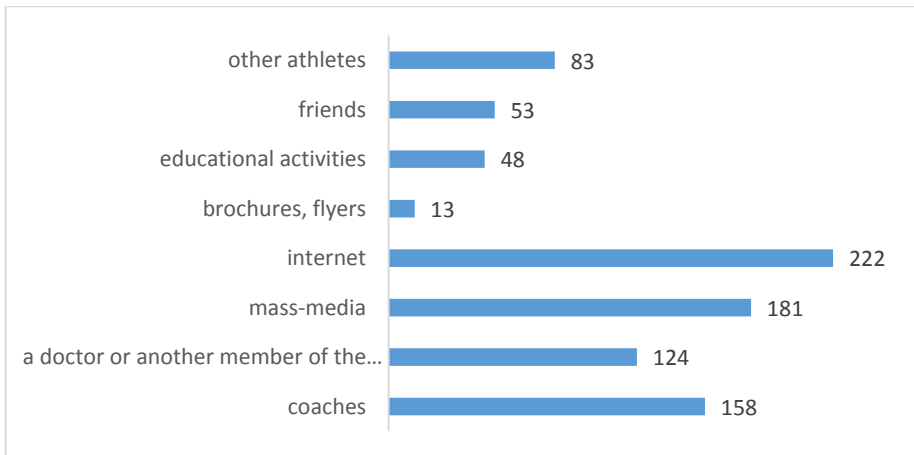


Figure 15. Source of information about doping for athletes

Considering that most of them - 63.6% do performance sports to have more strength, 59% believe that prohibited substances give even more strength, 39.8% that training will not be so exhausting and 30.4% that good performance will come faster.

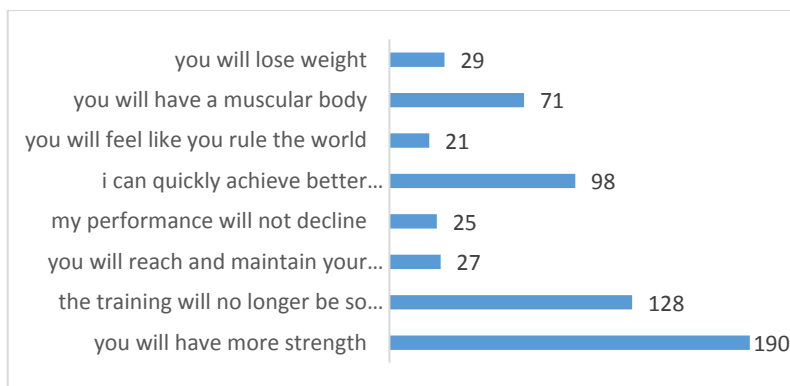


Figure 16. The athletes' opinion regarding the benefits of prohibited substances

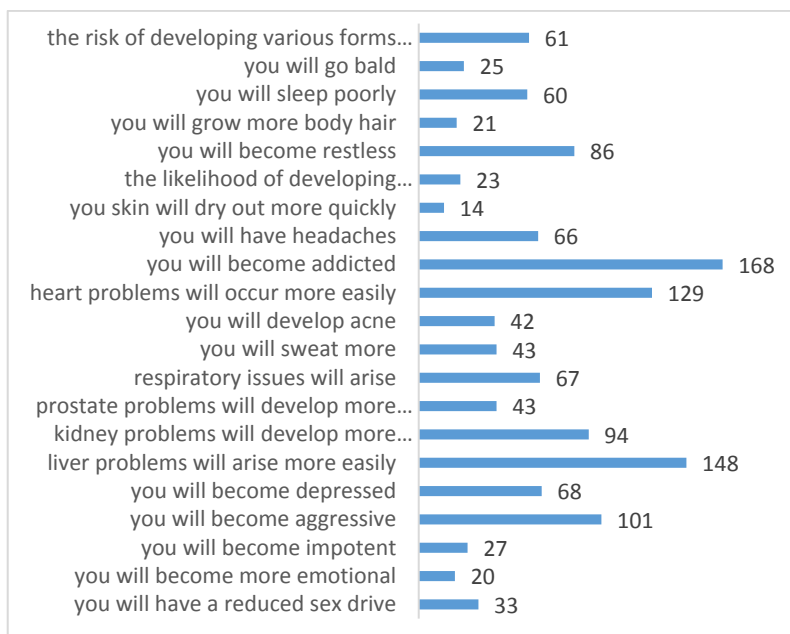


Figure 17. The athletes' opinion regarding the negative effects of prohibited substances

Addiction is the most important side effect (52.2%) of prohibited substances according to the group of respondents. Internal organs issues (liver 46%, heart 40.1%) and aggression (31.4%) are among the most important side effects.

How important it is:

Even though 63.6% of the respondents do professional sports to **have more strength** and **59% believe that prohibited substances give more strength, 26.3% still consider it not important at all the fact that if they use prohibited substances, they would have more force.**

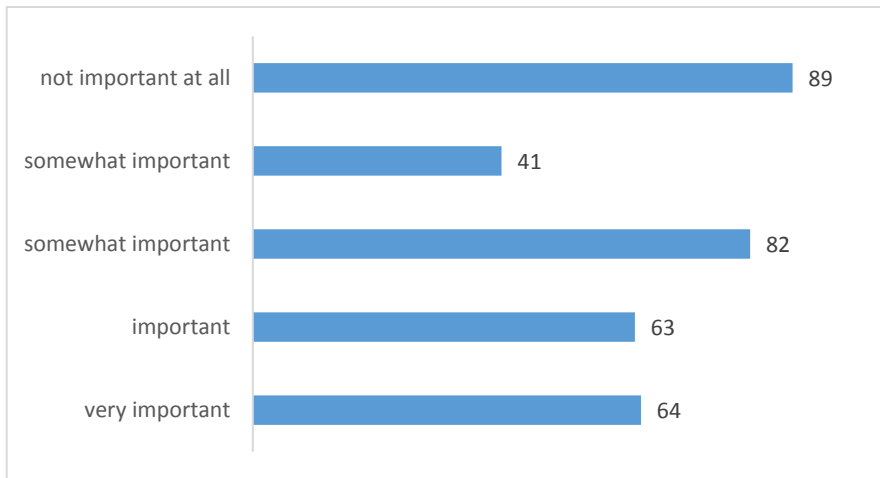


Figure 18. The athletes' opinion regarding the statement: if I use prohibited substances, I will have more strength

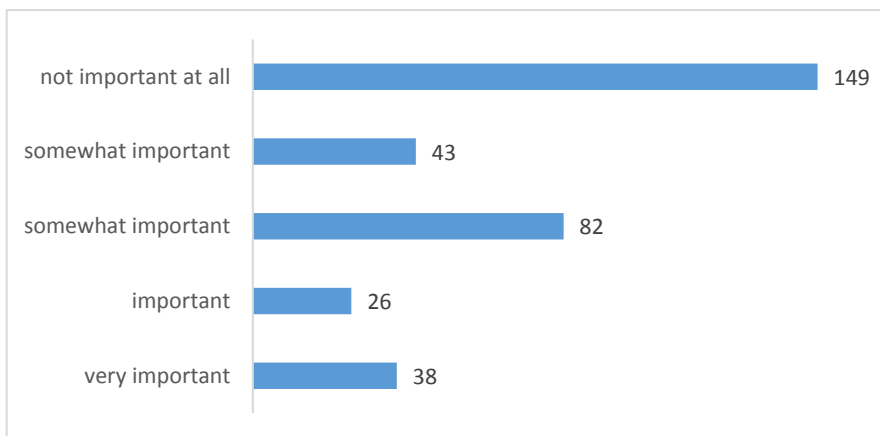


Figure 19. The athletes' opinion regarding the statement: if I use prohibited substances, training would be less tiring

Even if 39.8% believe that training would not be so tiring if they used prohibited substances, 44.1% **consider it not important at all** that if they used prohibited substances, **training would be less tiring**.

85.1% of respondents care about the coach's opinion.

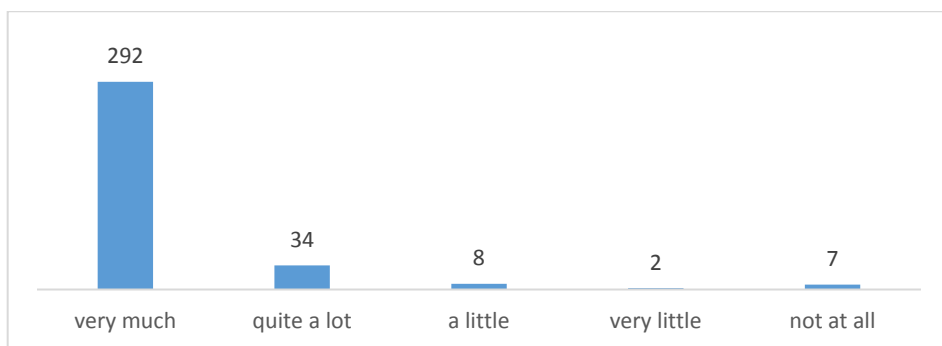


Figure 20. How much the athletes care about the coach's opinion

Very few, 33.2% of respondents, care about the opinion of their teammates.

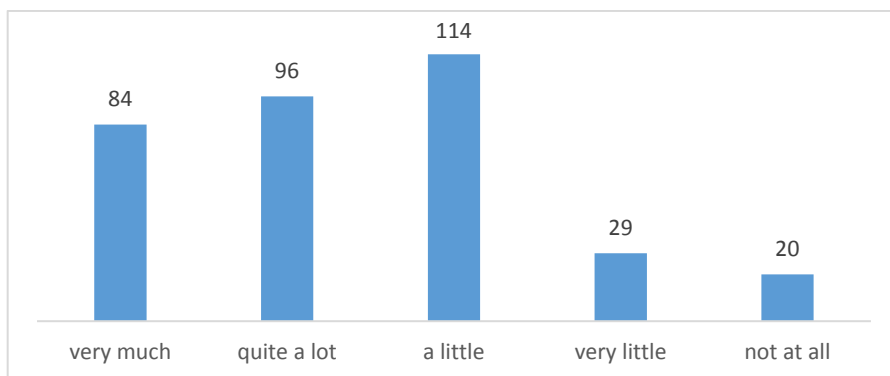


Figure 21. How much the athletes care about the teammates' opinion

Half of respondents, 51.6%, claim that the need for fame is the most important cause of doping. This is followed by insecurity – 49.3% and material gain – 38%.

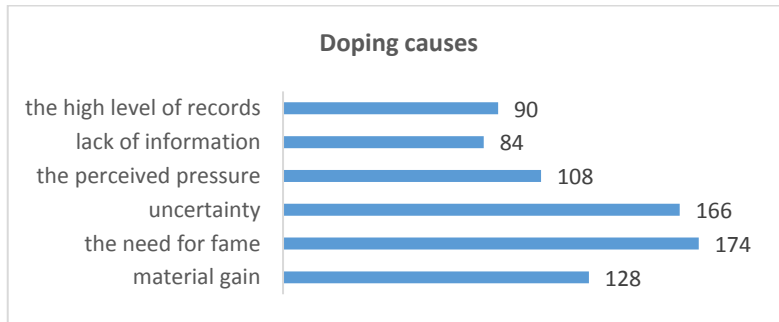


Figure 22. Doping causes

Even though 45.9% claim that the effect of doping equals its risk, it is significant that 42.6% do not know how to answer this question.

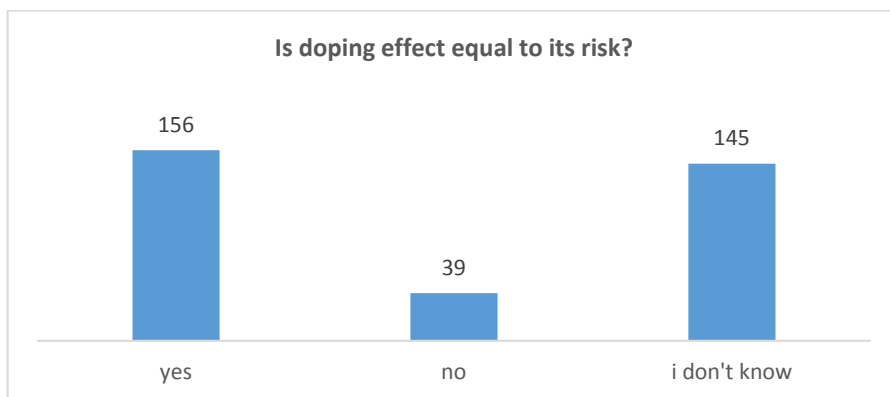


Figure 23. The athletes' opinion regarding the statement: is doping effect equal to its risk?

We designed our analysis based on 3 formative variables: Info, Coach, Impact.

The Info variable refers to the degree of coaches' information about legislation, side effects of prohibited substances, factors determining doping practice. This variable represents the aggregation of responses to questions 3 to 9 of the questionnaire (Table 2). We note that the most important elements regarding the degree of coaches' information about this phenomenon are the concrete cases faced by coaches involving athletes who violated the anti-doping

rules (athletes who violated the regulations -LF=0.61), taking responsibility for athletes' education on side effects, norms, therapeutic use exemptions, sanctions (Education-LF=0.453) and knowledge of sanctions for violation of the applicable legislation (LF=407). Coaches believe that factors influencing the consumption of prohibited substances are euphoria due to sports results, faster performance, pressure for best physical shape to obtain top performances, lack of information, entourage, psychological factors, unknown persons, others. Education must be done by specialized persons (e.g. those from ANAD), coach, teachers, pedagogue, physician, sports federation, sports clubs, parents, psychologist, entourage, mass-media, ministry of sports.

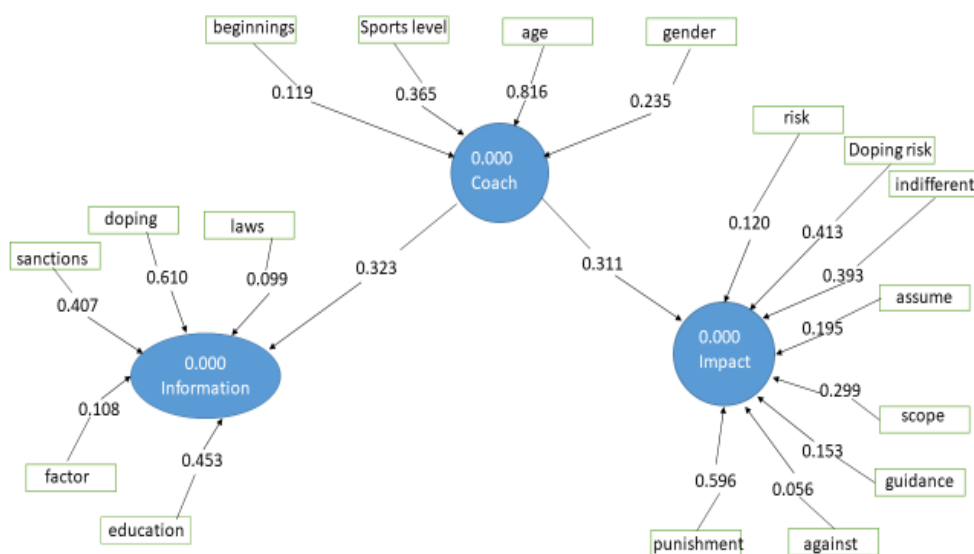


Figure 24. Path Analysis

The Coach variable refers to the characteristics of coaches. This variable represents the aggregation of responses to demographic questions (gender, age, category of trained athlete and seniority) in the questionnaire (Table 2). It is observed that age (load factor = LF = LF = 0.816) and type of trained athlete (cadet... senior) are the defining characteristics of the referees with the greatest impact on the model.

Table 2. Variables analyzed in the model

Variable	Details	LF
Coach	Gender	0.235
	Age	0.816
	The year you started coaching	0.119
	Trained:	0.365
Info	3. Are you aware of the legislation on the use of prohibited substances?	0.099
	5. Have you had athletes who have been declared to have violated anti-doping rules?	0.61
	6. Do you think the sanctions for athletes are fair?	0.407
	8. What factors in the athlete's environment do you think encourage him/her to use prohibited substances?	0.108
	9. Who do you think should educate athletes about doping? List - in order of importance	0.453
Impact	10. You have provided your athlete with information on the risks of using prohibited substances?	0.12
	11. How high do you suspect the possibility is that your athletes will use prohibited substances without your knowledge?	0.413
	12. I don't care how an athlete achieves his/her goal, as long as he/she achieves it.	0.393
	13. Everyone must be aware of the substances he/she uses to achieve his goal.	0.195
	14. When an athlete wants to achieve his/her goal, he must do so without using performance enhancers.	0.299
	With good professional guidance, athletes will no longer be tempted to use prohibited substances.	0.153
	15. I am against the use of prohibited substances.	0.056
	21. If an athlete in your group consumed prohibited substances and it was not detected, you would sanction him:	0.596

The Impact variable sums questions about coaches' opinion on the impact doping has on athletes. This variable represents the aggregation of responses to demographic questions (gender, age, category of trained athlete and seniority) in the questionnaire (Table 1). The items with a high impact load are Sanction 21 - LF=0.596, Doping11-LF=0.413, Regardless12 - LF=0.393, Goal14 LF=0.299. Thus, we can say that due to experience and the level of information, coaches would drastically sanction the athletes they train if they consumed prohibited substances, that they are not indifferent to this phenomenon. They believe that an athlete who wants to achieve his/her goal must do so without the use of performance enhancers.

The other questions were excluded from the template due to lack of representativeness.

There are positive but weak correlations between Coach and Info (R=323), Coach and Impact (R=311), Info and Impact (R=295). It shows that experienced coaches are better informed and have objective views on the impact of doping in sport. Also, collaterally, it is noticed that a higher level of information implies a more accurate assessment of the impact of this phenomenon.

To check if the model is consistent, we calculate Composite Reliability (>0.6), Cronbach Alpha and rho A (> 0.7- permissible bottom value) and AVE (>0.5). In our analysis we used only formative variables, so the model will only calculate rho A that is higher than the minimum accepted threshold (0.7), so our model is valid.

Next, we analyse whether the variables differ significantly from each other. Because the values of the Fornell-Larcker criterion are small (<0.7), we can say that the Coach variable differs significantly from the Impact and Info variables. They measure different elements/phenomena: the characteristics of the coach, his/her level of information and his/her opinion on the impact of doping in sport.

The inflation variation factor (VIF) of each build was calculated using 5000 samples and a 95% bootstrapping procedure to verify the significance of the variables. Diagrams 4 provide an overview of the findings. The P-values of this test are less than 0.01. Thus, we can declare that the global VIF does not exhibit multicollinearity between variables. All values less than 5 express the lack of collinearity and values less than 3, non-existent collinearity

Overall, our model is consistent and matched, as demonstrated by Chi-square values (The estimated value of our model - 260 is greater than the saturated, minimum acceptable value of model, 146), and the SRMR values are <0.7

In our analysis we started from the hypothesis *H1. People in the athlete's entourage who are against the use of prohibited substances or methods influence the causes for which some athletes resort to doping.*

To verify this hypothesis, we analysed 2 variables: Causes (formative variable) and Imp Persons (reflexive variable).

The load factors (LF) of the variable Imp Persons show that the person with decisive influence, who prevented the athlete from doping was the coach, but also the team physician, teammates, friends from private life and team, parents are against this behaviour. This means that institutions authorized to fight against doping must first inform and educate coaches and then the entourage.

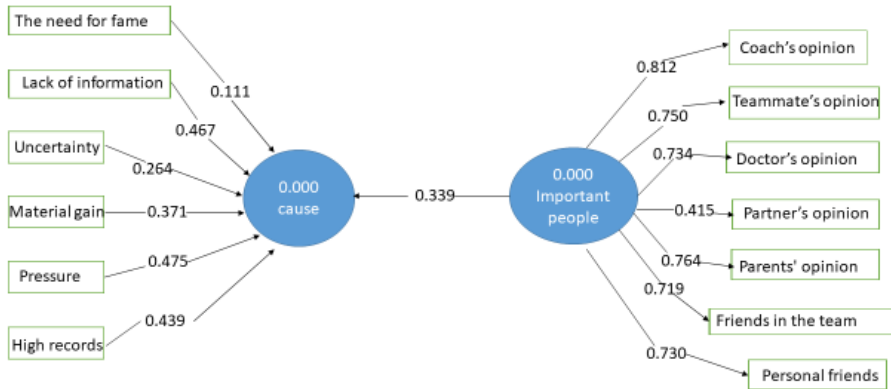


Figure 25. Path Analysis

The load factors (LF) of the Causes variable show that lack of information about doping, pressure felt and high levels of records in competitions, as well as the fact that athletes can quickly perform better are the main factors that lead them to resort to doping.

Table 3 shows the correlation between variables. There is a positive but weak correlation between the 2 variables People and Causes ($R=0.323$). It shows that people with great influence on athletes (especially coaches, parents and teammates) can support the athlete in adopting a correct behaviour, namely not to consume prohibited substances, even if the pressure of competitions and the high level of records is very high.

Table 3. Correlation between variables

Latent variable Correlations		
	Cause	Important people
Cause	1.00	0.34
Important people	0.34	1.00

To check if the model is consistent, calculate Composite Reliability=CR (>0.7), Cronbach Alpha=CA and rho_A (> 0.7 - bottom authorized value) and AVE (>0.5). In our analysis we used a formative variable -Causes, so the model will only calculate rho_A that is higher than the minimum accepted threshold

(0.7). For the reflective variable Persons Imp conditions are also met: CR, CA, $\rho_A > 0.7$ and $AVE > 0.5$. We note that the $CA=0.69$ value is very close to the 0.7 threshold. We consider that it meets the condition because there are authors who accept a minimum threshold of 0.6, which means that the items that form this variable are representative, with impact, but still different from each other. The CR and AVR values demonstrate that our model is valid (Table 4). The path coefficient (0.339) measures the size of the effect.

Table 4. Model consistency

Construct Reliability and Validity				
	Cronbach's Alpha	ρ_A	Composite Reliability	Average Variance Extracted (AVE)
Cause		1.00		
Important people	0.69	0.68	0.83	0.51

Next, we analysed whether the variables differ significantly from each other. Because the values of the Fornell-Larcker criterion are close to the maximum acceptable threshold (<0.7), we can say that the variables differ significantly from each other. They measure different elements/phenomena.

The inflation variation factor (VIF) of each build was calculated using 5000 samples and a 95% bootstrapping procedure to verify the significance of the variables. The figures present an overview of the findings. The P-values of this test are less than 0.01. Thus, we can declare that the global VIF does not exhibit multicollinearity between variables. All values less than 5 express the lack of collinearity and the values less than 3, non-existent collinearity.

Overall, our model is consistent and matched, as demonstrated by Chi-square values (Estimated value of our model equals saturated, minimum acceptable value of model 843), and SRMR values are <0.7

The second statistical hypothesis is H2. *The type of sport, gender, age and context influence doping in sport.*

To verify this hypothesis, we analysed 3 variables: Demographic, Context (formative variables) and Doping (reflective variable).

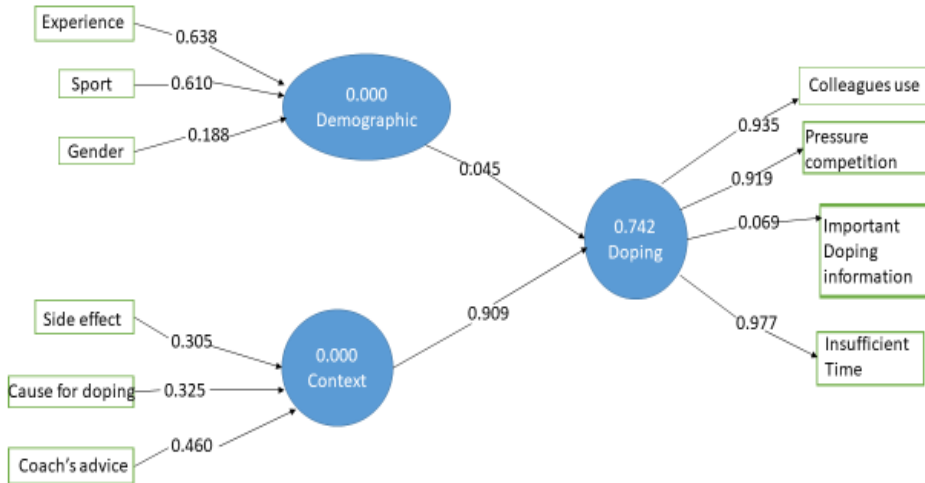


Figure 26. Path Analysis

The load factors (LF) of the Demographic variable show that the factor with decisive influence in the doping phenomenon is the type of sport and age (certain sports are prone – bodybuilding, age – uninformed young people, who come from disadvantaged environments, do not know how to read). Gender matters very little, but this phenomenon is mostly found in boys.

The load factors (LF) of the Context variable show that coach advice, competition pressure, and substance addiction are what cause the athlete not to give up.

The load factors (LF) of the Doping variable show that athletes turn to doping under peer pressure, lack of time required for training, and due to competition pressure.

Table 2 shows the correlation between variables. There is a positive and very strong correlation between the 2 variables Doping and Context ($R=0.92$). It shows that in most cases context determines doping.

To check if the model is consistent, we calculate Composite Reliability=CR (>0.7), Cronbach Alpha=CA and rho A (> 0.7 - the bottom authorized value) and AVE (>0.5). In our analysis we used a formative variable, Demographic and Context, so the model will only calculate rho A that is higher than the minimum accepted threshold (0.7). For the reflective variable Doping conditions are also met: CR, CA, rho A >0.7 and AVE >0.5 . These values demonstrate that our model is valid (Table 5).

Table 5. Model consistency

Construct Reliability and Validity				
Matrix	Cronbach's Alpha		rho_A	Composite
	Cronbach...	rho_A	Composi....	Average...
Context		1.00		
Demographic		1.00		
Doping	0.74	0.96	0.85	0.67

Further, we analysed whether the variables differ significantly from each other. The values of the Fornell-Larcker criterion are higher than the maximum acceptable threshold (<0.7) for the context and doping variables, so in this case the 2 variables do not differ significantly from each other. They do not measure elements/phenomena differently.

The inflation variation factor (VIF) of each build was calculated using 5000 samples and a 95% bootstrapping procedure to verify the significance of the variables. The diagrams present an overview of the findings. The P-values of this test are less than 0.01. Thus, we can declare that the global VIF does not exhibit multicollinearity between variables. All values lower than 5 express the lack of collinearity, and values lower than 3, non-existent collinearity.

The pathway coefficient for Context-Doping is very high (0.909) and is statistically significant (p value<0.05), so it is valid for the entire statistical population.

The pathway coefficient for Demographics-Doping is very low and therefore not statistically significant (p value 0.15), so it is valid only for our data source, not for the entire statistical population.

Overall, our model is consistent and matched, as demonstrated by Chi-square values (The estimated value of our model equals the saturated, minimum acceptable value of model 36), and SRMR values are <0.7

CONCLUSIONS

What is the attitude of coaches towards doping substance use?

The most important elements regarding the level of coaches' information on doping are the concrete cases faced by coaches involving athletes who violated anti-doping rules, taking responsibility for athletes' education regarding adverse effects, anti-doping rules, therapeutic use exemptions and knowledge of sanctions for violations of the applicable legislation.

Coaches believe that factors influencing the consumption of prohibited substances are euphoria due to sports results, faster performance, pressure for best physical shape in order to obtain top performances, lack of information, entourage, psychological factors, unknown persons, others.

Due to their experience and level of information, coaches would drastically sanction the athletes they train if they consumed prohibited substances, because they are not indifferent to this phenomenon. They believe that an athlete who wants to achieve his/her goal must do so without the use of performance enhancers.

Experienced coaches are better informed and have objective opinions on the impact of doping in sport. Better information also implies a more accurate assessment of the impact of this phenomenon.

What are the main factors considered responsible for athletes' anti-doping education?

Education must be done by specialized persons (e.g. those from ANAD) then by the coach, teachers, pedagogue, physician, sports federation, sports clubs, parents, psychologist, entourage, media, ministry of sports. The category of athletes he/she trains (cadet... senior) is a defining characteristic with the greatest impact on coaches.

H1. People in the athlete's entourage who are against the use of prohibited substances or methods influence the causes for which some athletes resort to doping.

Institutions authorized to combat doping must first inform and educate coaches and then the entourage.

The lack of information about doping, the pressure felt and the high level of records in competitions, as well as the fact that athletes can quickly achieve better performances are the main factors that lead them to resort to doping.

People with great influence on athletes (especially coaches, parents and teammates) can support the athlete in adopting a correct behaviour, namely not to consume prohibited substances, even if the pressure of competitions and the high level of records is very high.

H2. The type of sport, gender, age and context influence doping in sport.

Gender matters very little, but still, doping is mostly found in men. The coach's advice, competition pressure, and substance addiction are what cause the athlete to use doping. Athletes resort to doping under peer pressure, lack of time required for training and due to competition pressure. The social environment has a decisive influence on the decision regarding the use of doping substances.

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ANALYSIS OF THE PEAKS IN THE BUCEGI MOUNTAINS WITH RELEVANCE FOR SPORTS TOURISM ACTIVITIES

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ABSTRACT. Mountain peaks are geographical landmarks that arouse the interest of tourists practicing mountain tourism activities. Summiting a peak is an important reason, both for the views it offers over the landscape and for the personal satisfaction of reaching that point, which requires fitness and will. In addition to the recreational approach, the peaks can also be analyzed from a geo-morphometric point of view, concerning their shape, altitude, and prominence, aspects that matter in sports tourism activities. In this context, the present work aims to analyze the peaks of the Bucegi Mountains and establish their prominence. It is also aimed at the practical side of the problem, materialized through the methodological approach included in the research.

Keywords: *outdoor sport activities, mountain tourism, topographical prominence, key-saddle, parent-peak, sub-peak, lineage, orometric dominance, suspended syncline*

REZUMAT. Vârfurile munților sunt repere geografice care stârnesc interesul turiștilor care practică activități de turism montan. Adjudecarea unui vârf reprezintă un motiv important, atât pentru perspectivele oferite asupra peisajului, cât și pentru satisfacția personală de a fi atins acel punct, care necesită condiție fizică și voință. Pe lângă abordarea agrementală, vârfurile pot fi analizate și din punct de vedere geomorfometric, cu referire la forma, altitudinea și proeminența acestora, aspecte care contează în activitățile de turism sportiv. În acest context, lucrarea de față își propune să analizeze vârfurile din Munții Bucegi și să stabilească proeminența acestora. De asemenea, este vizată și latură practică a problemei, materializată prin demersul metodologic inclus în cercetare.

Cuvinte-cheie: *activități sportive în aer liber, turism montan, proeminență montană, înșeuare-cheie, vârf-părinte, sub-vârfuri, descendență genetică, dominanță orometrică, sinclinal suspendat*

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INTRODUCTION

Peaks, as geomorphological entities, can be defined from two perspectives:
 1) as a position within a morpho-geographical system: the peaks represent geomorphological structures located at the terminal upper part of a mountain, a point called the top of the mountain (Fig. 1).

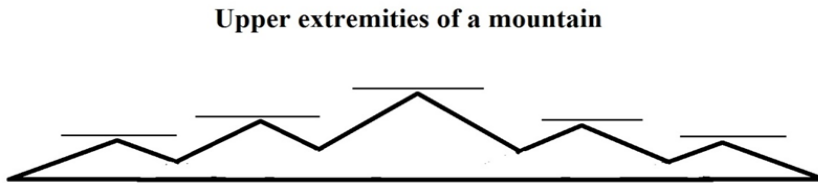


Figure 1. The position of peaks within a mountain ridge

2) as geomorphology: the peaks represent prominences located in the plane of the peaks (rises), defined by morpho graphic elements (base, shape, flanks, upper extremity) and specific morphometric elements (altitude, inclination, and length of the flanks, the difference in level between the base and the upper extremity) (Fig. 2).

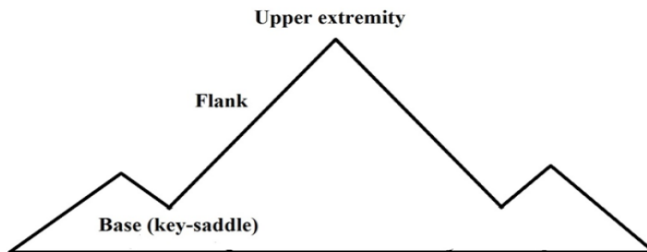


Figure 2. The morphological elements of a peak

These geomorphological structures appeared in the process of modeling mountain spaces, several factors contributing to their detachment, such as petrography (rock type), structural heritage (the presentation of geological bodies), hydro-atmospheric factors (precipitation, thermic variations, winds, ice), biogeographic factors (action of vegetation, organisms), and anthropic factors (man and his activities).

Certain genetic (age), altimetric (height), and spatial (distance between peaks) relationships are established between the peaks located on a mountain peak. These ratios are very important in determining the prominence because the peaks differ from each other in rank.

The highest peaks are considered parent-peaks, and the peaks located below their altitude represent sub-peaks, of rank I, II, III, etc. In this context, lower rank peaks are subordinated to higher rank peaks, and their prominence is established by them (fig. 3). Finally, all sub-peaks are subordinated to the parent-peak, in a so-called lineage.

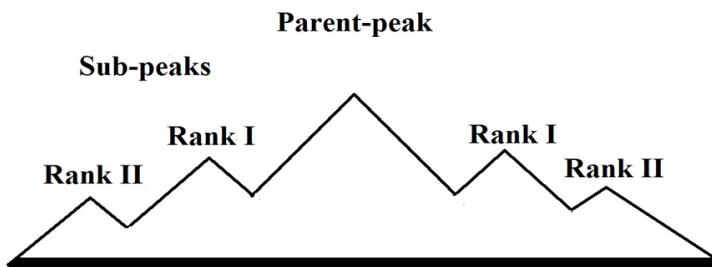


Figure 3. The ranks of the mountain peaks

The topographic prominence (rise) can be defined as the difference in level between the base of the peak, called the key-saddle, and its upper extremity (top).

Concerns regarding the establishment of topographic prominence, began in Great Britain at the end of the 19th century, when attempts were made to establish geomorphological structures with "mountain" status in England, Wales and Ireland (Munro, 1891; Donald, 1935; Nuttall & Nuttall (1989, 1990); Dawson, 1992; Graham, 1992; Dewey, 1995; Dawson, 1997a; Dawson, 1997b; Munro & Bearhop, 1997).

For this, the height of the structures and the minimum protrusion of the peaks were taken into account. Thus, structures that had altitudes above 600 m and minimum prominence above 15 m (30, 55, 150 m) were considered mountains. In 1991, Richard Goedeke, sets the minimum prominence of a peak of importance for mountaineering, at 30 m, as long as the classical rope length for mountaineering, a value also adopted by the UIAA, in 1994.

In the USA, the minimum value of the prominence of an important peak is 91 m. For the Alps, the works of Höhne (1993) Grimm and Mattmüller (2004), Helman (2005) and Goedeke (2006) can be mentioned. At a general and methodological level, the works of Schmidt (2018) and Stubbemann et al. (2019) stand out.

The value of topographic prominence is relevant in mountain recreational activities because peaks represent targets that must be climbed for several reasons:

- they are the highest surfaces of the mountain, which attract attention and interest;
- offers viewpoints over the surrounding regions;
- involves special physical and mental demands to be achieved;
- constitute targets with competitive sports connotations.

Because of this, the altitude and prominence of the peaks, along with the aesthetic component, induced by the shape (conical, pyramidal, dome) and the detailed relief of the flanks (slopes, steps, steepes, ravines, ridges, glacial cirques, debris fields, etc.) are the most important reasons for approaching the peaks and practicing mountain recreational activities (Bîca, 2019, 2021).

METHODOLOGY

For the realization of the present work, the following methodological stages were completed:

- consultation of specialized literature regarding the approach to peaks and topographic prominence (Munro, 1891; Donald, 1935; Nuttall&Nuttall, 1989, 1990); Dawson, 1992; Graham, 1992; Höhne, 1993; Dewey, 1995; Dawson, 1997a; Dawson, 1997b; Munro, Bearhop, 1997); Grimm&Mattmüller, 2004; Helman, 2005; Goedeke, 2006, Schmidt, 2018; Stubbemann et al., 2019; Bîca, 2019, 2021);
- consulting some works related to the Bucegi Mountains (Oncescu, 1965; Mihăilescu, 1969; Coteț, 1973; Săndulescu, 1984; Geografia României, 1984; Harta Geologică a României, 1967; Harta Topografică a României, 1980; Bucegi-Harta Turistică, 1995);
- carrying out field observations in the Bucegi Mountains area.

Study area

The Bucegi Mountains are located in the Southern Carpathians, between the Prahova Valley to the east, the Bran Corridor to the northwest, and the Brăteiuului Valley to the southwest (fig. 4). From a tectonic-structural point of view, Bucegi Mountains represents a suspended syncline, with a horst aspect, which dominates the surrounding regions through steep tectonic steepes, which make it spectacular and picturesque.

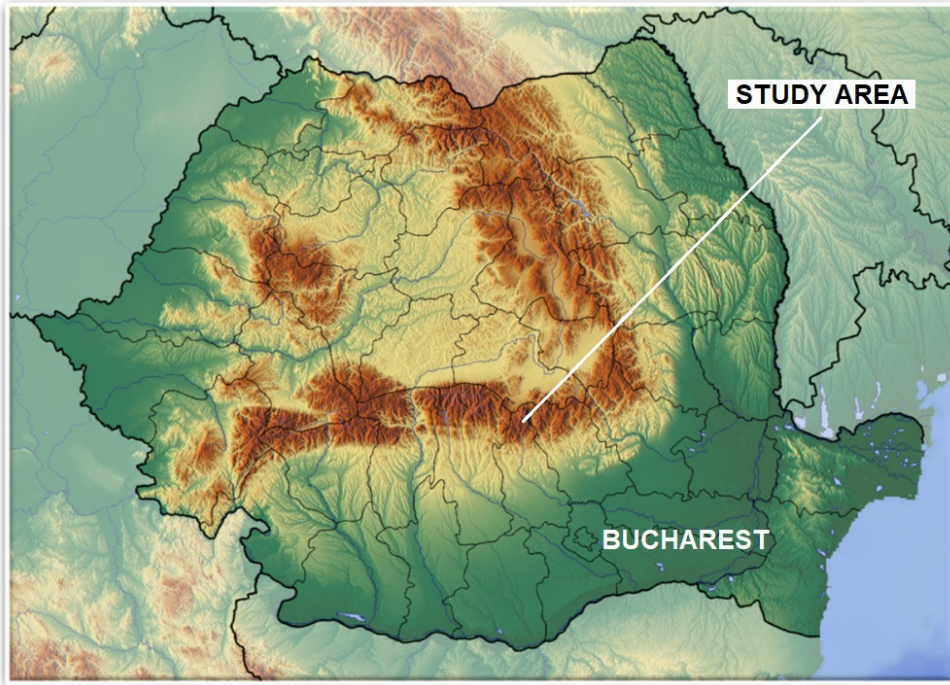


Figure 4. The geographic position of Bucegi Mountains within Romanian Carpathians (source: Harta României Grafică 3D Online-with changes)

The composition of this mountain unit includes Jurassic limestones, Bucegi conglomerates, and sandstones, rocks that have generated relief forms of great aesthetic value, a fact that attracts many visitors.

From a geomorphological perspective, the horst of the Bucegi Mountains is composed of two distinct subunits:

a) The basin of the suspended syncline, located at altitudes of 1500-2400 m, oriented and inclined from north to south, within which two subunits are distinguished:

- 1) Bucegi Plateau, drained by the Izvorul Dorului stream;
- 2) The upper valley of Ialomita;

b) The flanks of the syncline, characterized by vigorous steeps, within which there is a spectacularly detailed relief, made up of storied cuestas fronts, steep valleys, glacial valleys, ridges, ravines, structural steps, shelves, etc. (Fig. 5).

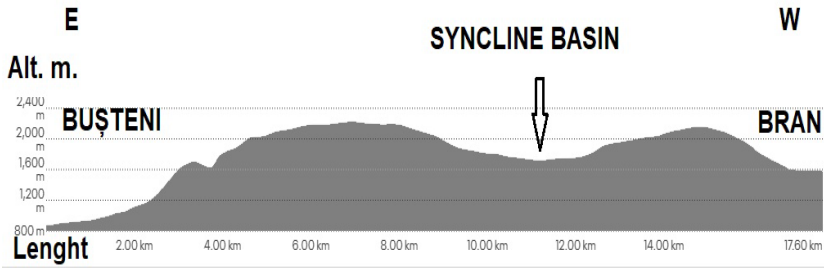


Figure 5. Geomorphological profile through the horst of the Bucegi Mountains (source: www.mapmyhike.com-with changes)

The Oro-hydrographic pattern of the suspended syncline basin is represented by:

- the external peaks, superimposed on the frame of the syncline, open to the south in the shape of a horseshoe, marked by the highest peaks;
- the valleys of Ialomița and Izvorul Dorului, separated from the peak of Cocora-Nucet;
- secondary ridges, plateaus, and erosive-structural bridges that converge towards the Ialomița Valley and the Izvorul Dorului Valley (fig. 6).

The oro-hydrographic system of the flanks of the suspended syncline consists of ridges that separate the tributary valleys of the Prahova River, to the east, the Râșnoava River, to the north, the Bârsa River, to the northeast, and the Ialomița River, to the southwest.

RESULTS AND DISCUSSION

Peak genesis and distribution

The factors that contributed to the formation of the peaks of the Bucegi Mountains are:

- the rocks, represented by conglomerates and sandstones, whose hardness and composition imposed the differential erosion, and determined the shape of the peaks;
- suspended syncline structure, a fact that determined the modeling of the main peaks on the edge of the ridges that form the frame of the syncline basin;
- subaerial erosion, which acted differently, depending on the hardness of the rocks, on the flanks, and the trough of the suspended syncline.

Therefore, depending on their position within the suspended syncline, the following categories of erosive-structural peaks are distinguished:

2) Peaks modeled inside the suspended syncline, on the edge of the internal cuesta, which separates the Izvorul Dorului Valley from the Ialomița Valley, oriented with the front towards the Izvorul Dorului Valley: Baba Mare, Cocora, Lăptici, Blana, Nucet (fig. 9);

3) Peaks modeled on the outside of the suspended syncline, on the edge of the suspended syncline: Bucșoiu, Scara, Lancia, Omu și Bucura Dumbravă.

From an altimetric perspective, the peaks of the Bucegi Mountains decrease in altitude from north to south, by the sinking of the suspended syncline in the same direction.

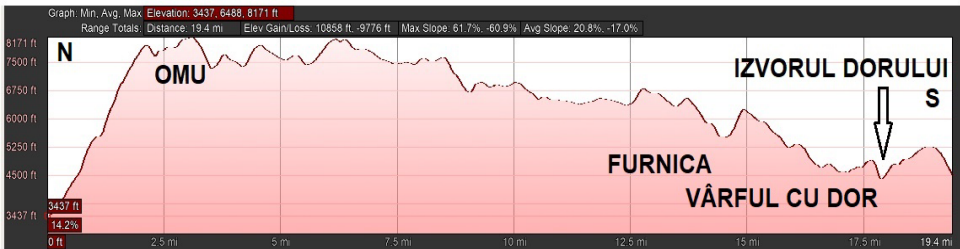


Figure 7. The peaks from eastern ridge of the Bucegi Mountains (source: Google Earth-with changes)

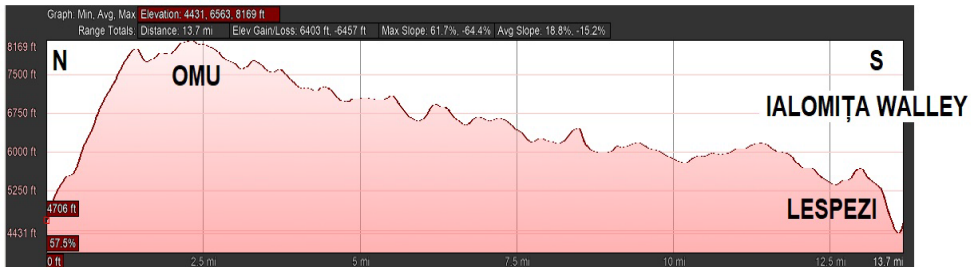


Figure 8. The peaks from western ridge of the Bucegi Mountains (source: Google Earth-with changes)



Figure 9. The peaks from internal ridge of the Bucegi Mountains (source: Google Earth-with changes)

The shape of the peaks

Depending on the behavior of the rocks during erosion and the structure, the main peaks of the Bucegi Mountains, on the eastern summit and the western summit, have an asymmetrical shape, having a steep external flank, which coincides with the tectonic steeps facing the Prahova valley, the Bran corridor and the valley Brăteiuului, and a gentler internal flank, represented by structural bridges that go down to the valley of Izvorul Dorului and the valley of Ialomița. Also, the peaks on the internal ridge have an asymmetric profile, because they are modelled on the monoclinical structure inside the syncline (e.g. Obârșia, Nucet, etc.). In some cases, their upper part (top) presents a detailed rocky relief (Omu, Bucșoiu, Baba Mare, Lancia, Tătaru, Strungile Mari, Strungile Mici, Colții Țapului, Nucet, etc.).

From a geometrical point of view, according to the profile and detailed relief, several categories of peaks have been defined, as follows:

- sharp peaks: Bucșoiu, Colții Obârșiei, Obârșia, Baba Mare, Lancia, Furnica, Vârful cu Dor, Vânturiș, Strungile Mari, Strungile Mici;
- beveled peaks: Omu, Coștila, Doamnele, Scara, Batrâna, Guțanu, Tătaru, Lucăcilă, Jepii Mici, Jepii Mari, Piatra Arsă, Blana, Nucet;
- rounded tops: Cocora, Deleanu, Lăptici;
- narrow and elongated tips: Bucura Dumbrăva.

The rank of the peaks and subordination relations between them

The following elements were taken into account in establishing the rank of the peaks: the elevation, prominence, and position of the peak relative to the other peaks on the ridge on which it is located. Therefore, we have the following situation:

- a) parent-peak: Omu (2507 m);
- b) first rank peaks: peaks over 2400 m (Bucura Dumbravă, Bucșoiu, Coștila, Colții Obârșiei);
- c) rank II peaks: Scala (2422 m), Obârșia (2405 m), Doamnele (2402 m);
- d) rank III peaks: Baba Mare (2292 m), Lancia (2288 m), Cocora (2191 m), Guțanu (2246 m);
- e) rank IV peaks: Batrâna (2181 m), Colții Țapului (2168 m), Jepii Mici (2143 m), Furnica (2103 m), Jepii Mari (2071 m);
- f) rank V peaks: Strungile Mari, Tătaru, Deleanu, Piatra Arsă, Vârful cu Dor;
- g) rank VI peaks: Lucăcila;
- h) rank VII peaks: Lespezi, Dichiu.

Topographic prominence and orometric dominance of peaks

Based on the topographical map of Romania, scale 1:25 000, the altitude of the peaks and key saddles was extracted, after which the graph of the peaks was drawn up, and the ratios between them were established. The peak graph represents the altimetric sequence of the peaks within a ridge, to analyze the genetic and altimetric relationships between them, as well as to establish the rank for each peak, and the subordination relationships between the peaks.

This graph was developed with the help of the Excell program, in which the elevations of the peaks and the associated key saddles were entered (Figure 10, 11, 12). Based on the key-saddles, the prominence of each peak was calculated using the formula: $P_p = P_a - A_{ks}$, where P_p =peak prominence, P_a =peak altitude, and A_{ks} =altitude of the key-saddle (table 1, 2, 3).

Finally, the orographic dominance of each peak was established, based on the formula $O_d = P_p / P_a \times 100$, where O_d =orometric dominance, P_p =peak prominence, and P_a =peak altitude. The orometric dominance shows us the importance of the respective peak in the orographic system of the Bucegi Mountains and within the main peaks.

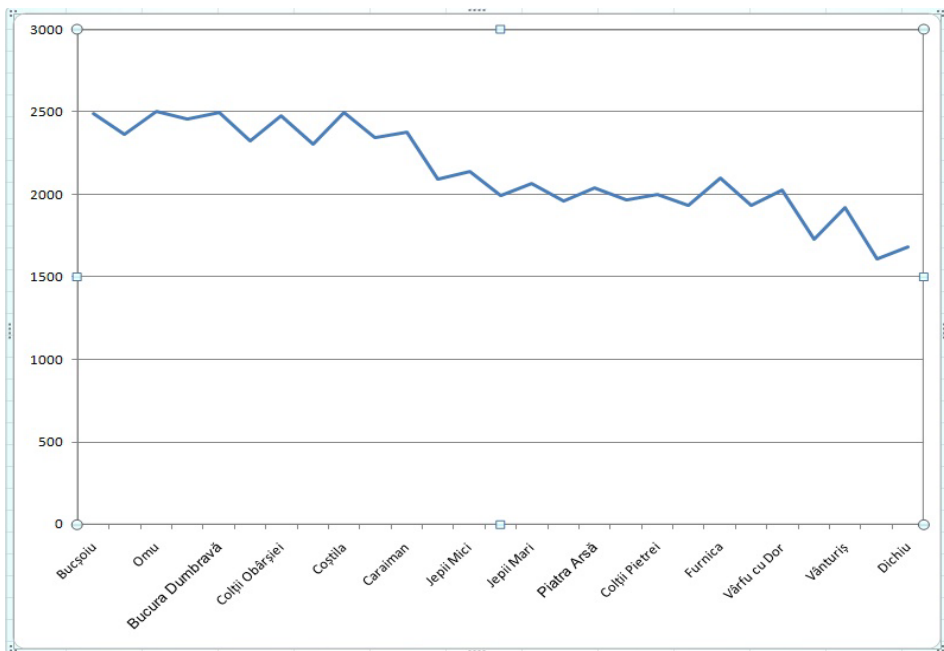


Figure 10. The graphic of the peaks from Eastern Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

ANALYSIS OF THE PEAKS IN THE BUCEGI MOUNTAINS WITH RELEVANCE FOR SPORTS TOURISM ACTIVITIES

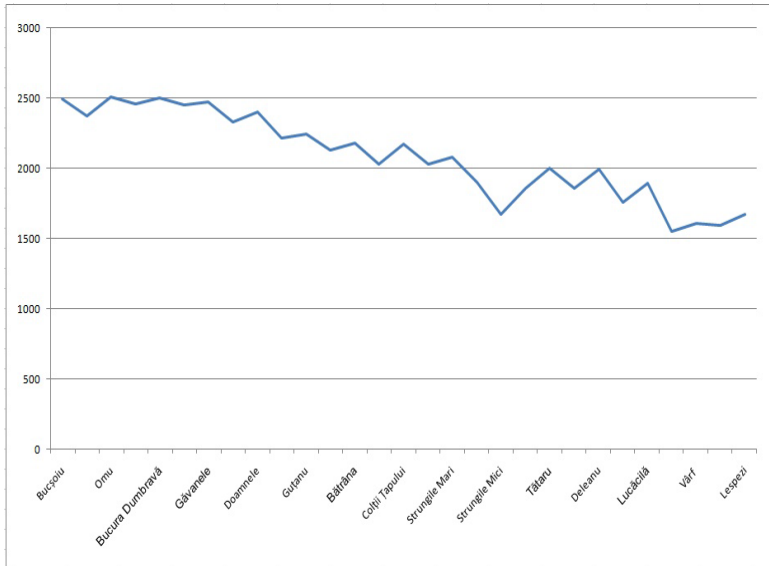


Figure 11. The graphic of the peaks from Western Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

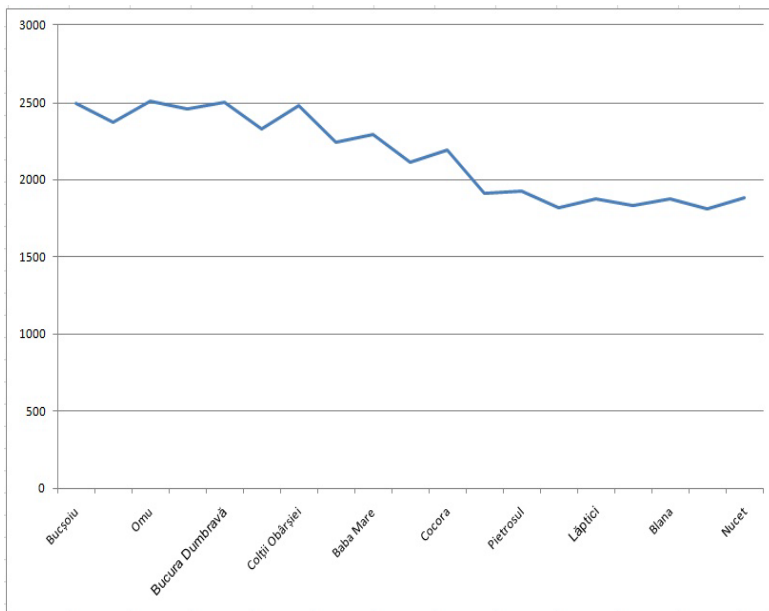


Figure 12. The graphic of the peaks from Internal Ridge of Bucegi Mountains (source: Topographic Map of Romania-with changes)

The smaller the difference between the prominence value and the peak altitude, the greater the orometric dominance/the greater the prominence, the greater the orometric dominance. Peaks with high prominence are also distinguished by high values of orometric dominance. The most prominent peaks are: Vânturiș (195 m), Coștila (189 m), Furnica (168 m), Colții Obârșiei (150 m), Colții Țapulului (143 m), Deleanu (130 m), Bucșoiu (122 m), Scara (122 m), Lucăcilă (115 m).

Table 1. The prominence of the peaks around the Omu peak and on the western summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Bucșoiu	2492	2370	122	4.89	peak
2	Omu	2507	-	-	-	parent-peak
3	Scara	2422	2300	122	5.03	peak
4	Lancia	2288	2190	98	4.2	peak
5	Bucura Dumbravă	2503	2460	43	0.17	peak
6	Găvanele	2472	2450	22	0.88	summit
7	Doamnele	2402	2330	72	2.99	peak
8	Guțanu	2246	2215	31	1.38	peak
9	Bătrâna	2181	2130	58	2.65	peak
10	Colții Țapulului	2168	2025	143	6.59	peak
11	Strungile Mari	2080	2030	50	2.40	peak
12	Strungile Mici	1968	1900	68	3.45	peak
13	Tătarul	1998	1860	138	6.90	peak
14	Deleanu	1990	1860	130	6.53	peak
15	Lucăcilă	1895	1780	115	6.06	peak
16	Vârf	1610	1550	60	3.72	peak
17	Lespezi	1670	1590	80	4.79	peak

Table 2. The prominence of the peaks on the internal summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Colții Obârșiei	2480	2330	150	6.04	peak
2	Obârșia	2405	2340	65	2.7	peak
4	Coștila	2498	2309	189	7.56	peak
5	Baba Mare	2294	2240	54	2.35	peak
6	Cocora	2191	2115	76	3.46	peak
7	Pietrosul	1927	1910	17	0.88	summit
8	Lăptici	1872	1820	52	2.77	peak
9	Blana	1875	1830	45	2.4	peak
10	Nucet	1881	1810	71	3.77	peak

Table 3. The prominence of the peaks on the eastern summit of the Bucegi Mountains

Crt. no.	Peak	Altitude m	Key-saddle m	Prominence m	Orometric dominance m	Status
1	Coștila	2498	2309	189	7.56	peak
2	Caraiman	2384	2345	39	1.63	peak
3	Jepii Mici	2143	2095	48	2.23	peak
4	Jepii Mari	2071	1995	76	3.66	peak
5	Piatra Arsă	2044	1965	79	3.86	peak
6	Colții Pietrei	2001	1970	31	1.54	peak
7	Furnica	2103	1935	168	7.98	peak
8	Vârful cu Dor	2030	1935	95	4.67	peak
9	Vânturiș	1925	1730	195	10.12	peak
10	Dichiu	1685	1610	75	4.45	peak

In terms of orometric dominance, the most dominant peaks within the synclinal basin and in the plane of the ridges on which they are located are Vânturiș (10.12), Furnica (7.98), Coștila (7.56), Tătaru (6.90), Colții Țapului (6.59), Deleanu (6.53), Lucăcilă (6.06), and Colții Obârșiei (6.04).

The relevance of the peaks of the Bucegi Mountains for sports tourism

Due to the high altitude, low prominence, and friendly shape, the peaks of Bucegi Mountains are included in various sports tourism activities, such as:

a) hiking, ski touring, and mountain biking:

- consecrated peaks: Omu, Bucura Dumbravă, Bucșoiu, Colții Obârșiei, Obârșia, Coștila, Caraiman, Jepii Mici, Jepii Mari, Furnica, Vârful cu Dor, Doamnele, Tătaru etc.;

- these peaks offer viewpoints towards the Bucegi Plateau, the Ialomiței Valley, the Bran Couloir, and the Prahova Valley;

b) mass sports competitions:

- Scara Skyrace (25 km): includes Scara Peak;

- Omu Marathon (40 km): includes Scara, Omu, Doamnele, Guțanu and Bătrâna Peaks;

c) paragliding launches:

- Coștila, Caraiman, Jepii Mici, Furnica;

d) climbing:

- the walls of Jepii Mici, Caraiman, Coștila, Bucșoiu peaks, and the ridge of Strungile Mari-Strungile Mici.

Ski areas, and sports complexes (Piatra Arsă National Sports Complex), have been arranged on the inner, gentler flank of some peaks (Furnica, Vârful

cu Dor-Valea Izvorul Dorului). Finally, some peaks have cultural-historical connotations, such as the Caraiman Peak, on which the Heroes' Monument is located, a very visited objective.

CONCLUSIONS

The Bucegi Massif represents a very important, iconic tourist attraction for mountain tourism, due to several factors, such as:

- its external aesthetic appearance (steep flanks);
- proximity to cities and tourist resorts: Braşov, Ploiesti, Bucharest, Predeal, Buşteni, Sinaia, Râşnov, Bran, Zărneşti, Codlea;
- the existence of the altitude plateau, which is very accessible to a wide range of tourists;
- access by cable car to the height plateau from Sinaia, and Buşteni Resorts;
- car access to the Ialomiţa Valley (Padina area), and the Bucegi Plateau (Babele Road, TransBucegi Road);
- the perspectives on the surrounding mountain landscape: the Leaota Mountains, the Baiului Mountains, the Ciucaş Mountains, the Piatra Mare Mountains, the Postăvaru Mountains, the Piatra Craiului Mountains, the Prahova Valley, the Braşov Depression, and the Bran-Rucăr Corridor.

The genesis and shape of the peaks are the result of the geological constitution (conglomerates, sandstones) and the structure in the form of a suspended syncline, a fact that is reflected in the reduced values of their prominence, making them very accessible from the Bucegilor Plateau or from the summit plane on which find out.

This permissiveness of the relief and the peaks determined the early tourist equipment of the mountain area, and led to the registration of very large flows of visitors, with consequences for the environment (erosion, waste) and the tourist act (crowding, accidents).

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DETERMINING THE SPEED REACTION TIME TO THE LOWER LIMBS IN A WOMEN' S VOLLEYBALL TEAM (CSU MEDICINA TG. MURES)

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ABSTRACT. Speed reaction is an important concept in various fields like physiology, psychology and sports science. It refers to the time it takes to respond to a specific stimulus visual, auditory, tactile. Reaction speed is an important and fundamental measure in the study of human performance and cognitive processes. **Methods.** The testing was conducted on the female volleyball players, members of the CSU Medicine Târgu Mureş team. This testing took place at the beginning of the 2023-2024 competitive season. **Objective.** The objectives of this study are to identify the reaction time values obtained during the testing of the CSU Medicine Târgu Mureş team. **Results.** The analysis of the results was conducted after downloading the data from the Optojump software as follows: Test 1 Range: $0.532 - 0.393 = 0.139$ seconds, test 2. Range: $0.531 - 0.425 = 0.106$ seconds Test 3 Range: $0.750 - 0.597 = 0.153$ seconds **Conclusion.** This statement suggests that, based on the data collected from the three tests, there is consistency in the performance of individual subjects. Some subjects consistently have low reaction speed values across all three tests, while others consistently have high reaction speed values.

Keywords: Volleyball, Optojump, Speed Reaction

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REZUMAT. *Determinarea timpului de reacție ale membrelor inferioare la echipa de volei feminin CSU medicina Târgu Mureș.* Reacția rapidă este un concept important în diverse domenii precum fiziologie, psihologie și știința sportului. Se referă la timpul necesar pentru a răspunde la un anumit stimul: vizual, auditiv, tactil. Viteza de reacție este o măsură importantă și fundamentală în studiul performanței umane și al proceselor cognitive. **Metode.** Testarea a fost efectuată pe jucătoarele de volei ale echipei CSU Medicina Târgu Mureș la începutul sezonului competițional 2023-2024. **Obiective.** Obiectivele acestui studiu sunt identificarea valorilor timpului de reacție obținut în timpul testării. **Rezultate.** Analiza rezultatelor a fost efectuată după descărcarea datelor din software-ul Optojump, astfel: Testul 1 interval $0,532-0,393=0,139$ secunde, Testul 2. Interval: $0,531-0,425=0,106$ secunde, Testul 3. Interval: $0,750-0,597=0,153$ secunde. **Concluzie.** Această afirmație sugerează că pe baza datelor colectate din cele 3 teste există o consistență în performanța individuală a subiecților. Unii subiecți au în mod constant valori scăzute ale vitezei de reacție în toate cele 3 teste, în timp ce alții au în mod constant valori mari ale vitezei de reacție.

Cuvinte-cheie: volei Optojump, viteză de reacție

INTRODUCTION

Speed reaction it is an important concept in various fields like physiology, psychology and also sports science. It refers to the time it takes to respond to a specific stimulus visual, auditory, tactile. One of the physical abilities is reaction, which is the ability of a person to act quickly in response to a stimulus that comes from outside either through the senses of nerves or feelings (Lima,2021). Reaction speed is an important and fundamental measuring in the study of human performance and cognitive process. In several studies, reaction speed has been assessed with computerized tests, such as the motor reaction test, simple reaction time test, and choice reaction time test to understand the facts that affect speed reaction it is important to optimizing the human performance (Piras, 2014). First of all, neurological processes are involved in the speed reaction. The brain must generate a motor response after sensory input wich involves a series of complex neural pathways. Also factors like neural transmission speed, synaptic efficiency, and brain health can influence this process. Volleyball visual reaction speed training belongs to non-periodic sports. The model has no specific exercise intensity and quantitative power metrics (Estrada, 2021). Volleyball requires agility, coordination and reaction ability for playing and a good suspicion to lift and hit the ball. In volleyball, changes in the speed of game and scoring system the set finishes quickly, so players need a high level of

agility, coordination and reaction ability (Freire, 2018). Agility is an important component needed by almost all sports, which is the ability to change the direction or position of the body quickly which is done together with other movements (Mawarti et al., 2021). The most commonly studied in reaction time research is to visual stimuli. Auditory stimuli like a start pistol in a sprint race play a significant role in reaction time. This can be influenced by factors like: sound and frequency of the sound, volume, individual s hearing ability also multisensory integration, when both visual and auditory cues are involved. Athletes have higher requirements and higher standards based on completion targets. Basic skills require a variety of performances of the ball. The testing was conducted on the female volleyball players, members of the CSU Medicine Târgu Mureş team. This testing took place at the beginning of the 2023-2024 competitive season. The order of the tests was arranged as it will be presented in the paper below. The testing was conducted after a 10-minute warm-up consisting of light jogging, 10 minutes of stretching, and 10 minutes of running drills. Each subject followed the specified protocol both in the warm-up phase and during the testing phase. In volleyball, according to (Mroczek, 2007) reaction speed is ranked in the first place among all coordination abilities. Skilled players are better in information extraction that is globally distributed across the body, rather than relying on a single isolated or local information cue or source (Williams et al., 2018).

OBJECTIVE

The objectives of this study are to identify the reaction time values obtained during the testing of the CSU Medicine Târgu Mureş team. The three tests used to assess the lower body reaction speed levels and conducted with the assistance of the Optojump device were applied with the purpose of analyzing each individually tested player and, at the same time, the entire team. Collecting this data helps us analyze the results and, consequently, the successful development of post-testing training programs.

METHODS

Optojump is an optical measurement system consisting of a transmitting and receiving bar. Each of these contains 96 leds (1.0416 cm resolution). The leds on the transmitting bar communicate continuously with those on the receiving bar (web source). Testing reaction speed in volleyball with an Optojump

system is a valuable tool for coaches and athletes to assess and improve their performance. The testing was performed using the Optojump device. This device is designed to test and analyze the physical qualities of each individual being tested. The tests conducted with the help of this device in this article were used to identify reaction time values in the lower limbs of the CSU Medicina Târgu Mureș women's volleyball team. The three tests used were as follows: reaction speed with the left foot, reaction speed with the right foot. In these two tests, the reaction speed of the tested foot is located within the two beams of the Optojump device. At the sound or auditory signal, the foot must be lifted from the ground. The reaction time will be measured from the moment the alert started until the foot was raised, indicating the reaction speed. The three tests used were as follows: reaction speed with the left foot, reaction speed with the right foot. In these two tests, the reaction speed of the tested foot is located within the two rails and lifted when the stimulus appeared.

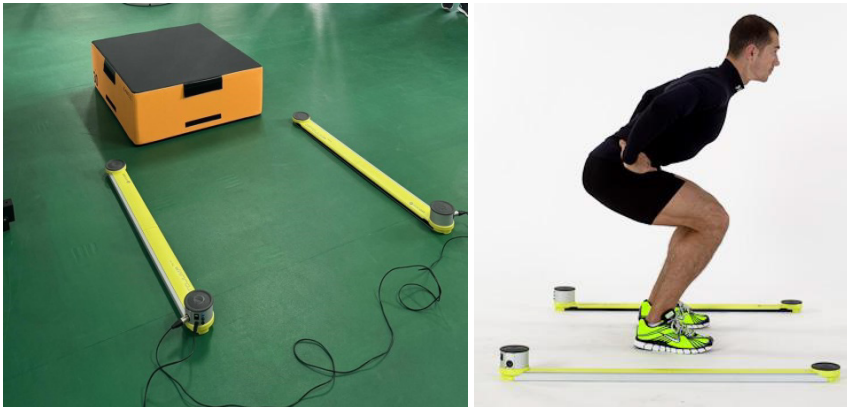


Figure 1. Optojump device – speed reaction test

In the table presented above, the consolidated data obtained by the volleyball team during the three tests to determine the reaction speed of the lower limbs is shown. The first test was performed by jumping with both feet at the moment a stimulus appeared. The next two tests were carried out with the left foot and the right foot, which were placed inside the two rails and lifted when the stimulus appeared.

DETERMINING THE SPEED REACTION TIME TO THE LOWER LIMBS
IN A WOMEN' S VOLLEYBALL TEAM (CSU MEDICINA TG. MURES)

With the help of Optojump software, the average values of reaction speed were determined, and the values obtained by each tested subject were also determined.

RESULTS

Table 1. Average reaction time results for each tested subject (Avg)

Subject	Left leg reaction time (sec.) avg	Right leg reaction test (sec.) avg	Visual reaction test (sec.) avg
A. C.	0.532	0.531	0.643
A.B.	0.501	0.496	0.652
B.D.	0.453	0.484	0.717
M.F.	0.454	0.469	0.726
D.M.	0.419	0.489	0.670
N.E.	0.476	0.492	0.641
C.A.	0.438	0.456	0.632
D.A	0.422	0.425	0.603
P.E.	0.474	0.429	0.597
G.D.	0.393	0.425	0.621
C.M.	0.441	0.445	0.615
P.D.	0.420	0.441	0.649
M.M.	0.459	0.470	0.631
S.L.	0.502	0.531	0.750
S.A	0.427	0.439	0.638

Table 2. Average reaction time results for the entire tested team (Avg)

	Left leg reaction time (sec.) avg	Right leg reaction test (sec.) avg	Visual reaction test (sec.) avg
AVG	0.454	0.468	0.652
MIN	0.393	0.425	0.597
MAX	0.532	0.531	0.750

The analysis of the results was conducted after downloading the data from the Optojump software as follows: left leg speed reaction reaction test shows us that the best value was obtained by the subject G.D. with a result of 0.393 sec. The lowest reaction time was obtained by the subject A.C. with a result of 0.532 sec. The left leg reaction time vary between 0.393 and 0.532 seconds. Range: $0.532 - 0.393 = 0.139$ seconds.

The right leg speed reaction reaction test shows us that the best value was obtained by the subject D.A. and G.D. with a result of 0.425 sec. The lowest reaction time was obtained by subjects A.C. and S.L. with a result of 0.531sec. The left leg reaction time varies between 0.425 and 0.5312 seconds. Range: $0.531 - 0.425 = 0.106$ seconds.

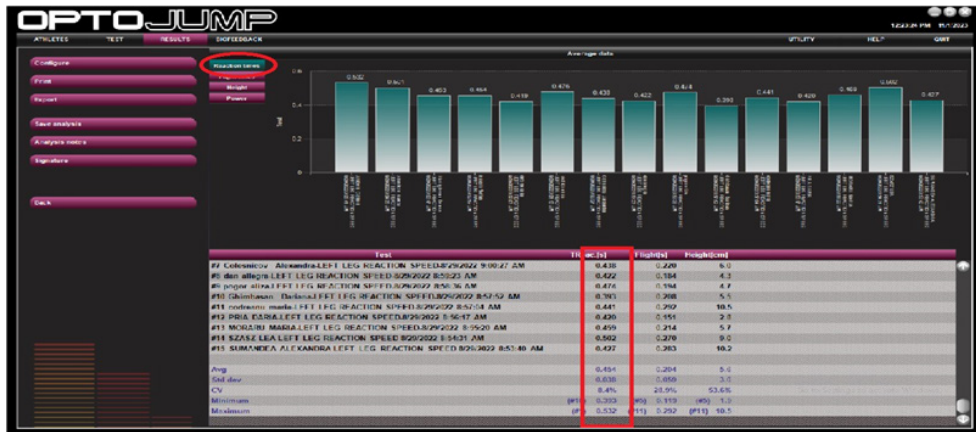


Figure 2. Reaction test with left leg

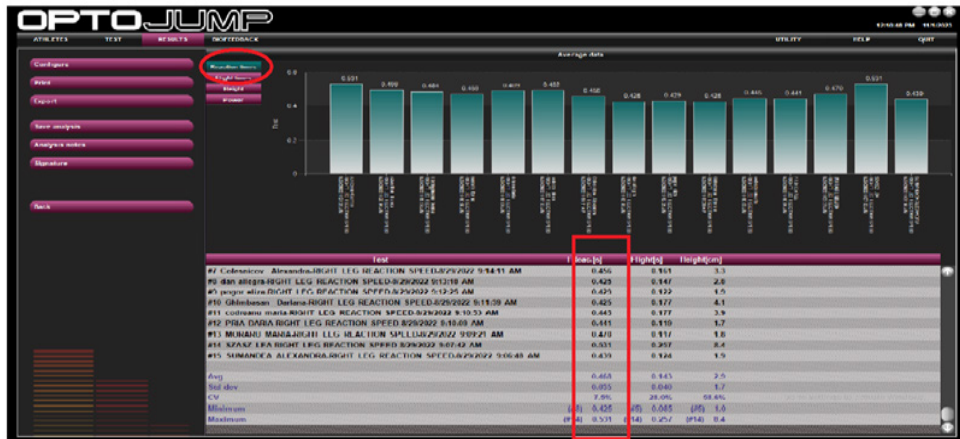


Figure 3. Reaction test with right leg

On the 3th test, *Visual reaction time*, the following results was obtained. The best reaction time value: 0.597 (P.E.). Lowest reaction time value: 0.750 (S.L.). Range: $0.750 - 0.597 = 0.153$ seconds. The visual reaction test times vary between 0.597 and 0.750 seconds. Based on this analysis, we can make several

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observations: A.C. has the lowest average reaction time for both the left and right leg reaction tests G.D. has the highest average reaction time for the left leg reaction test. S.L. has the lowest average reaction time for the visual reaction test. P.E. has the highest average reaction time for the visual reaction test.

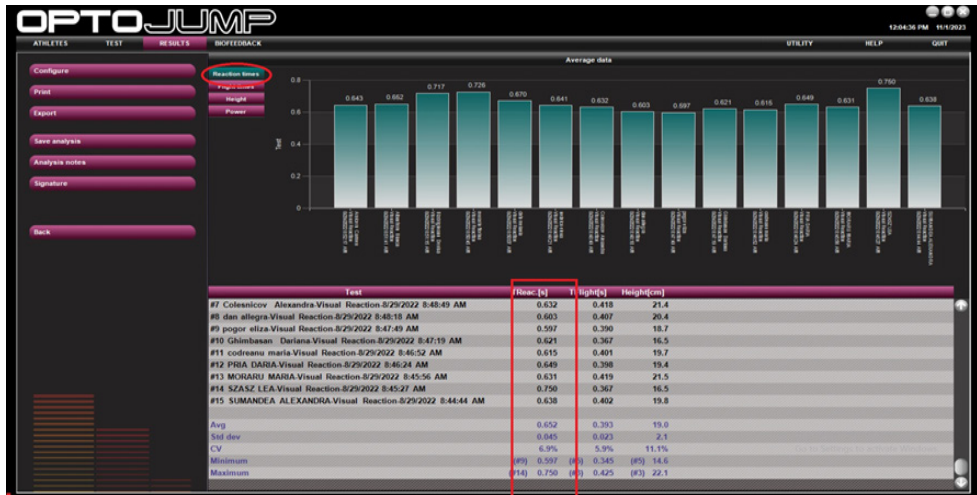


Figure 4. Visual. reaction time results for each player tested

CONCLUSION

There is a range in reaction times for all three tests, indicating individual variability in performance. The data collected and analyzed in the three tests used to identify reaction speed in the lower extremities show that the same subjects with low values are also the same subjects with high values. motor fitness components such as agility, speed, reaction and others will support skills in volleyball games. It can be seen from the results showing the magnitude of the correlation between the value of motor fitness with volleyball skills (Trecroci et al., 2017; Wilkerson et al. 2021).

This statement suggests that, based on the data collected from the three tests, there is a consistency in the performance of individual subjects. Some subjects consistently have low reaction speed values across all three tests, while others consistently have high reaction speed values. This may indicate that the reaction speed of these subjects is relatively stable and not significantly affected by the specific test or conditions. However, the context and details of the tests and the data should be considered to draw meaningful conclusions from this observation.

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