

# Proceedings



**4 HEALTHY  
ACADEMIC  
SOCIETY**

International Scientific  
Congress of student'  
sport, physical  
exercises and health

**1<sup>st</sup> INTERNATIONAL SCIENTIFIC CONFERENCE**  
**4 HEALTHY ACADEMIC SOCIETY**

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**POREČ, CROATIA, June 7-9, 2023**

**Proceedings**



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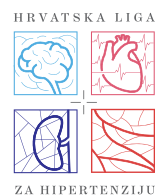
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# Welcome Note

We live in a time when the preservation and improvement of health have become one of the greatest challenges. The modern way of life, increased engagement in work obligations, studying, and society in general have led to the neglect of some fundamental values crucial for quality of life: physical inactivity, dangerous changes in dietary habits (increased salt and sugar intake), ecological changes, changes in communication methods, growing alienation, lack of social skills, and shifts in personal priorities regarding quality of life. The period of studying is a dynamic phase in the lives of young individuals, full of challenges and opportunities for growth. However, it also requires a balance between academic responsibilities, extracurricular activities, social life, social skills, as well as taking care of one's physical and mental health. The lack of personal inner balance contributes to dissatisfaction and unhealthy habits. Considering these challenges, it is necessary to understand the importance of physical exercise and sports and their impact on the physical and mental health of students.

In order to truly bring about a change in lifestyle habits, multidisciplinary research is needed from experts in various scientific fields who deal with the adoption of healthy habits within the academic community. In the Republic of Croatia, according to the National Sports Program 2019-2026, one of the goals is to promote health-oriented physical exercise, the promotional value of sports and physical activity, and to define a dual career system within the academic community that will ensure successful careers for a greater number of student athletes after their sports careers, as well as promote higher education institutions through sports and health.

The first goal of the 4th International Scientific Congress on Student Sports, Physical Exercise, and Health, "4 Healthy Academic Society," is to present research results, share knowledge and experiences, and encourage discussions on how to improve the status of physical and health education, establish a support system for student athletes' dual careers, and raise awareness about the importance of personal health through promotional preventive activities. The Croatian Academic Sports Federation, in cooperation with the academic community and partners involved in organizing this Congress, to whom I would like to express my gratitude on behalf of the Organizing Committee, will offer solutions for the aforementioned areas based on scientific research results conducted on the student population and collaborate with relevant authorities to find ways to implement them for the betterment of society as a whole.



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# Proceedings



# FROM EU GUIDELINES ON DUAL CAREER TO USEFUL PRACTICAL TOOLS FOR STUDENT ATHLETES

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## 1.0 INTRODUCTION

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The concept of dual career was defined by the European Commission (EC) in 2012 as the "combination of elite sport and education". With this in mind, the EC has produced the EU Guidelines on Dual Careers for Athletes, which provide a framework for the concept of dual careers. This framework contributes to the overall well-being of athletes and the achievement of the maximum of their athletic potential. Although these EU guidelines on dual career athletes have been developed and promoted by the EC, they sometimes lack effective implementation in most member states. There is a lack of solid agreements between the sport system and the education sector or the labor market, as well as a lack of a legal framework or sustainable government policies.

In general, talent development spans a period of 15-20 years and includes different stages in sport (e.g., initiation, talent development, talent retention, championship, and perfection/elite performance), education (e.g., elementary school, high school, and college/vocational), and professional life (Stambulova & Wylleman, 2015, 2019; Wylleman, 2019; Moreno et al., 2021). Therefore, when pursuing an athletic career, multiple decisions must be made that directly impact the lives of athletes and their academic/athletic/family and peer support environments.

In the field of sport, increasing attention is being paid to sport transitions, career development, and sport retirement in Europe (Stambulova, Ryba & Henriksen, 2021; Stambulova & Wylleman, 2019). Research highlights the need for a holistic approach to sport by combining athletic and personal excellence to help athletes achieve a lifelong career (e.g., Aquilina & Henry, 2010; Wylleman, 2019; Wylleman & Lavalley, 2004). On this basis, Stambulova (2020) introduced the concept of athlete career excellence to describe an athlete's aspiration to lead a healthy, successful, and long-lasting career in sport and other areas of life.

Because every athlete's fundamental goals are related to sports, student-athletes should be aware that their athletic careers will end one day and should therefore also think about life "after sports." The big question is whether an athlete who is only striving for athletic goals and success can, will, or wants to think about his or her future life at this time. Therefore, in any case, he needs real and serious encouragement from those whom he trusts and who have a sufficiently large influence on him, which is usually the parents (family), but certainly also the coaches.

### 1.1. From dual career concept to The EU guidelines

In its "White Paper on Sport" (2007), the European Commission stated the importance of offering "dual career" training to young athletes at an early stage in order to ensure the reintegration of professional athletes into the labour market after the end of their sporting careers. In addition, in 2008,



the Council of the European Union issued a declaration calling for increased dialogue with the International Olympic Committee and sport representatives, particularly on the issue of combined sport training and education for young people. Following the 2008 European Council's call to address the issue of dual careers "Developing the European dimension in sport" (European Commission, 2011), the Commission stressed the importance of providing high-quality education to young high-performance athletes in parallel with their sports training.

The EU Guidelines on Dual Careers for Athletes (European Commission, 2012), which recommend policy measures to support dual careers in high-performance sport (approved by the EU Expert Group on Education and Training in Sport" at its meeting in Poznań on September 28, 2012), states that promoting dual careers for athletes is in line with the various objectives of the Europe 2020 strategy:

- preventing school dropouts;
- more graduates in higher education;
- higher employability;
- increasing the economic activity of citizens;
- a more efficient sports policy by retaining more talented and high-performing athletes in the sports system.

According to the conclusions on dual careers for athletes published by the European Commission in 2013 (European Commission, 2013), the term "dual career" means that an athlete is able to flexibly combine his or her sporting career, including high-quality training, with education and/or work.

The EU Work Plan for Sport 2017-2020, adapted by the Council of Ministers, proposed that the EU Work Plan for Sport should also be guided by the following guiding objective: it should take into account the relationship between education and sport, including dual careers (Council of the European Union, 2017).

## 1.2 Benefits and challenges

Several international studies have found that, compared with athletes who do not have dual careers or whose athletic and academic careers are not properly aligned, athletes with dual careers have several benefits: greater well-being (e.g., a balanced life and less stress), better health, and greater opportunity for personal development (e.g., personal identity, independence, responsibility, and transferable skills), as well as clear social benefits in the form of larger social networks, greater social support, and strong, supportive friendships. However, researchers have found that dual careers can also be challenging. Athletes may encounter challenges and obstacles, such as lack of time, when balancing sports and education. The most commonly cited obstacles for student athletes are lack of support and understanding from academic staff. Faculty should understand that high performance athletes stand for their state and represent their country in the world, so their daily routine is different.

Also, student athletes should be aware of the fact that higher education is not only necessary for their future, but also helps them to achieve better results in the present.

To further conceptualise the potential overlap of demands, Wylleman and Lavallee (2004) introduced the developmental model based on findings from research on the development of interpersonal relationships of athletes, dual careers of elite athletes, and retired athletes. The life span model represents a holistic developmental perspective that encompasses four different levels of athlete development: athletic, psychological, psychosocial, and academic and career development. After about a decade, the Holistic Athlete Career (HAC) model was introduced, which includes five different levels of athlete development: athletic, psychological, psychosocial, academic/professional, and financial (Wylleman, et al., 2013).

## 2. HOLISTIC MODEL

The literature on sports talent identification emphasises the importance of key stakeholders promoting the holistic development of talented athletes, particularly through supportive initiatives/measures to promote well-being and address stressful situations in different areas of life, such as training and competition stress, injuries, lack of social life, and transition to higher levels of competition and academics.

Indeed, athletes reported lack of time to study, limited relationships with teachers/professors, classmates, and peers, missed classes and exams, physical and mental exhaustion, and identity conflicts (Stambulova, Engstroem, Franck, Linnér, & Lindahl, 2015; Kerstajn, 2018). Although athletes have primary responsibility for their dual career pathways (e.g., micro dimension), different individuals, institutions, or specific contexts have different and integrated responsibilities in guiding and supporting talented athletes during their developmental years, primarily by providing a critical balance of challenges and/or emotional and logistical support at the meso level (e.g., parents, peers, teachers/employers, coaches, sport managers), macro level (e.g., sport clubs/associations, educational institutions, and the labour market), and at the policy level (e.g., national and international governing bodies) that provide a critical balance of challenges and/or emotional and logistical support for dual careers (Quinaud, Capranica, Doupona, Guidotti, 2022).

### 2.1 The challenges in the micro dimension of dual careers

Talented athletes who want to excel in their sports need effective proactive strategic planning to help them transition to the elite level and into the job market at the end of their sports careers. A holistic development programme encompasses several individual aspects, including a deep understanding of the athletes' potential profile in terms of the dynamic combination of their endogenous (e.g., physical and mental attributes and personal values) and exogenous (e.g., cultural and physical environment) resources, as well as a sound understanding of potential barriers.

Therefore, initial identification of future athletic and academic performance should be based on a thorough understanding of the key determinants that support dual career pathways and prevent risks of athletic or academic burnout and dropout. Finally, measures should be taken to implement the development of a dual career supportive environment for athletes, which can be helped by an Erasmus plus project that has created an educational platform accessible to all student athletes as a result of the study.

Useful platforms for student athletes in the micro level are: DONA – Dual career for women athletes (<https://www.desportmaatschappij.nl/dona>), ELACAMP - Educational Program for athletes (<https://www.bootcampforathletes.com>)

### 2.2 The challenges in the meso dimension of dual careers

The meso dimension of dual career comprises actors having strong, direct and personal relationships with the athlete at the family (e.g., parents, siblings, relatives, friends, and peers), the sport (e.g., coaches, managers, staff, dual career tutor), and the academic (e.g., classmates, teachers, tutors, deans) environments.

Recent research focusing on the parent's role in sustaining athletes' dual career highlighted difficulties in establishing meaningful relationships with sport and academic staff for the construction of a coherent dual career support environment (Gjaka et al., 2021; Tessitore et al., 2021). In considering that parents may lack the required knowledge to work individually and in teams with other key dual career actors, a European framework informed the development of an on-line education programme for parents within the Erasmus+ Sport project EMPATIA - Educational Program for parents (<https://edu.empatiasport.eu/eng/>), to empower them in promoting a positive dual career environment for their talented children (Capranica et al., 2018)

### **2.3 The challenges in the macro dimension of dual careers**

In Europe, sports are primarily organised at the club level, and there is a need for specific national dual career guidelines and regulations to avoid a fragmented and incoherent culture that supports student athletes in their athletic and academic achievements.

A rare study that focused specifically on the challenges of workforce athletes found that the latter believe they face greater time management challenges than other workers due to "increasing time demands in both sports and education" or work-related activities. In addition, employee athletes also report a lack of encouragement for continuing education from their employers (EU Athletes, 2013) and criticise the general lack of effective institutionalised support to better balance work and sport.

The Elit-in project (Integration of elite athletes into the labour market through the valorization of their transversal competences) found that any elite athlete wishing to integrate into the labour market should acquire the following transferable soft skills: communication, entrepreneurial skills, work ethics, problem-solving skills, negotiation skills, teamwork, time management, financial and money management, trainability, use of international languages, self-presentation in interviews and job search.

The above concepts are a summary of the basic skills employers look for in their employees. They also give athletes the best possible chance to succeed in the job market. Some of them develop with the practise of sports, but not in the same way. Others are developed in other ways, and it is very important for an athlete to acquire these standard skills before entering the job market.

Useful platforms for student athletes at the macro level are: ED MEDIA (<https://www.lsu.lt/en/project-edmedia/edmedia-online-platform>), STARTING11 with European dual career toolkit (<https://starting11.eu/toolkits>) and others.

MORE THAN GOLD the project with the guidelines to promote dual careers for athletes and students presented a set of strategies that are currently being developed in a number of higher education institutions from different countries of the European Union and that can be a reference for general application in the institutions of the member states.

In addition to the academic community, athletes and their supportive environment, managers, policy makers and stakeholders are also required to contribute to the holistic development of young athletes through innovative and collaborative approaches. In this context, the European Commission's successful experience in providing funding for cross-national collaboration through the ERASMUS +Sport Collaborative Partnerships, which focus on dual career and student development, is a valuable example of establishing a platform to promote evidence-based knowledge that uncovers effective bidirectional relationships between policy and practice (Quinaud, Capranica, Doupona, Guidotti, 2022).

### 3. CONCLUSION

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Athletes invest in an athletic career at several crucial stages of their age- and life-course-related development and should therefore be supported to maximize the benefits of their athletic activities (e.g., physical, psychological, social) and compensate for their potential costs (e.g., lopsided development, sacrifices in other areas of life, injuries).

Dual careers (i.e., combining sport and education, sport and work) have been shown to be a good solution for balancing sport and other areas of athletes' lives and preparing them for life after sport. The literature on athletes' careers shows that finding (and achieving) an optimal balance between sport and other life domains (directly or indirectly) is a factor in preventing sport dropout and exclusion from sport identity, as well as a strategy for managing the transition from junior to senior careers, and that athletes should be helped to realize the benefits of their sport activities (e.g., physical, psychological, and social) and offset their potential costs (e.g., lopsided development, sacrifices in other areas of life, injuries).

At the sport level, National Olympic Committees and sport federations could take a top-down approach by promoting dual-career programs through education courses for coaches and managers and by promoting the involvement of a dual-career tutor at the club level to facilitate collaboration with educational institutions. In addition, athlete organizations could take a bottom-up approach by asking clubs and sports federations to take steps to support dual career development for young talent to promote their holistic, integrated, and sustainable development.

The academic community in general and the institutional community in particular should develop a supportive and inclusive environment by identifying individual academic pathways and engaging students that could facilitate learning and social opportunities inside and outside the classroom.

International and national dual career guidelines could further enhance key social support principles and practices for holistic development of talented athletes in different sport and educational settings. In addition, the European Athlete as Student (EAS) network provides a platform for effective dialog between educational institutions (e.g., universities, high schools, sports schools) and sport organizations (e.g., clubs, sports federations, National Olympic Committees) and cooperates with European institutions (e.g., European Parliament, European Commission, and Council of Europe) and various partners in developing innovative international, transnational projects and research on dual careers in the different contexts that constitute a laboratory for reconciling youth sport and education also outside Europe. In particular, networking is seen as critical to making progress on dual career policies and strategies and raising awareness of best practices and methodological advances in European dual careers.

Several universities in the EU have established dual career services that focus on curricular requirements to make the educational pathway more flexible. For example, sports students have the option of part-time study, individualized study plans, distance learning (e-learning), valorization of sports credits through ECTS, etc. So far, each country is addressing these issues with its own methods and has accumulated a variety of experiences, ranging from countries where dual careers are still at an early stage of development (e.g. Latvia, Romania) to countries with a national law on dual careers (e.g. Portugal). In other countries (e.g., Italy), there are significant differences within higher education institutions.

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Theme:  
**HEALTH AND  
EXERCISE**



# ASSOCIATION BETWEEN SEDENTARY BEHAVIOR AND BODY COMPOSITION IN PHYSIOTHERAPY STUDENTS

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## ABSTRACT

This study aimed to determine how much time students of physiotherapy spend in different sedentary activities, and to investigate the association of weight status and body composition with the sedentary behavior. Sixty students (35 women and 25 men) were involved in a cross-sectional survey. Body height was measured by stadiometer. Body mass and body composition were assessed by bioelectric impedance analysis. Involvement in sedentary behavior during leisure time was assessed by self-administered questionnaire. Results showed that students spend a total of 6,4 h/day of their leisure time in sedentary activities. Athletes spend on average 1 h less in sedentary activities than non-athletes. Correlation between the time spent in sedentary activities and body composition was statistically significant only in overweight group, where % body fat correlated with total sedentary time ( $r=0,859$ ,  $p=0,013$ ), watching TV ( $r=0,782$ ,  $p=0,038$ ), doing paperwork or computer work ( $r=0,758$ ,  $p=0,014$ ) and reading books ( $p=0,791$ ,  $p=0,034$ ). BMI correlated with total sedentary time only in group of overweight ( $r=0,776$ ,  $p=0,04$ ), while in group of normal weight and underweight tested correlations were not statistically significant. These results indicate that students spend great amount of their leisure time in sedentary behavior, and that there is an association between sedentary behavior and body composition in overweight students. Students who are involved in sports are less sedentary than those who do not practice sports. Evidence supports a need for additional education of students on adverse effects of sedentary behavior on their health and appearance.

**Key words:** sedentary, students, behavior, body composition

## INTRODUCTION

Sedentary behavior is any waking activity with low energy expenditure undertaken in sitting or reclining position (Tremblay et al, 2017). Technological changes and globalization have influenced the type of activities in human during work hours, as well as during leisure time. The need for a physically demanding tasks decreased because of technologic solution and involvement of machines, while human work switched to enhanced mental work performed without or with small use of muscles. Leisure activities also changed from active time spent in sports and socializing to sedentary activities like watching TV, video games, using internet and social networks. Studies show that in high income countries adults spend around 55-65% of their waking time in sedentary activities (Hansen et al, 2012). Time spent in sedentary activities is still increasing (Du et al, 2019). Some studies showed variations in sedentary time



according to age, gender, economic status (Lakerveld et al 2017) and current occupation (Loyen et al 2016). University students are one of the population sub-groups at risk of accumulating high levels of sedentary activities because activities like attending lectures and studying while preparing for exams involve long periods of sitting (Cotten and Prapavessis, 2016). If they perform more sedentary activities during their leisure time that could be detrimental for their health. High levels of sedentary behavior have been recognized as a risk factor for premature death and chronic diseases such as diabetes (Patterson et al, 2018), cardiovascular diseases (Wilmot et al, 2012) and metabolic syndrome (Biswas et al, 2015). It has been shown that spending prolonged time in sedentary activities increases risk of anxiety and depression (Zhai et al, 2015). However, evidence on association of sedentary behavior with obesity is still inconclusive (Saunders et al, 2020). The aim of this study is to find out the amount of time spent in different sedentary activities by the freshmen of Physiotherapy at the College of Applied Sciences Lavoslav Ružička in Vukovar, and to investigate association of weight status and body composition with the time spent in sedentary activities.

## **MATERIALS AND METHODS**

This cross-sectional study consisted of measuring anthropometric data (height, body mass and body composition analysis) and self-reported involvement in sedentary behavior. Some general demographic data were also collected, such as: gender, age, if they were athletes or not.

All freshmen students of Physiotherapy at the College of Applied Sciences Lavoslav Ružička in Vukovar (62 potential subjects) were offered to participate in this survey. Two students declined and 60 (35 women and 25 men) agreed to be involved in the study (response rate 97%). Participants were 19-24 years old. They were informed about goals of the study and gave their informed consent to be involved in the survey.

Height of all participants was measured using stadiometer Seca 711 (Seca GmbH, Hamburg, Germany) according to instructions of the manufacturer. Weight measurement and the analysis of body composition was done by bioelectric impedance analysis (BIA) method, using the body composition analyzer Tanita MC780MA (Tanita Co, Tokyo, Japan). The measurement results included: the body mass index (BMI), mass of body fat (MBF), percent of body fat (PBF), mass of skeletal muscles (SMM) and the percent of skeletal muscle (PSM). All measurements were performed in the morning (at 7-9 AM), by the same trained technician.

Sedentary behavior as time spent in sedentary activities was assessed by adapted SBQ (sedentary behavior questionnaire). The SBQ consisted of reports of time spent in 9 sedentary behaviors performed during leisure time: 1) watching television, 2) playing computer or video games, 3) sitting listening to music on radio or CD, 4) sitting and talking on the phone, 5) doing paperwork or computer work, 6) sitting reading a book or magazines or preparing for exams, 7) playing a musical instrument, 8) doing artwork or crafts, 9) sitting and driving in a car, train or bus. This questionnaire assess time spent in sedentary behavior on weekdays and weekend days. Participants were instructed how to complete questionnaire, and completion was done immediately after measuring anthropometric data.

### **Statistical analysis**

The statistical analysis was performed using IBM SPSS Statistics 20. The level of statistical significance was set at  $p=0.05$ . The Kolmogorov-Smirnov tests were applied to test the normality of data. Descriptive statistics included mean, standard deviation, minimum and maximum. To check for differences one way Anova with Bonferroni corrections was used. Correlation was tested using Pearson correlation coefficient. Statistically significant correlations between sedentary activities and body composition were tested by linear regression.

## RESULTS

Freshman students of Physiotherapy at College of Applied Sciences Lavoslav Ružička in Vukovar who were involved in this study were mostly normal weight (72% or 43 students), with BMI from 18,5 to 24,9 kg/m<sup>2</sup>. Among them there was 8% (5 participants) who were underweight (BMI<18,5 kg/m<sup>2</sup>, all of them were females. 12 students (20%) were overweight (10 men and 2 women). Body composition is presented in Table 1.

**Table 1.** Average values of body composition of the sample (N=60)

	MEAN	SD	MIN	MAX
BODY MASS (kg)	71,9	16,49	47,4	122,2
HEIGHT (cm)	172,5	8,9	155	194
BMI (kg/m <sup>2</sup> )	23,9	4,26	17,3	38,6
MASS OF BODY FAT (kg)	18,97	9,44	6,6	54,6
% BODY FAT	25,7	7,67	9,5	45,6
SCELETAL MUSCLE MASS (kg)	30,12	6,99	20,5	49,7
% SCELETAL MUSCLE	42,31	5,75	27,9	55

Average time spent in sedentary activities for the whole sample and for groups of different BMI categories are presented in Table 2.

There was 18 students (30% of the sample) who declared as athletes. Athlete students spend on average 1 hour less engaged in sedentary activities than non-athletes. This difference was statistically significant ( $p=0,047$ ). However, there was no statistically significant difference in average body composition between athletes and non-athletes.

**Table 2.** Average time spent in sedentary activities for the groups of underweight, normal weighted and overweight and for the total sample

		MEAN	SD	MIN	MAX	p
<b>WATCHING TV (min)</b>	UNDERWEIGHT	35	22,913	15	60	0,719
	NORMAL WEIGHT	59,46	51,718	0	180	
	OVERWEIGHT	60	48,99	0	120	
	<b>TOTAL</b>	<b>57,6</b>	<b>49,13</b>	<b>0</b>	<b>180</b>	
<b>PLAYING VIDEO GAMES (min)</b>	UNDERWEIGHT	45	65,383	0	120	0,215
	NORMAL WEIGHT	20,89	35,199	0	120	
	OVERWEIGHT	51,43	64,143	0	180	
	<b>TOTAL</b>	<b>28,4</b>	<b>44,3</b>	<b>0</b>	<b>180</b>	
<b>DOING PAPERWORK OR COMPUTER WORK (min)</b>	UNDERWEIGHT	50	17,321	30	60	0,41
	NORMAL WEIGHT	72,86	49,785	0	180	
	OVERWEIGHT	49,29	39,415	0	120	
	<b>TOTAL</b>	<b>66,7</b>	<b>46,74</b>	<b>0</b>	<b>180</b>	

<b>SITTING TALKING ON THE PHONE (min)</b>	UNDERWEIGHT	120	0	120	120	0,769
	NORMAL WEIGHT	116,79	40,282	30	180	
	OVERWEIGHT	130,71	68,583	15	180	
	<b>TOTAL</b>	<b>119,6</b>	<b>44,45</b>	<b>15</b>	<b>180</b>	
<b>READING BOOKS (min)</b>	UNDERWEIGHT	60	0	60	60	0,282
	NORMAL WEIGHT	69,11	47,142	15	180	
	OVERWEIGHT	38,57	40,488	0	120	
	<b>TOTAL</b>	<b>62,8</b>	<b>45,04</b>	<b>0</b>	<b>180</b>	
<b>DOING ARTWORK OR CRAFT (min)</b>	UNDERWEIGHT	20	34,641	0	60	0,335
	NORMAL WEIGHT	16,07	24,471	0	60	
	OVERWEIGHT	2,14	5,669	0	15	
	<b>TOTAL</b>	<b>13,8</b>	<b>23,23</b>	<b>0</b>	<b>60</b>	
<b>SITTING DURING TRANSPORT (min)</b>	UNDERWEIGHT	100	34,641	60	120	<b>0,001</b>
	NORMAL WEIGHT	30,54	29,856	0	120	
	OVERWEIGHT	45	19,365	15	60	
	<b>TOTAL</b>	<b>38,7</b>	<b>33,74</b>	<b>0</b>	<b>120</b>	
<b>TOTAL SEDENTARY TIME (min)</b>	UNDERWEIGHT	430	124,9	330	570	0,777
	NORMAL WEIGHT	385,71	105,976	180	615	
	OVERWEIGHT	377,14	126,223	135	480	
	<b>TOTAL</b>	<b>387,6</b>	<b>108,58</b>	<b>135</b>	<b>615</b>	
<b>TOTAL SEDENTARY TIME (h)</b>	UNDERWEIGHT	7,1667	2,08167	5,5	9,5	0,777
	NORMAL WEIGHT	6,4286	1,76627	3	10,25	
	OVERWEIGHT	6,2857	2,10371	2,25	8	
	<b>TOTAL</b>	<b>6,46</b>	<b>1,8</b>	<b>2,25</b>	<b>10,25</b>	

Correlation between time spent in sedentary activities and body mass and body composition was statistically significant only in overweight group, where % body fat correlated with total sedentary time ( $r=0,859$ ,  $p=0,013$ ), watching TV ( $r=0,782$ ,  $p=0,038$ ), doing paperwork or computer work ( $r=0,758$ ,  $p=0,014$ ) and reading books ( $p=0,791$ ,  $p=0,034$ ). BMI correlated with total sedentary time only in group of overweight ( $r=0,776$ ,  $p=0,04$ ), while in group of normal weight and underweight none correlation was statistically significant. There was no statistically significant correlation between time spent in sedentary activities and body mass or body composition when tested on the whole sample ( $N=60$ ). Linear regression models of correlated variables did not reveal statistically significant predictors of body fat %.

## DISCUSSION

The main goal of this study was to assess sedentary behavior of college students and how sedentary behavior is associated to the weight status and body composition. Our results confirm association of sedentary behavior and body composition among the overweight students, but not in students of normal weight and underweight. Majority of students involved in this study were normal weight. This result is in accordance with similar surveys performed on university or college students. For instance, results of Pengpid and Peltzer (2015) are very similar to ours. They also found most of the students are normal weight, women are prevailing in underweight category, while the representation of men is greater in overweight category.

Average total time spent in sedentary behavior by students who participated in this survey is 6h and 46 min. Considering that time spent sitting listening to lectures at the faculty is not involved in this result, we can say that our participants could be considered very sedentary. If we add up approximately 4 hours /day spent sitting listening to lectures that would result in most of their waking time spent in sedentary behavior. Similar results are presented by others. According to Smetaniuk et al (2017) physiotherapy students spend on average 11,2 h /day involved in sedentary activities. Moulin et al (2019) reported longest average time spent in sedentary behavior in students from Korea (14,3 h/day) and New Zealand (13 h/day), followed by students in Portugal and Canada (around 12 h/day), while somewhat shorter time in sedentary behavior/day was reported for students in Belgium (9 h), Turkey (7 h) and USA (6,5 h). Most of the time spent in sedentary behavior, for our participants, is screen time, which involves activities with the use of cell phones, computer or TV. It has been shown that sedentary behavior correlates greatly with the screen time, and particularly with the use of cell phones (Barkley et al, 2016). Interesting result of our study confirms results of Driller et al (2017), who found that students who are active athletes spend less time in sedentary activities. Along the benefits of practicing sports, they are also less exposed to detrimental effects of sedentary behavior to their health. Although we found no correlation between average time spent in sedentary activities and body composition in the whole sample and in underweight and normal weight categories, while the correlation between % body fat and time spent in some sedentary activities, as well as with total time spent in sedentary activities exists in the overweight category. Our results indicate that in this weight category, sedentary behavior is positively correlated with body fat content. Although we can not draw causal relations based on the results of cross-sectional study, as this one is, this result is very interesting and worth studying more in some future survey. Similar results are presented by Kim et al (2015) who found positive correlation between body fat mass and use of mobile phones. They found also negative correlation of lean mass and the use of mobile phones in students in China, which is different than our study results, because we found no correlation between lean mass and any of the sedentary behaviors. There are some limitations of this study: along with cross-sectional study design, which does not allow causal interpretation of the results, there is also use of subjective measures of time spent in sedentary behavior. It has been shown that questionnaires tend to underestimate total sedentary time and weekly correlate with objective measure of sedentary time. Nevertheless, questionnaires remain valuable tools to observe contribution of different sedentary activities to total sedentary time. It is, in our opinion, very important to know how time is spent in sedentary behavior, in order to suggest changes that could improve active and decrease sedentary time in college students.

## CONCLUSION

Overall conclusion of this study could be that students of physiotherapy at the College of Applied Sciences Lavoslav Ružička in Vukovar spend most of their waking time in sedentary behavior. Athletes among them spend less time sedentary. Total amount of time spent in sedentary behavior is correlated to body fat content only among overweight students, In normal weight and underweight students there is no correlation between sedentary behavior and body composition. For explanation of found relations further studies are needed.

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# STUDENT-LED HEALTH ENHANCING PHYSICAL ACTIVITY FOR ELDERLY-EVIDENCE BASED RESEARCH

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## ABSTRACT

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Physical activity is an essential part of a healthy lifestyle, and it is important for people of all ages to exercise regularly. For students and the elderly, physical activity can be of great benefit to physical and mental health. Therefore, student-led group exercise can be an effective means of promoting health-enhancing physical activity in all populations by creating a stimulating and motivating environment. Data were collected using standardized questionnaires and tests, as well as interviews.

This combined quantitative-qualitative study was conducted to compare the quality of life of older people while participating in group exercise led by physiotherapy students, as well as the improved quality of life and physical condition of the students.

Results showed significant improvement in functional abilities and quality of life, as well as the acquisition of healthy habits after two years of participation in group exercise. Participants reported reduced pain, improved ability to perform daily activities, and improved social interaction. Participants expressed satisfaction with the exercise program and emphasized the importance of the guidance and motivation they received from physiotherapy students.

**Key words:** elderly, quality of life, exercise, physical activity, students.

## INTRODUCTION

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The aging population is one of the greatest challenges facing modern society. According to the World Health Organization, it is estimated that by 2050 nearly 2 billion people will be older than 60 years (World Health Organization (WHO), 2022). Aging leads to natural changes in the body that can affect physical and mental functioning. Decreasing muscle mass, strength, balance, and flexibility are some of the changes that can occur with age. These changes can limit the ability of older people to perform activities of daily living, which can lead to a decrease in quality of life. In addition, older people are more susceptible to diseases such as heart disease, diabetes, osteoporosis and depression. Therefore, it is important to promote a healthy lifestyle and maintain physical activity in the third age (Rumiha, 2022).

Exercise in groups, as an organized and reproducible part of physical activity, has a number of benefits for physical and mental health, but also has a positive effect on social bonding and social contact. It is important for older people to participate in organized exercise groups where the exercises are adapted to their age, with a focus on maintaining balance and strength, as well as preventing falls and maintaining healthy aging. Evaluating the effectiveness of group exercise as part of physical activity is very important to prove the positive effects on health in general and to confirm the fact that it is never too late to exercise. In this study, the focus was on evaluating the effects of group exercise on the quality of life of older people. And it examines differences in the effectiveness of exercise among older adults with different baseline levels of physical activity and motivation to participate in group exercise, and identifies the rationale for engaging older people in the exercise program.

## METHODS

Quantitative and qualitative research methods are used in the study. Participants are elderly (60-91 years old) who participate in an age-appropriate exercise program led by students in the Undergraduate Physiotherapy Undergraduate Study Program. Inclusion criteria for this study included participation in two consecutive measurements (the first measurement and the second after 1 year of participation in group exercise, with no major absences).

The program of group exercise is performed twice a week for one hour.

The quantitative part included measurements and physical tests, including measurement of forward flexion, lateroflexion in the left and right sides, measurement of handgrip strength, Romberg test and Timed up and go test". Quality of life is assessed with the World Health Organization Quality of Life Questionnaire (WHOQOL), which has been validated by the World Health Organization and can be used free of charge (WHO, 2012). The questionnaire consists of a general health item and three subgroups that include quality of life, physical appearance, and motivation. Responses are recorded on a Likert scale, with 1 representing "I strongly disagree" and 5 representing "I strongly agree"

The qualitative data for this study were obtained through the interview method, for which a protocol was created for the facilitator to collect data on older people's perceptions, attitudes, and opinions about the experience of participating in group exercise, motivation, and expectations of the exercise program, as well as ratings of the amount of physical activity and their lifestyle habits.

## RESULTS OF THE QUANTITATIVE PART

In the exercise group, 55 women participated continuously, but in the quantitative part of the measurement, the results of 18 women who were continuously monitored by measurements are presented. The values obtained by measurements showed improvement of individual parameters. After 1 year of participation in group exercises, handgrip strength improved for both hands, right hand from 24.3 kg to 25.7 kg and left arm from 23 to 24 kg. After participation in the exercises, forward flexion and lateroflexion improved, indicating better spinal mobility, balance, and flexibility. Handgrip strength became stronger compared to the previous year, especially in the right hand. Balance and coordination are better, as measured by the Romberg test. Participants are faster and more agile, as shown by the results of the Timed Up and Go test (Table 1).

	Handgrip strength R (kg)	Handgrip strength L (kg)	Forward flexion (cm)	Lateroflexia R (cm)	Lateroflexia L (cm)	Romberg test (s)	TUGT (s)
2021.	24,29	22,97	4,21	13,16	13,35	5,55	10,23
2022.	25,69	23,97	3,89	15,33	16,39	5,39	8,00

**Table 1:** Display of measurement results before and after 1 year of participation in group exercises

### Quality of life

Most respondents (61.8%) rate their quality of life as a three, which means neither good nor bad. 54.5% are quite satisfied with their health. Pain prevents 52.7% of respondents from fulfilling their obligations and performing their daily activities.

Most of the participants are satisfied with their physical appearance and with being able to exercise well and very well, while a few gave a score of three, which means neither bad nor good.

To participate in this program, they have the support of friends, which affects their motivation and the respondents are quite satisfied and very satisfied. Negative feelings such as despair, anxiety and in general sometimes or almost never occur (Table 2).

score	satisfaction with the quality of life	satisfaction with the health.	Pain prevents me from fulfilling my obligations.	I am satisfied with my physical appearance.	I can move sufficiently.	I can perform my daily activities.	I have support from my friends.	I have negative feelings like despair and anxiety.
1	1,8	1,8	10,9	1,8	0,0	1,8	0,0	16,4
2	1,8	9,1	36,4	5,5	3,6	1,8	7,3	<b>67,3</b>
3	<b>61,8</b>	34,5	<b>40,0</b>	23,6	18,2	27,3	12,7	5,5
4	27,3	<b>52,7</b>	12,7	<b>41,8</b>	<b>45,5</b>	<b>54,5</b>	<b>56,4</b>	9,1
5	7,3	1,8	0,0	27,3	32,7	14,5	23,6	1,8

**Table 2:** Display of questionnaire results before and after 1 year of participation in group exercises (WHOQOL) (%)

### RESULTS OF QUALITATIVE METHOD- INTERVIEW

Respondents who had never exercised found motivation in realizing that laziness and feelings of dissatisfaction can be mistaken for something positive. Many of them did not have time for themselves because they had the obligation to take care of their grandchildren, which they say kept them somewhat in shape, but as the grandchildren grew up, a surplus of time presented itself and they decided to do something useful for themselves by engaging in an exercise program. Through the exercise program, many of the respondents made new acquaintances and friends. They say that exercise is a good "excuse" for them to get outside, and they have psychosocial and physical benefits.



*"Since I retired, I do not go anywhere else. A friend who retired at the same time as me found this program and said we should try it. Of course, I could not wait and we have made a wonderful team here."*

Many of the participants in the group exercise program were previously physically active in the form of regular walking or similar physical activity, while others participated in another group program. Those who had participated in the second group program preferred the program led by physical therapy students because of its better organization, systematization, and general atmosphere during the exercises.

*"These exercises are great, there is a plan, that is warm up, so a little activity, then a little stretching and so it is planned. It's very convenient for me and I plan to continue next year."*

The respondents state that the exercise program is very suitable for them and highlight as positive that they can organize everything themselves and are in contact with the students. The exercises are organized and designed in such a way that everyone can follow them. For participants who have a limited range of motion or cannot perform certain movements, the students have also designed substitute exercises that follow the rhythm of the exercise.

*"Everything I expected, I got. I feel better, I am more mobile, my company is great, the women are all ok, you students are so beautiful I am at a loss for words. One thing I wish was some heavier exercise, but I know we can not do that for the sake of the others. "*

The students who lead the exercises not only plan the exercises, but also perform them themselves. In this way, not only physical well-being is promoted, but also social interaction with the elderly (intergenerational socialisation) and gaining professional experience. The group exercises lead to the development of professional communication, the design and implementation of training and adaptation to the diagnoses of the participants.

## DISCUSSION

This study is consistent with the results of other studies that emphasise the constructive properties of exercise. In this study, we showed how physical and social aspects affect the vitality and functioning of older people. Through exercise, participants lost weight, increased their grip strength, became more mobile and flexible, and improved their balance and coordination. Although the results show only small improvements, they are all important as participants age. Because of their own progress, the motivation and support they receive from friends and family increases. In addition, other studies more accurately show that using exercise to treat depression in older people has an antidepressant effect and also reduces vulnerability to anxiety and stress reactivity, which has a significant impact on improving quality of life (Awick et al., 2017). In addition, exercise significantly reduces the development of cardiovascular disease, obesity, falls, osteoporosis, and congenital disorders (McPhee et al., 2016).

## CONCLUSION

Physical activity in the form of group exercise has a positive effect on all three areas of health. Physical, because flexibility, balance and muscle strength improve and physical functioning is enhanced, and psychological, because quality of life improves. Social benefits come from socializing before and after exercise, a sense of belonging to the group, mutual support, and intergenerational interaction. Planned group exercise teaches healthy habits and increases social interaction between older people, benefiting both the participants and the older people.

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# COMPARING SELF-RATED HEALTH IN STUDENTS: REGULAR PHYSICAL EDUCATION CLASSES VS. STUDENT ATHLETES

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## ABSTRACT

The aim of this work is to investigate the differences in self-rated health between students who participate in student sports and those who participate in regular physical education classes. The present study included 125 students (91 females and 34 males) from the Faculty of Economics, University of Zagreb, with an average age of  $20.21 \pm 1.54$  years. Participants were randomly selected and consisted of 71 students who participated in regular physical education classes and 54 students who were members of sports teams participating in the University Championship of the University of Zagreb. Self-rated health was assessed by using single-item question: "How would you rate your health?" with five responses: (1) very poor, (2) poor, (3) fair, (4) good and (5) excellent. We categorized the outcome as "poor" health (responses very poor and poor) and "good". The differences between the two groups were analyzed by using the Man-Whitney U-test. The significance level was set up at  $p < 0.05$ . The results show that student athletes reported a significantly better ( $p < 0.000$ ) self-rated health (4.31) than students from regular physical education classes (3.44). Moreover, it is evident that athletes have a lower body weight ( $p < 0.006$ ) and BMI ( $p < 0.005$ ) compared to their non-athlete counterparts, with statistically significant differences between the two groups. Given these findings, it is imperative to raise awareness about the importance of sports participation among students, along with other recreational programs that complement physical education.

**Keywords:** Health, Student sports, Physical Education

## INTRODUCTION

In recent years, academic sports programmes have become increasingly important in Croatia. These programmes offer students who have had to give up sport due to their academic commitments the opportunity to continue playing sport at a high level. Academic sports competitions aim to promote students' physical health and well-being as well as their cognitive and academic performance. Through such a competitive system, students not only build their academic skills, but also have the opportunity to return to the competitive sport system, potentially leading them back into elite sport.

Student sports have been found to have numerous benefits for both physical and mental health, academic performance, and social skills development in students (Biddle & Asare, 2011; Eime et al., 2013). Regular participation in sports can improve physical fitness, reduce the risk of chronic diseases, and enhance cognitive function and academic achievement (Donnelly et al., 2016).

Self-rated health has become an increasingly important area of research because of its importance to public health and its ability to predict future morbidity and mortality. Self-rated health refers to a person's subjective assessment of their general health and quality of life. It is a simple but powerful health indicator that can reflect a person's physical, emotional and social well-being. In this context, this paper will discuss the concept of self-rated health, its meaning and the factors that influence it.

Self-rated health has been found to be a robust predictor of morbidity and mortality across various populations and age groups (Idler & Benyamini, 1997; Jylhä, 2009). Numerous studies have reported that individuals who rate their health as poor are more likely to experience chronic diseases, disability, and premature death compared to those who rate their health as good or excellent (Benyamini, Idler, & Leventhal, 2000; DeSalvo et al., 2005). Therefore, self-rated health has been recognized as an essential tool for monitoring and evaluating population health and assessing the effectiveness of health interventions (Jylhä, 2009). Several factors have been found to influence an individual's self-rated health, including demographic, socioeconomic, behavioral, and health-related factors (Mackenbach et al., 2008). Demographic factors such as age, gender, and race have been shown to be associated with self-rated health, with women, older adults, and individuals from minority groups more likely to rate their health as poor (DeSalvo et al., 2006). Socioeconomic status has also been found to be a strong predictor of self-rated health, with individuals from lower socioeconomic backgrounds more likely to rate their health as poor (Mackenbach et al., 2008). Health behaviors such as physical activity, smoking, and alcohol consumption have also been found to be associated with self-rated health (DeSalvo et al., 2005).

The aim of this paper is to investigate the differences in self-rated health between students who participate in student sports and those who participate in regular physical education classes.

## METHODS

The present study included 125 students (91 females and 34 males ) from the Faculty of Economics, University of Zagreb, with an average age of  $20.21 \pm 1.54$  years. Participants were randomly selected and consisted of 71 students who participated in regular physical education classes and 54 students who were members of sports teams participating in the University Championship of the University of Zagreb (UniSport Zg). The data collection process was conducted in accordance with ethical guidelines and ensured anonymity of the respondents. We measured the height of the subjects using an anthropometer and their body weight using a medical scale to describe the sample and calculate the body mass indeks (BMI). Self-rated health (SRH) was assessed by using single-item question: "How would you rate your health?" with five responses: (1) very poor, (2) poor, (3) fair, (4) good and (5) excellent. We categorized the outcome as "poor" health (responses very poor and poor) and "good" (responses fair, good and very good). SRH serves as a good predictor of mortality (Idler, Benyamini, 1997). The research data was collected anonymously and in compliance with the Declaration of Helsinki. Statistical analysis was conducted to determine the differences between groups using Mann-Whitney's U-test. A significance level of  $p < 0.05$  was considered to indicate statistical significance. The data were analyzed using the Statistica 13.3 software package.

## RESULTS

Table 1 displays the descriptive parameters of the respondents, as measured in the above-mentioned variables. The results show that the respondents' average BMI is 22.51, which indicates a desirable body mass category according to the World Health Organization's (2000) classification. Specifically, a BMI below 18.5 signifies malnutrition, while a BMI between 18.5 and 24.9 denotes an ideal weight. A BMI ranging from 25.0 to 29.9 indicates being overweight, while a BMI higher than 30 signifies obesity. The measured values range from 17.86 to 34.89. Furthermore, the self-rated health of all respondents is slightly below an very good, with an average rating of 3.82.

**Table 1.** Basic descriptive statistics of the study respondents.

Variable / N= 125	Mean	Min	Max	SD	Skew	Kurt
AGE	20,21	19,00	26,00	1,54	1,50	1,82
BH	172,20	155,00	198,00	8,68	0,54	0,10
BW	67,04	48,00	100,00	12,19	0,88	0,24
BMI	22,51	17,86	34,89	3,08	1,23	2,64
SRH	3,82	2,00	5,00	0,81	-0,40	-0,17

Legend: BH-body hight, BW-body weight, BMI-body mass indeks, SRH- Self-rated health

The findings of the analysis conducted to determine the differences between two groups of respondents are presented in Table 2. The groups were classified into "athletes who compete in the UniSport Zg system" and "students who attend regular physical education classes." Out of the 125 students who participated in the study, 71 attended classical physical education classes, while 54 were athletes. The differences between the two groups in the observed variable SRH (self-rated health) were analyzed using the Man-Whitney test. The significance level was set at  $p < 0.05$  to determine the statistical significance of the differences observed.

**Table 2.** Differences between the groups by using the Mann-Whitney U-test

Study variables	Athletes (N=54) mean±s.d.	Physical education (N=71) mean±s.d.	p-value
AGE	20.22±1.33	20.20±1.70	0.302
BH	171.65±8.56	172.62±8.81	0.524
BW	63.80±10.53	69.51±12.84	0.006
BMI	21.54±2.13	23.25±3.48	0.005
SRH	4.31±0.54	3.44±0.77	0.000

Legend: BH-body hight, BW-body weight,, BMI-body mass indeks, SRH- Self-rated health

## DISCUSSION

The aim of this work is to investigate the differences in self-rated health between students who participate in student sports and those who participate in regular physical education classes. The research findings indicate a statistically significant differences between student athletes and students attending regular physical education classes in terms of their self-rated health status. The results show that student athletes reported a significantly better ( $p < 0.000$ ) self-rated health (4.31) than students from classical physical education classes (3.44). Moreover, it is evident that athletes have a lower body weight ( $p < 0.006$ ) and a lower BMI ( $p < 0.005$ ) compared to their non-athlete counterparts, with statistically significant differences between the two groups. The Body Mass Index is undoubtedly one of the predictors of an individual's health status, including both their physical and mental well-being. Several authors have highlighted the benefits of participating in sports. For instance, Donnelly et al. (2016) emphasized that playing sports is crucial for improving cognitive functions and academic achievement.

## CONCLUSION

This research has certain limitations, such as the absence of information regarding the amount of time spent by student-athletes in training and competitions per week, as well as the lack of data on the number of physically active students attending regular physical education classes and the time they spend engaging in such activities. To address these limitations, future studies could consider a larger sample of students, categorized into three groups: student-athletes competing in the university championship, physically inactive students attending regular physical education classes, and a third group of students participating in recreational sports within the regular physical education classes. Given findings in this paper, it is imperative to raise awareness about the importance of sports participation among students, along with other recreational programs that complement physical education.

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# THE POWER OF MINDSET AND ITS ROLE IN THE PSYCHOLOGICAL WELL-BEING OF STUDENT-ATHLETES, STUDENT-EXERCISERS, AND NON-ACTIVE STUDENTS

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## ABSTRACT

This research aimed to explore the psychological well-being of students who rarely or never engage in physical activity, recreational student-exercisers and active student-athletes and the influence of their belief in benefits of physical activity (PA) on psychological well-being. A sample of 387 students ( $N_{\text{female}} = 279$ ) aged between 18 and 27 years ( $M_{\text{age}} = 21.56$ ,  $SD = 2.06$ ) took part in the study. We measured psychological well-being using a shortened version of Riff's psychological well-being scale. Based on their rate to the questions on their belief in the positive impact of PA on their PH on a scale from 1 to 7 (with a larger number indicating firmer beliefs on the more substantial impact of PA), we categorized participants as a group with lower, moderate, and firmer belief in the positive impact of PA on PH. The results showed that belief in the positive impact of PA on PH moderated the impact of different levels of PA on psychological on autonomy, personal growth, and self-acceptance. Specifically, if their belief in positive impact of PA on PH was lower or moderate student-athletes showed lower autonomy. Furthermore, student-athletes and student-exercisers with lower belief in positive impact of PA on PH exhibited lower personal growth and self-acceptance, while self-acceptance was highest among student-athletes with firmer belief in positive impact of PA on PH. We discuss these findings within the Growth mindset theory emphasizing the possible moderating role of sets of beliefs in the assumed beneficial effect of PA on students' psychological well-being and suggest the practical relevance of the positive effect of belief in the mentally beneficial effect of PA.

**Keywords:** *Mindset, physical activity, psychological well-being, students*

## INTRODUCTION

Increased emphasis on physical activity (PA) not only as a preventive factor for physical health but as the maintenance and improvement of psychological health (PH) raised numerous research questions on the relationship between physical activity and psychological well-being. A very recent review of John W. Brick Mental Health Foundation (2022) showed that 89% of all published peer-reviewed research between 1990 and 2022 found a positive, statistically significant relationship between physical activity and/or exercise and mental health. The results are in line with earlier systematic review that showed a consistently positive association between physical activity level and health-related quality of life (Bize et al., 2007).

However, although the mental health benefits of physical activity are empirically well supported, some questions are still open. In that line, it is important to highlight that these empirical insights mainly come from studies that have focused on clinical populations such as individuals with depression and anxiety or from studies related to age-related cognitive decline.

Thus, having in mind the definition of health offered by the World Health Organization (WHO, 2005) as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity offered, the question raised is whether physical activity benefits the well-being of a general population, not just ill-being of a clinical population. A fairly recent meta-analysis legitimates this question showing inconsistencies in the relationship between different levels of physical activity and mental health (White et al, 2017). The authors concluded that despite the well-accepted relationship between PA and mental health indicators, we have to be aware of specific factors that mediate or moderate these relationships.

One such potential moderator of the impact of physical activity on mental health we may find in the arguably ground-breaking study of Crum and Langer (2007). In their study, the authors showed that one's mindset moderated the relationship between exercise and physical health. More specifically, hotel room attendants, whose everyday work implies exerting activities very similar to exercise, were assigned to one of two conditions: informed or control. Unlike the control group of subjects, the informed group of subjects received information that their daily housekeeping work satisfied the CDC's (Centers for Disease Control and Prevention, 1996) recommendations for an active lifestyle and that exercise does not necessarily need to be hard or painful to be good for one's health. In other words, they received the message that their work is good exercise. Physiological parameters including weight, body mass index, body fat percentage, waist-to-hip ratio, and blood pressure (systolic and diastolic) were taken for both groups at Time 1 (before the intervention started) and Time 2 (four weeks later). Results showed that, except for diastolic blood pressure, the decline in all physiological indicators was significantly more pronounced in the informed group than in the control group. The findings indicated that the mindset or the degree of an individual's belief in a certain benefit (like with the placebo effect), in this case, the effect of physical activity, may play a significant role in the magnitude of a positive effect of physical activity on health. As Crum and Langer (2007) highlighted, the role of mindset in moderation and enhancing health should be further identified, substantiated, and utilized.

Another possible moderator is the level of physical activity engagement, particularly in sports. Despite the fact that sports imply physical activity mechanisms that may be beneficial to athletes' mental health, we are aware of the constant challenges athletes experience (such as competition stress, training pressure, uncertainties, etc.) that may harm their mental health.

Having in mind two aforementioned possible moderators, in this study we explored the psychological well-being of students who rarely or never engage in physical activity, recreational student-exercisers and active student-athletes and the influence of their beliefs in psychological health benefits of physical activity on psychological well-being.

## METHODS

Participants in this study were 387 students (students from 4<sup>th</sup> grades of Croatian high schools and students at Croatian universities, 72.1 % of whom were female) aged between 18 and 27 years ( $M = 21.56$ ,  $SD = 2.06$ ) who participated in the research project "Physical activity and psychological well-being: from habit to identity".

This study was a part of the research project "Physical Activity and Psychological Well-being: from Habit to Identity", funded by the Catholic University of Croatia. The Ethics Committee of the Catholic University of Croatia approved the study. We prepared the survey using the SurveyRock online platform. Within the first part of the survey, we informed participants about the purpose of the study, anonymity, and confidentiality of the data. Furthermore, we indicated that the data would be analysed only at the group level and highlighted the possibility of withdrawing from the research at any time with no repercussions. At the end of this part, we asked participants whether they consented to participate in the study. If they agreed to participate in the study, they clicked the "next" button.



## Measures

### *Physical activity levels*

To report on their participation in physical activity/sports students answered the question *Are you engaged in any exercise or sports activity, and if so, at what level?* Choosing one option/a number between 1 and 5 (1 - *I am not or I am very rarely engaged in exercise or sports activities*, 2 - *I am recreationally but not so actively engaged in sports (for example once a week, three times in two weeks, occasionally or similar)*, 3 - *I am recreationally actively engaged in sports (for example couple of times a week, 2-3 times and more)*, 4 - *I train a certain sport and compete at an amateur level*, 5 - *I train a certain sport and compete at a professional level*).

Based on their responses we categorized three groups of students. Students who selected *option 1* were classified as Not or rarely engaged in physical activities (PA). Students who responded with a number 2 or 3 were classified as recreational student-exercisers, while those who responded with a number 4 or 5 were classified as active student-athletes.

### *Psychological well-being*

A shortened version of Ryff's (1989) psychological well-being scale was used to assess psychological well-being. It measures six aspects of well-being (autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance) and overall well-being. A shortened version includes three items for each aspect of well-being. Item agreements scaled from 1 (strongly disagree) to 7 (strongly agree). Higher scores reflected greater psychological well-being. Internal consistency (Cronbach  $\alpha$ ) of autonomy ( $\alpha = .66$ ), environmental mastery ( $\alpha = .73$ ), personal growth ( $\alpha = .68$ ), and self-acceptance ( $\alpha = .72$ ), subscales indicated acceptable reliability. However, subscales: positive relations with others ( $\alpha = .59$ ) and purpose in life ( $\alpha = .48$ ) showed less acceptable reliability.

### *Belief in the positive impact of physical activity on psychological health*

Data on participants' beliefs in the positive impact of physical activity (PA) on psychological health (PH) was obtained using the question: *"Do you think that the amount of your physical activity has a positive effect on your psychological health?"* which participant rated using a seven-point rating scale (1 - *no, not at all*, 7 - *yes, extremely*).

We formed three groups according to their answer on the scale. The group with lower (answers 1, 2 or 3), moderate (answer 4 or 5) and firmer (answer 4 or 5) belief in the positive impact of PA on psychological health PH.

## RESULTS

To test the effects of levels of PA, belief in the positive impact of PA on PH and levels of PA  $\times$  beliefs in the positive impact of PA interaction we performed a factorial two-way ANOVA (3 $\times$ 3) for each dependent variable followed by a simple effect analysis if significant interaction was revealed. The significance level for each analysis was set at .05.

If a significant interaction was revealed, we interpreted a significant main effect only if simple effect analyses had confirmed its relevance. The means and standard deviations of psychological well-being variables for all levels of PA and belief in the positive impact of PA on PH groups are shown in Table 1, along with the main and interaction effects. Estimated marginal means and 95% confidence intervals are illustrated graphically in Figure 1.

		Effects															
		Belief in the Positive Impact of PA on PH				Levels of PA				Beliefs in the Positive Impact of PA on PH				Levels of PA × Belief			
		Lower	Moderate	Firmer	F	p	η <sup>2</sup>	F	p	η <sup>2</sup>	F	p	η <sup>2</sup>	F	p	η <sup>2</sup>	
Autonomy	Nor or rarely engaged in PA	11.91 (2.25)	13.04 (2.65)	12.61 (2.43)													
	Recreational student-exercisers	12.50 (3.54)	12.31 (2.50)	12.93 (2.79)	5.09	.007	.03	4.44	.012	.02	3.05	.017	.03				
	Active student-athletes	9.00 (2.83)	9.75 (2.99)	12.89 (2.52)													
Environmental Mastery	Nor or rarely engaged in PA	10.44 (4.01)	11.60 (2.82)	12.14 (3.00)													
	Recreational student-exercisers	11.00 (2.83)	11.50 (2.85)	13.16 (2.39)	0.29	.746	< .01	6.67	.001	.03	1.10	.355	.01				
	Active student-athletes	9.20 (3.63)	12.50 (3.42)	13.35 (2.03)													
Personal Growth	Nor or rarely engaged in PA	14.84 (2.54)	14.89 (2.27)	15.63 (2.45)													
	Recreational student-exercisers	15.50 (0.71)	15.44 (2.00)	16.22 (2.08)	3.68	.026	.02	9.43	<.001	.05	2.53	.040	.03				
	Active student-athletes	12.60 (2.07)	12.75 (2.22)	16.14 (1.91)													
Positive Relations with Others	Nor or rarely engaged in PA	12.09 (4.12)	13.55 (2.73)	14.00 (2.77)													
	Recreational student-exercisers	7.50 (6.36)	12.75 (2.82)	14.02 (2.74)	2.78	.063	.01	10.98	<.001	.06	1.51	.199	.02				
	Active student-athletes	11.00 (2.35)	14.50 (4.04)	14.37 (2.67)													
Purpose in Life	Nor or rarely engaged in PA	13.63 (2.38)	13.83 (2.45)	13.68 (2.09)													
	Recreational student-exercisers	10.50 (0.71)	13.00 (2.66)	14.01 (2.12)	3.21	.041	.02	3.28	.039	.02	1.76	.137	.02				
	Active student-athletes	12.60 (2.41)	12.25 (2.87)	13.40 (2.47)													
Self-Acceptance	Nor or rarely engaged in PA	11.38 (3.05)	13.04 (2.58)	13.14 (2.88)													
	Recreational student-exercisers	9.00 (4.24)	11.50 (3.50)	13.60 (2.93)	1.55	.213	.01	13.73	<.001	.07	2.89	.022	.03				
	Active student-athletes	10.60 (4.16)	10.50 (4.12)	14.37 (2.16)													

**Table 1.** Means and standard deviations on dimensions of psychological well-being among students with different le

Note: Means and standard deviation in parentheses are depicted. PA = physical activity, PH = psychological health

The results of two-way ANOVA showed a significant interaction effect of levels of PA and belief in the positive impact of PA on PH on autonomy,  $F(4,378) = 3.05$ ,  $p = .017$ ,  $\eta^2 = .03$ . Simple effect analyses demonstrated lower autonomy of active student-athletes if their belief in the positive impact of PA on PH was lower or moderate. In other words, active student-athletes whose belief in the positive impact of PA on PH was firmer demonstrated significantly higher autonomy compared to those with lower or moderate belief.

The levels of PA  $\times$  beliefs in the positive impact of PA on PH interaction and the main effect of levels of PA on environmental mastery were not significant ( $p > .250$ ). There was a significant main effect of beliefs in the positive impact of PA on PH on environmental mastery  $F(2,378) = 6.68$ ,  $p = .001$ ,  $\eta^2 = .03$ . Students with a firmer belief in the positive impact of PA on PH exhibited the highest, while students with a lower belief in the positive impact of PA on PH exhibited the lowest environmental mastery.

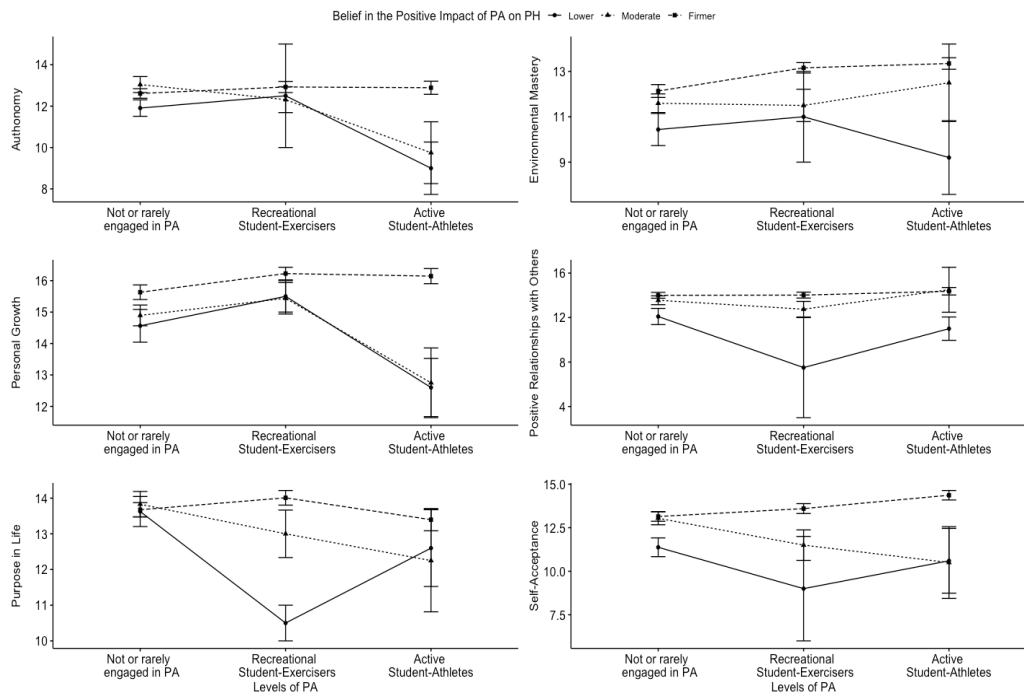
The analysis, furthermore, revealed a significant interaction effect of levels of PA  $\times$  beliefs in the positive impact of PA on PH on personal growth  $F(4,378) = 2.53$ ,  $p = .040$ ,  $\eta^2 = .03$ . Simple effect analyses showed that active student-athletes with lower or moderate belief in the positive impact of PA on PH expressed lower levels of personal growth. Conversely, active student-athletes with firmer belief in the positive impact of PA on PH expressed the same level of personal growth as recreational student-exercisers with firmer beliefs and a higher level of personal growth than students not or rarely engaged in PA with firmer beliefs.

The statistically significant main effect of the belief in the positive impact of PA on PH,  $F(2,377) = 9.43$ ,  $p < .001$ ,  $\eta^2 = .05$ , regardless of significant interaction (with further post hoc analysis) showed higher levels of personal growth of students with a firmer belief in the positive impact of PA on PH.

The analyses yielded no statistically significant interaction effect of the levels of PA  $\times$  beliefs in the positive impact of PA on PH interaction on positive relations with others ( $p = .199$ ). The significant main effect of beliefs in the positive impact of PA on PH on personal growth was found,  $F(2,378) = 10.98$ ,  $p < .001$ ,  $\eta^2 = .06$ , while the main effect of levels of PA was approaching statistical significance  $F(2,378) = 2.78$ ,  $p = .063$ ,  $\eta^2 = .01$ . As shown in post hoc analyses, students with firmer and moderate belief compared to students with a lower belief in the positive impact of PA on PH exhibited more positive relations with others. Also, active student-athletes exhibited slightly more positive relations with others compared to students not or rarely engaged in PA.

The results further revealed no statistically significant interaction effect of the levels of PA  $\times$  beliefs in the positive impact of PA on PH interaction on purpose in life ( $p = .137$ ). Statistically significant but rather small main effects of the level of PA,  $F(2,378) = 3.21$ ,  $p = .041$ ,  $\eta^2 = .02$ , and beliefs in the positive impact of PA on PH,  $F(2,378) = 3.28$ ,  $p = .039$ ,  $\eta^2 = .02$ , were found. As shown with post hoc analyses, the results suggested slightly higher levels of purpose in the life of students with firmer beliefs compared to students with moderate and lower beliefs in the positive impact of PA on PH, and slightly higher purpose in the life of recreational student-exercisers compared to active-student athletes.

A significant interaction effect of the levels of PA  $\times$  belief in the positive impact of PA on PH interaction on self-acceptance was shown  $F(4,378) = 2.89$ ,  $p = .011$ ,  $\eta^2 = .03$ . Simple effect analyses indicated decreased self-acceptance among recreational student-exercisers and active student-athletes if their belief in the positive impact of PA on PH was lower or moderate. Conversely, if their belief in the positive impact of PA on PH was firmer, active student-athletes exhibited the highest levels of self-acceptance. Among students who were not or rarely engaged in PA, those with a lower belief in the positive impact of PA on PH exhibited lower self-acceptance compared to those with a moderate or firmer belief in the positive impact of PA on PH.



**Figure 1.** The psychological well-being of students not or rarely engaged in PA, student exercisers and student-athletes with lower, moderate, and firmer belief in the positive impact of PA on PH

## DISCUSSION

The consistency of the positive effect of belief in the mentally beneficial effect of physical activity (PA) on all dimensions of psychological well-being, whether independently or dependent on the physical activity level of students, showed the importance of one's mindset in psychological well-being. Furthermore, the results of the study suggest that firm belief in the positive impact of PA on psychological health (PH) may serve as a protective factor for active student-athletes or the factor that helps them to harness the benefits of regular training they are engaged in. More specifically, lower belief in beneficial PA impact on their PH of student-athletes may inhibit them from reaching higher levels of psychological well-being, as they showed lower levels of autonomy, personal growth, and self-acceptance. However, if their belief in the positive effect of PA on PH is firmer their autonomy is the same as the autonomy and personal growth of student-exercisers with the same level of belief in the mentally beneficial effect of PA. Moreover, student-athletes with firmer belief in the positive effect of PA on PH showed even higher levels of self-acceptance compared to student-exercisers and students not or rarely engaged in PA with the same level of belief in the positive impact of PA on PH. Similarly, firmer belief in the mentally beneficial effect of PA on PH may have a role in the harnessing benefits of PA among student exercisers. These findings may add new knowledge to the inconsistent empirical insights on the specific mental challenges high-level athletes face and their impact on their mental health (Gerber et al. 2011; Rice et al. 2016). When it comes to mindset, an indispensable theoretical model that explains these findings is the motivational theory of Growth mindset (Dweck, 2000; Yeager & Dweck, 2016) According to this theoretical framework growth mindset characterizes individuals with the belief that they can develop their skills through effort and perseverance which further enhances their desire for learning and growth and consequently may lead to psychological well-being. The firmer belief of individuals may also indicate their internal locus of control as a perception of more controllable environments and belief of themselves as in charge of what happens to them (Rotter, 1996; Rotter 1990).

Taking a step forward and considering interventions with the aim of more effective, healthier, and sustainable physical activity more beneficial for PH, these findings emphasize the importance of awareness and knowledge about the benefits of PA on psychological well-being. Promising theoretical models for such interventions is the Theory of planned behaviour (Ajzen, 1985; Ajzen 2020) and the Multi-process action control framework (Rhodes, 2021). Within the theory of planned behaviours, interventions can be focussed on behavioural, normative and control beliefs that determine attitudes, subjective norms and perceived behavioural control which then form intentions that lead to desired behaviour. Additionally, the multi-process action control framework adds regulation and reflexive processes which can reinforce the intention to the manifestation of behaviour, and empirical insights such as moderation role of belief in the mentally beneficial effect of PA on PH can strengthen these regulation and reflexive processes.

Although this study provides insightful empirical evidence, explanation with theoretical frameworks and offers practical tools, it is not without limitations. From the methodological and statistical viewpoint, there are several issues. Although variances across groups are homogeneous, differences in the number of participants across groups of levels of PA and beliefs in the positive impact of PA on PH are notable, which has led to wide confidence intervals which in turn limits statistical inference. Furthermore, we measured psychological well-being using a shortened scale which is a probable cause of the lower reliability of certain subscales, which calls for caution when concluding specific constructs. Meeting these limitations and encompassing other important variables such as type of sports and physical activity, there is a fruitful avenue for future studies on the role of mindset and physical activity in students' psychological well-being.

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# STUDENTS MENTAL HEALTH ATTRIBUTES IN RELATION TO ENGAGEMENT IN PHYSICAL ACTIVITY

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## ABSTRACT

The aim of this study was to investigate the mental health features of university students according to their involvement in physical activities. The research included 368 first year students at the University of Dubrovnik. The results show a high correlation between mental health characteristics and physical activity, proving that students who are more active have significantly fewer problems with self-esteem and fewer symptoms of depression. On the other hand, the level of physical activity could not be a determinant to differentiate students by their self-image. The study contributes to a better understanding of the reciprocal relationship between mental health and physical activity. The authors suggest better collaboration between mental health services and higher education institutions and recommend the most appropriate type of exercise to improve mental health.

**Key words:** *mental health, students, exercise, physical activity*

## INTRODUCTION

The increasingly sedentary lifestyles and insufficient physical activity among young people are becoming a major public health problem. Understanding the factors that influence students' mental health and well-being provides an opportunity to identify strategies that improve students' ability to cope with the challenges of higher education (Campbell et al., 2022). Student life brings common stressors, including adjustment to a new environment, increased academic demands, changes in social life, and many other challenges that affect a person's mental, emotional, and physical health during the particularly sensitive developmental period of late adolescence. The escalating number of students reporting pre-existing mental illness (Hughes, Spanner, 2019) and struggling with stress, anxiety, and depression, draws insufficient attention of responsible student mental health support services. Most research agrees that physical activity has a positive impact on an individual's physical and mental well-being. While in European countries more than 50% of the population is physically active on a regular basis, in Croatia, according to some research, it is less than 10% (Horga, 1999.). The aim of this study was to investigate the level of physical activity of students in relation to their mental health attributes.

## METHODS

The study included 368 randomly selected first-year students (201 men; 167 women) from different study departments enrolled at the University of Dubrovnik in the academic year 2017/2018 and 2018/2019. The variable sample was collected during the regular medical examination of the students, without identification evidence and in compliance with all GDPR regulations. Mental health status was examined with a questionnaire consisting of 16 statements. Responses were rated on a 4-point Likert scale: strongly agree (1), agree (2), disagree (3), strongly disagree (4).

<ol style="list-style-type: none"><li>1. I am mostly satisfied with myself</li><li>2. Sometimes I think I am worth nothing</li><li>3. I think I have many good qualities</li><li>4. I can do things as well as most</li><li>5. I do not think I have much to be proud of</li><li>6. Sometimes I feel completely useless</li><li>7. I feel that I am at least as valuable as others</li><li>8. I would like to respect myself more</li><li>9. On the whole, I tend to believe that I am a complete failure</li><li>10. I have a positive attitude towards myself</li></ol>	<p>How often in the last seven days have you:</p> <ol style="list-style-type: none"><li>1. Lost your appetite and desire for food</li><li>2. Had difficulty concentrating</li><li>3. Felt depressed</li><li>4. Felt that you could only fulfil your obligations with great effort</li><li>5. Felt sad (miserable)</li><li>6. Were unable to fulfil your commitments (at school, at home)</li></ol>
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Students' engagement in physical activity was assessed by the total amount of weekly physical activity in addition to compulsory physical education sessions provided in Croatian higher education institutions. The responses were classified into four categories:

- less than 1 hour per week - defined as "insufficient"
- up to 1 to 2 hours per week - defined as "insufficient"
- 3 to 4 hours per week - defined as "recreational"
- 5 hours or more - defined as "active"

The statistical method involved explanatory factor analysis of the mental health questionnaire. Component extraction was performed using Kaiser-Varimax rotation. The reliability of the questionnaire was verified using the Cronbach's alpha coefficient, and the normality distribution of the responses was tested using the Kolmogorov-Smirnov test. The data were processed with the Kruskal-Wallis H-test nonparametric method to investigate the statistically significant relationship between psychological characteristics and active lifestyle.

## RESULTS

The correlations and the mutual variability of the statements of the mental health questionnaire resulted in the extraction of three main components, which cumulatively explain 55.02% of the total variance. The components were defined as follows: 1. Poor self-esteem; 2. High self-image; 3. Symptoms of depression. The values of Cronbach's alpha, ranging from 0.783 to 0.812 (Table 2), demonstrate high reliability of each of the extracted factors.



**Table 1.** Rotated Component Matrix

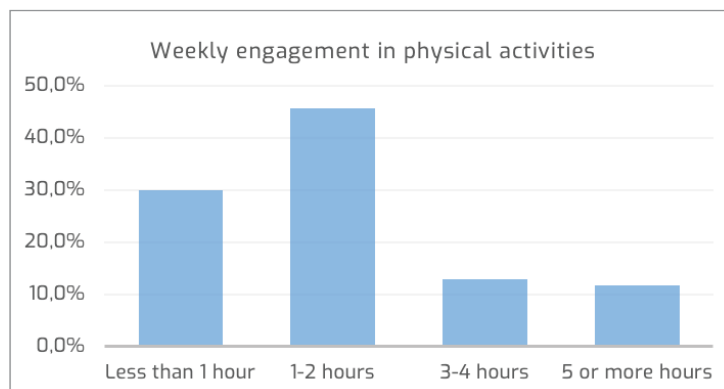
	Component		
	1	2	3
I am mostly satisfied with myself	-.543	<b>.306</b>	.264
Sometimes I think I am worth nothing	<b>.681</b>	-.246	-.278
I think I have many good qualities	-.309	<b>.656</b>	
I am capable of doing things as well as most other people	-.282	<b>.723</b>	
I do not think I have much to be proud of	<b>.751</b>		
Sometimes I feel completely useless	<b>.703</b>		-.280
I feel that I am at least as valuable as others		<b>.815</b>	
I would like him to respect myself more	<b>.641</b>		
On the whole, I tend to believe that I am a complete failure	<b>.600</b>	-.275	
I have a positive attitude towards myself	-.651	<b>.408</b>	.210
In the last seven days, how often have you - Lost your appetite and desire to eat?			<b>.568</b>
In the last seven days, how often have you - Had difficulty concentrating?			<b>.742</b>
In the last seven days, how often have you - Felt depressed?	-.416		<b>.643</b>
In the last seven days, how often have you - Felt that you had to make a great effort to fulfil your obligations?			<b>.712</b>
In the last seven days, how often have you - Felt sad?	-.393		<b>.666</b>
In the last seven days, how often have you - Felt unable to fulfil your obligations (at school, at home...)?			<b>.737</b>

There are many definitions of self-esteem, but the generally accepted explanation is self-respect and confidence in one's worth. Self-image encompasses the belief in one's own abilities and describes the way individuals portray themselves, either as a result of personal experience or by internalizing the judgments of others. Common signs of depression include physical, emotional, and mental symptoms such as persistent sadness, anxiety, feelings of worthlessness, hopelessness or guilt, thoughts of self-harm or suicide, fatigue, difficulty performing daily activities, changes in appetite or sleep patterns, and others.

**Table 2.** Factors reliability coefficient

		Cronbach's Alpha	Items
Factor 1	Poor self-esteem	.783	5
Factor 2	High self-image	.768	5
Factor 3	Symptoms of depression	.812	6

Figure 1. shows the level of students' weekly engagement in some form of physical activities whether as part of a dedicated sports club or a self-regulated exercise program. It is an alarming fact that 30% of students exercise less than one hour per week. Another 46% of the participants reported only one to two hours of physical activity per week, which is also considered insufficient. On the other hand, about 13% of the students exercise for three to four hours and 12% of them are active for five or more hours per week.



**Figure 1.** Students' involvement in physical activities

From the descriptive values of the mental health factors related to the level of engagement in the weekly exercise routine (Table 3), it is noticed that the median values within each component are similar. The lowest median values are found in the factor "High self-image", indicating the majority of affirmative responses. The highest median scores are found in the factor Poor self-esteem, although it should be noted that the questions in this component were reversely scaled, i.e. higher hours of physical activity indicate higher levels of self-esteem. The values of the Kolmogorov-Smirnov test impose the implementation of a nonparametric test, as the data are not normally distributed.

**Table 3.** Descriptive values of mental health factors and active life-style and their relation significance

Mental health factors	Amount of physical activities	N	Median (IQR)	Rank average	Kolmog-Smirnov			Kruskal-Wallis H		
					stat	df	Sig.	value	df	Asymp. Sig.
<b>Poor self-esteem</b>	less than 1 hour per week	110	3,20 (2,60 - 3,60)	170,90	,117	368	,000	12,893	3	<b>,005</b>
	1-2 hours per week	168	3,20 (2,80 - 3,60)	177,39						
	3-4 hours per week	47	3,20 (2,80 - 3,80)	195,49						
	5 and more hours per week	43	3,60 (3,20 - 3,80)	235,03						
<b>High self-image</b>	less than 1 hour per week	110	1,60 (1,40 - 2,00)	193,26	,119	368	,000	2,411	3	,492
	1-2 hours per week	168	1,60 (1,20 - 2,00)	183,91						
	3-4 hours per week	47	1,60 (1,20 - 2,00)	184,94						
	5 and more hours per week	43	1,60 (1,20 - 1,80)	163,91						
<b>Symptoms of depression</b>	less than 1 hour per week	110	2,00 (1,67 - 2,50)	197,48	,066	368	,001	10,417	3	<b>,015</b>
	1-2 hours per week	168	2,00 (1,58 - 2,33)	191,85						
	3-4 hours per week	47	2,00 (1,50 - 2,00)	165,34						
	5 and more hours per week	43	1,67 (1,17 - 2,17)	143,52						

The results of the Kruskal-Wallis H test confirm that there is a statistically significant correlation between the signs of low self-esteem, as well as symptoms of depression and the level of involvement in physical activities ( $p < 0.05$ ). The rank averages in Table 3 show that students who report higher levels of regular physical activity have higher self-esteem and report fewer symptoms of depression. In fact, the rank averages prove that their relationship is entirely proportional. The amount of physical activity was not found to have a significant effect on High self-image.

## DISCUSSION

The study showed that exercise has a positive effect on the mental health of students. In fact, the linear progression of rank averages from the obtained results proves a significant correlation between higher engagement in physical activities and lower self-esteem and fewer signs of depression. This statement is confirmed by other studies (Weinberg & Gould, 2011; Shaw et.al., 2005). The role of self-esteem is particularly important in adolescence, as it correlates with both academic achievement and mental health (Minev et.al., 2018). In general, an exercise program promotes a sense of progress, and consequently, increases the perception of one's own possibilities and abilities, builds satisfaction with one's appearance, and boosts self-esteem and self-confidence.

The signs of depression were found mainly among inactive students. These students were more likely to report instances of sadness, poor concentration, loss of appetite, and difficulty in completing daily tasks. Similar results have been found in other studies (Deng et.al., 2022; Travis et.al. 2020). According to Mirza et al. (2021), university students are more likely to suffer from depression than the general population. Exercise has been shown to be an effective treatment for depression (Carek et.al. 2011). It helps release endorphins and serotonin in the brain, which are natural chemicals that reduce stress and anxiety and improve mood (Basso & Suzuki, 2017), improve memory and thinking (Erickson et.al. 2019), and promote better sleep (Dolezal et.al. 2017).

According to Stojaković (2019), aerobic activities are particularly important for stress prevention. The focus should be more on regularity and habituation than on actual intensity, and this can only be achieved if it is interesting, attractive, and enjoyable. In addition, working in groups has a positive effect on satisfaction, perseverance, and socialization, which are prerequisites for long-term physical activity. In addition, there are certain activities that are recommended for stress reduction, such as: Outdoor activities (walking, hiking, cycling, rowing, and other cyclic activities); wellness activities (various forms of massage and hydromassage); low-intensity activities (such as swimming and diving); relaxation exercises (autogenic training, yoga, breathing exercises, meditation, stretching exercises, corrective exercises, etc.); and low-intensity aerobics.

The study also found that  $\frac{3}{4}$  of students are inefficiently engaged in physical activities. These results are consistent with the findings of Horga (1999). Given the increasingly sedentary lifestyle of young people, it is of utmost importance to explore different strategies to promote and stimulate various types of exercise. This also highlights the significance of physical education curricula in the Croatian higher education system. Although it provides only two hours of physical education per week, the course focuses maximally on the process of creating habits and awareness of the need for regular lifelong physical activity, developing anthropological characteristics, and improving new motor skills.

## CONCLUSION

Mental health challenges are prevalent in the lives of university students, so more attention needs to be paid to mental well-being in the school system. Higher education institutions should provide counseling services that identify and analyze the difficulties and provide recommendations to overcome mental health problems. This study confirms the widely accepted viewpoint that physical activity positively

influences mental health. The whole university environment should promote a healthy lifestyle, with an emphasis on physical activity. It is commendable that the Croatian higher education system implements compulsory physical education, but considering the extent of sedentary lifestyle among young people, it should aim to introduce additional, broad-based programs that match students' interests. The research findings may be useful for psychologists, kinesiologists, and educators to gain a more accurate insight into the mental health status of students.

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# THE RELATIONSHIP BETWEEN KINESIOLOGICAL ACTIVITIES AND POSITIVE EMOTIONAL STATES OF STUDENTS

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## ABSTRACT

The aim of this study was to investigate the relationship between time spent in kinesiological activities with the intensity of positive emotional states among the student population of the University of Zagreb during the COVID-19 pandemic. In this research the International Physical Activity Questionnaire (IPAQ-SF) and Questionnaire of the former engagement in kinesiological activities (KINAKT), were used to assess the frequency and duration of kinesiological activities. The intensity of positive/pleasant emotions among students was estimated with Positive and Negative Affect Schedule questionnaire (PANAS). Univariate and multivariate methods were used. The connections between the variables were estimated using the Pearson coefficient of correlation. The main study was conducted in the 2020/2021 academic year, on a final sample of respondents of the University of Zagreb (N=1000, M=48% and F=52%). A significant difference by gender was observed. The results show that male students are more active compared to female students and they are achieving better results and more values for pleasant affective experiences in the PANAS questionnaire. The research results show that less and less students are involved in any form of kinesiological activity. Positive affective experiences have been shown to develop in students engaged in any form of kinesiology activity.

**Key words:** kinesiology activity, students, positive/pleasant affective experiences

## INTRODUCTION

For many years, scientific research and knowledge of the influence of physical activity have shown that engaging in sports and recreation has a great impact on the global functioning of the people. Problems related to lack of movement and the consequences of prolonged daily sitting became particularly visible during the occurrence of the COVID-19 pandemic, when we could notice the appearance of various symptoms related to the physical and mental health.

A large number of studies show that people are insufficiently moving and that their kinesiology activity has been minimized (Ajman, 2016; Petrić et al., 2012). Furthermore, the research notes the higher activity of male respondents versus females (Fagaras et al., 2015; Singh, 2019; Inchley et al., 2020; Bednarek et al., 2016). Young men are more physically active due to greater general interest in sports and sporting events and are more often involved in team sports, while girls are more inclined to exercise individually and prefer seat-type activities (Ajman, 2016; Ćurković, 2010; de Privitellio, 2021; Vučić, 2004).

The primary goal of this research was to explore the connection of time spent in kinesiology activities with the intensity of positive emotional states in the student population.

## METHODS

The research was conducted by using a Google online form in the spring semester of the 2020/21 academic year, during the COVID-19 pandemic. All respondents were undergraduate and graduate students from University of Zagreb (N=1000, M=48% and F=52%). In this randomly chosen sample all the respondents were aged 19-48 (M=23.14, SD=2.72), with the majority of students studying in the field of social (47.5%) and technical sciences (25.4%). The participation in the survey was anonymous and voluntary. The research proposal was approved by the Ethical Committee, who also confirmed that the planned research procedure was in accordance with ethical principles.

The International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003) and Previous engagement in kinesiological activities Questionnaire (KINAKT) (Ćurković, 2010) were used to assess the frequency and intensity of kinesiological activities. The Questionnaire PANAS (Positive-PA and Negative-NA affective schedule) (Watson et al., 1988) was used to assess pleasant emotional conditions among students.

The SPSS software package (version 26.0, SPSS Inc., Chicago, IL, USA) was used to process the data. For all variables, descriptive parameters expressed through frequencies and percentages, arithmetic mean and standard deviations were calculated. Univariate and multivariate methods, correlation analysis and multiple linear regression were used. To check differences with regard to sociodemographic indicators, the Kruskal-Wallis H test was used, and to test differences in independent variables with two level (level of kinesiological activity), a nonparametric replacement for a t-test (Mann-Whitney U test) was used.

## MEASURING INSTRUMENTS

The IPAQ-SF questionnaire contains 7 items where respondents report physical activity that exceeded at least ten minutes in duration. Each participant's level of physical activity was measured and scored using the International Physical Activity Questionnaire (IPAQ – short form) posted on the IPAQ website ([www.ipaq.ki.se](http://www.ipaq.ki.se)). Participants reported the frequency (days per week) and duration (hours) of walking, and also moderate and vigorous physical activity that they engaged in during the week prior to survey. All respondents were classified into groups (high, moderate, and low PA). The results of the Spearman correlation coefficient range from 0.57 to 0.88 (Craig et al., 2003), while for the Croatian version it is 0.64 and based on that physical activity can be measured with a high level of reliability (Ajman et al., 2015).

Because IPAQ-SF does not cover kinesiology engagement in sports and recreational activities during growing up period, the KINAKT questionnaire was used. Previous engagement in kinesiological activities Questionnaire (KINAKT) (Ćurković, 2010) was constructed and conducted during the 2007/2008 academic year research survey for students of the University of Zagreb. As a new measuring instrument, based on empirical research of the student population in the world and previous scientific knowledge, KINAKT was used to get information about physical activity and sports or inactivity and getting out of sports during the childhood and growing up period.

An abbreviated part of the original KINAKT questionnaire contains 10 variables covering the previous engagement in sports and the reasons to give up sports activities, engagement in sport or recreational activities during the last month and in the last seven days were used. The metrical characteristics of the questionnaire to assess student engagement in kinesiology activities determined under different measurement models originally show good metric properties where Cronbach alpha was 0.978 (Ćurković, 2010).

Questionnaire PANAS (Positive-PA and Negative-NA affective Schedule (Watson et al., 1988) was used to assess pleasant emotional states. The 20-part PANAS questionnaire measures the frequency of experiencing pleasant and unpleasant emotional conditions in recent weeks (10 particles for the pleasant and 10 for unpleasant emotions). Respondents on a 5-degree Likert-type scale (1 – very low / single up to 5 – markedly) estimate the extent to which they are described by words denoting different affective states (Watson et al., 1988). Cronbach alpha for PA measured by authors of PANAS questionnaire was 0.870 (Watson et al., 1988), while in our study the Cronbach alpha for the pleasant emotional states was 0.880.

## RESULTS

Our findings show that 48.8% of all participants exhibited high physical activity levels, 36.1% exhibited moderate physical activity levels, and 15.1% exhibited low physical activity levels. Table 1 shows the average indicators for the factors obtained by the analysis. For each factor the arithmetic mean, the standard deviation, and the minimum and maximum values are shown.

	N	$\bar{x}$	Sd	Min	Max
HIGH PA	940	2328,1751	3845,47513	,00	40320,00
MODERATE PA	914	1180,2985	1722,30993	,00	13440,00
LOW PA	879	1495,4722	1923,40876	,00	16632,00
TOTAL PA	1000	4581,7975	5734,09042	,00	52794,00
POSITIVE EMOTIONS	1000	3,1182	,80990	1,00	5,00

**Table 1:** Average indicators for factors obtained by analysis

Since for all observed categories the signification levels of Kolmogorov-Smirnov and Shapiro-Wilk tests are not higher than 0.05, further analysis included the use of nonparametric tests.

	Gender	N	Arithmetic mean of ranks	Sum of ranks	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
TOTAL PA	M	480	526,25	252598,50	112441,500	247901,500	-2,709	<b>,007</b>
	F	520	476,73	247901,50				
	Total	1000						
POSITIVE EMOTIONS	M	480	535,22	256907,00	108133,000	243593,000	-3,655	<b>,000</b>
	F	520	468,45	243593,00				
	Total	1000						

a. Grouping Variable: gender

**Table 2:** Comparison of ranks by gender using the nonparametric tests. Bolded p-values denote statistical significance ( $p < 0.05$ )

The values for total physical activity and pleasant affective experiences were statistically significantly different ( $p < 0.05$ ) between gender. Results shown in Table 2 confirmed that the male students achieved higher results in all ranks (with higher scale values).

		N	Arithmetic mean of ranks (Average)	Kruskal-Wallis H	p	
MONTH						
Over the last month how many times have you participated in some sports and recreational activity that lasted at least 30 minutes	TOTAL PA	none per month	273	412,64	106,621	<b>,000</b>
		1-5 times/month	323	449,72		
		6-10 times/month	153	512,30		
		11-20 times/month	251	654,21		
	POSITIVE EMOTIONS	none per month	273	444,45	35,710	<b>,000</b>
		1-5 times/month	323	475,80		
		6-10 times/month	153	509,65		
		11-20 times/month	251	587,67		
WEEK						
Over the last week how many times have you participated in a sports and recreational activity that lasted at least 30 minutes	TOTAL PA	none per week	357	403,53	151,194	<b>,000</b>
		1x per week	185	436,30		
		2x per week	157	491,72		
		3x per week	129	597,68		
		4x and more	172	705,94		
	POSITIVE EMOTIONS	none per week	357	447,47	46,588	<b>,000</b>
		1x per week	185	479,22		
		2x per week	157	495,99		
		3x per week	129	514,19		
		4x and more	172	627,31		

a. Kruskal Wallis Test

**Table 3:** Comparison of ranks for different number of participations in some sports and recreational activity that lasted at least 30 minutes over the last month and week (Kruskal-Wallis H test). Bolded p-values denote statistical significance ( $p < 0.05$ )

Table 4 shows the correlation coefficients for the observed variables in the study. Correlation coefficients are presented to determine whether the factors are in a positive or negative relationship.

		1	2	3	4	5
1. VIGOROUS - INTENSITY	r	1,000	,500**	,136**	<b>,808**</b>	,207**
	p	.	,000	,000	,000	,000
	N	940	890	845	940	940
2. MODERATE - INTENSITY	r	,500**	1,000	,302**	<b>,698**</b>	,174**
	p	,000	.	,000	,000	,000
	N	890	914	832	914	914
3. WALKING	r	,136**	,302**	1,000	<b>,556**</b>	,134**
	p	,000	,000	.	,000	,000
	N	845	832	879	879	879
4. TOTAL PA	r	,808**	,698**	,556**	1,000	,226**
	p	,000	,000	,000	.	,000
	N	940	914	879	1000	1000
5. POSITIVE EMOTIONS	r	,207**	,174**	,134**	,226**	1,000
	p	,000	,000	,000	,000	.
	N	940	914	879	1000	1000

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* . Correlation is significant at the 0.01 level (2-tailed).

**Table 4:** Spearman's correlation coefficient (Spearman's rho\*\*)



## DISCUSSION

Many research has shown that engaging in an individual's physical activities contributes not only to physical but also to mental well-being and is positively related to improving the quality of life (Pucci et al., 2012).

Our study was conducted using the International Physical Activity Questionnaire (IPAQ-SF). The IPAQ is the most widely used and comprehensive evaluation tool that accounts for all domains of vigorous and moderate intensity exercise and walking (Brown et al., 2004).

Comparing physical activity in this study, a statistically significant difference was obtained between the observed groups by gender. University male students are more physically active than females, exercise more on higher intensity level (M=51.2%, F=48.8%) while female students generally train at the low (61.6%) and moderate intensity level (52.4%) (Fagaras et al., 2015; Singh, 2019; Inchley et al., 2020; Ajman, 2016; Bednarek et al., 2016).

It has been shown that by increasing the frequency of engaging in physical activity, growth and values for pleasant affective experiences are growing.

Similar results were obtained in a recent study by de Privitello (2021) where it has been shown to be common results according to which students beside more engagement in kinesiology activities show a higher level of positive emotions and lower level of negative conditions and greater life satisfaction.

In a study of the assessment the intensity and level of physical activity in the last week, it was shown that 48.8% of respondents participate in vigorous intensity physical activities, 36.1% in moderate, while 15.1% regularly walks or participates in low intensity activities. The problematic result gave the answers of 42.0% students who are not currently engaged in any form of physical activity. That result corroborates with the results of a numerous studies warning of risks and a large number of young people who are not involved in any form of physical activity.

By using the Kruskal-Wallis non-parametric test, ranks of time spent participating in sports or recreational activity for at least 30 minutes over the last month and week was explored.

The value of Kruskal-Wallis test expressed as the sum of the ranks for participating in physical or recreational activity that lasted at least 30 minutes over last month (none, 1-5 times, 6-10 times and 11-20 times), the value of the *total PA* expressed as the sum of the scores is  $H=106.621$ ;  $p<0.05$  and the value of the *positive emotions* expressed as the sum of the scores is  $H=35.710$ ;  $p<0.05$ . The value of the Kruskal-Wallis test for different number of times categories regarding participation in physical or recreational activity that lasted at least 30 minutes over last week (none, 1 per week, 2 per week, 3 per week and 4 and more per week) the value of the *total PA* is  $H=151.194$ ;  $p<0.05$  and the value of the *positive emotions* expressed as the sum of the scores is  $H=46.588$ ;  $p<0.05$ .

## CONCLUSIONS

In our research, it has been shown that by increasing the frequency of engaging in physical activity, the values for positive affective experiences are growing.

1. There is a significant positive association between engagement in kinesiological activities and positive affective/emotional conditions
2. The result of student participation in kinesiological activities over the last week/month showed significant positive correlation with positive emotional states
3. Male students engage in more vigorous physical activity than female students

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# DEPRESSION SYMPTOMS IN A SAMPLE OF FEMALE UNIVERSITY STUDENTS OF DIFFERENT PHYSICAL ACTIVITY LEVELS

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## ABSTRACT

**Aim:** To determine physical activity levels among female students attending Faculty of Education in University of Osijek and to determine the differences in the level of depression symptoms between the students with low, moderate and high levels of physical activity. **Methods:** The data was collected using self-administered questionnaires on a sample of 121 female students by using the short version of the *International Physical Activity Questionnaire* (IPAQ) and Depression, Anxiety and Stress Scale (DASS) of which only the depression subscale was used. **Results:** Median total physical activity of the whole sample was 51,1 MET-hour/week. Students achieved the highest level of physical activity in the category of walking (23,1 MET-hour/week). There were no differences in levels of depression symptoms between the students of low, moderate and high levels of physical activity ( $p=0,6522$ ). **Conclusion:** Mental health benefits can be sustained by achieving physical activity levels even below the public health recommendations. For future interventions, it is necessary to identify factors that lead to depressive disorders in this population and enable early detection of those at increased risk of mental disorders and provide them with adequate help. Furthermore, future studies should include physical activity in domains of work, transport, domestic and garden and leisure time for more detailed results.

**Key Words:** *physical activity, female students, depression symptoms*

## INTRODUCTION

Depression is the leading cause of disability and the burden of mental health-related illness worldwide, affecting approximately 280 million people (GBD 2019 Diseases and Injuries Collaborators, 2020). Women generally show a higher prevalence of depression symptoms compared to men (Kessler et al., 2015; Ramos-Arbues et al., 2020). Depression is also associated with premature death from other diseases (Walker et al., 2015), and prevention of depression requires effective interventions that include modifying risk factors (Salazar de Pablo et al., 2021). Literature reviews suggest that physical activity can prevent depression (Mammen & Faulkner, 2013), i.e. meta-analyses show that people with a high level of physical activity are less likely to develop depression (Schuch et al., 2018). Studies on the student population show that 12 to 50% of students meet at least one diagnostic criterion for one or more mental disorders (Bruffaerts et al., 2018). Furthermore, physical inactivity has been identified as another major public health problem in the world (WHO, 2010). Regular physical activity reduces the risk of mortality and reduces the level of morbidity from metabolic, mental and cardiovascular diseases (Warburton et al., 2006). However, most young people do not reach the recommendations for participation in moderate to vigorous physical activity of at least 150 minutes per week (Keating et al., 2005). According to a study from Norway, less than 25% of male students and 20% of female students reach the minimum recommendations for physical activity on a weekly basis (Grasdalsmoen et al., 2019). Female students represent a group at increased risk of achieving a low level of physical activity and

a higher level of depression symptoms, and it is necessary to examine the differences in the level of depression symptoms between female students with low, moderate and high levels of physical activity.

## AIM AND HYPOTHESES

The aim of this research was to determine the differences in the level of depression symptoms among female university students of different levels of physical activity.

H1: female students with a low level of physical activity have a significantly higher level of depression symptoms compared to female students with a moderate and high level of physical activity

H2: female students with a moderate level of physical activity have a significantly higher level of depression symptoms compared to female students with a high level of physical activity

## METHODS

The research sample consisted of 121 first and second-year female university students attending Faculty of Education in Osijek.

Physical activity level was assessed using the International Physical Activity Questionnaire (IPAQ) short form (Craig et al., 2003), which estimates the amount of walking, moderate to vigorous and vigorous physical activity in one week. The result of multiplying the number of days of the week in which the activity is carried out with its usual duration and the metabolic equivalent of the category represents the total energy consumption. The total level of physical activity is calculated as the sum of all three categories. Depression symptoms were examined using the Depression, Anxiety and Stress Scale (DASS) (Lovibond & Lovibond, 1995). Each subscale consists of 14 items. For the purpose of this research, only the depression subscale was used. The participants were given statements to which they had to offer an answer on a Likert type scale from 0 (does not apply to me at all) to 3 (completely applies to me). The total result is calculated as the sum of all items.

The tables show basic statistical parameters such as mean, standard deviation, median, interquartile range, skewness and kurtosis. With the aim of creating numerically similar categories, the participants were divided into three categories: 1. participants with a low level of physical activity (<25th percentile of the total level of physical activity); 2. participants with a moderate level of physical activity (25th to 75th percentile of the total level of physical activity); 3. participants with a high level of physical activity (>75th percentile of the total level of physical activity). Before the main analysis, the normality of the distribution of the depression variable was determined using the Shapiro-Wilk test. The Kruskal-Wallis test was used to examine differences in the level of depression by categories of physical activity

## RESULTS

**Table 1.** Basic descriptive statistics of the participants (n=121)

Variable	Mean $\pm$ SD	Median
Age (years)	19,88 $\pm$ 1,35	20
Height (cm)	166,41 $\pm$ 6,16	166
Weight (kg)	63,31 $\pm$ 12,84	60
BMI (kg/m <sup>2</sup> )	22,85 $\pm$ 4,37	21,72

Legend: SD- standard deviation; BMI- body mass index

**Table 2.** Physical activity and depression symptoms of the participants

Variable	Mean $\pm$ SD	Median	Interquartile range	Skewness	Kurtosis
VPA	935,537 $\pm$ 1160,832	480	1440	1,292	0,989
MVPA	799,008 $\pm$ 922,247	480	880	1,705	2,939
Walking	1577,591 $\pm$ 972,622	1386	1287	0,898	0,677
Total PA	3312,136 $\pm$ 1897,423	3066	2487	0,874	1,224
Depression	5,64 $\pm$ 5,56	3	9	1,033	0,014

Legend: SD- standard deviation; VPA- vigorous physical activity; MVPA- moderate to vigorous physical activity; PA- physical activity

**Table 3.** Descriptive indicators of physical activity by physical activity category

	Low PA (n=30)		Moderate PA (n=59)		High PA (n=32)	
Variable	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median
VPA	109,33 $\pm$ 259,43	0	726,780 $\pm$ 794,95	480	2095,000 $\pm$ 1356,34	2040
MVPA	210,67 $\pm$ 289,77	0	715,932 $\pm$ 695,38	480	1503,750 $\pm$ 1203,47	1440
Walking	842,05 $\pm$ 452,61	693	1646,644 $\pm$ 772,41	1386	2139,844 $\pm$ 1222,72	2079
Total PA	1162,05 $\pm$ 502,14	1188	3089,356 $\pm$ 715,2	3039	5738,594 $\pm$ 1448,31	5247

**Table 4.** Differences in depression symptoms by physical activity category

	Physical activity category						
	Low PA (n=30)		Moderate PA (n=59)		High PA (n=32)		
Variable	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	p-value
Depression	6,13 $\pm$ 5,18	4	5,17 $\pm$ 5,14	3	6,03 $\pm$ 6,55	3	0,6552

Students achieved the highest level of physical activity in the category of walking (1577.591  $\pm$  972.622 MET-min/week), followed by vigorous physical activity (935.537  $\pm$  1160.832), and moderate to vigorous physical activity (799.008  $\pm$  922.247 ) (Table 2). The average score on the depression subscale of all participants was 5.64  $\pm$  5.56 (Table 2). Participants from all three categories of physical activity achieved the highest level of physical activity while walking (Table 3). There were no significant differences in depression symptoms between categories of participants with different levels of physical activity (p=0.6552) (Table 4).

## DISCUSSION

The level of physical activity of female students is high and amounts to 3066 MET-minutes/week, i.e. 51.1 MET-hours/week, and thus the female students reach the prescribed recommendations for achieving health benefits on a weekly basis (Bull et al., 2020). Compared to women of a similar age in Croatia, female students are somewhat more active (Jurakić et al., 2009). On the other hand, the results are very similar to the values of 49.65 MET-hours/week obtained on a sample of female students of the University of Zagreb who live in student dormitories (Pedišić et al., 2014). It is important to promote physical activity in this population considering the level of physical activity at university is lower than at secondary school (Sevil et al., 2018), and the level of physical activity especially decreases during exam periods (Rathony et al., 2021).

Previous studies conducted on a sample of female students from Spain show similar values on the depression subscale of  $5.44 \pm 6.55$  (Ramos-Arbues et al., 2020). On the other hand, some other research shows that almost 21% of first-year university students in Hong Kong have clinical depression according to the scale of Depression, Anxiety and Stress, and the average score of 4966 students on this scale is  $8.45 \pm 7.35$  (Wong et al., 2006). Students around the world encounter problems in seeking help from the people they are surrounded by or seeking specialist advice regarding mental health problems (Eisenberg et al., 2007) as individuals seeking help are often publicly or self-stigmatized as undesirable or socially unacceptable. (Vogel et al., 2006). Therefore, colleges and, above all, family and friends should pay attention to the mental health of female students and help those who are at increased risk to overcome demanding situations and potential crises.

According to the physical activity category of female students, there are no significant differences in the level of depression symptoms. The results of previous studies show that people with a high level of physical activity are more likely to have lower levels of depressive symptoms than people with a low level of physical activity (Mikkelsen et al., 2010; Biernat et al., 2022) and that physically active people have a lower levels of depressive symptoms (de Oliveira et al., 2019). Nevertheless, the obtained result can be considered expected considering that the female students with a low level of physical activity in this study reach the recommendations of physical activity on a weekly basis, and the most significant differences in the level of depression symptoms are noticed between people who are completely inactive and those who are at least partially active (Pearce et al., 2022). For example, brisk walking for 2.5 hours a week reduces the risk of depression by 25%, and half of the same level of walking reduces the risk of depression by 18% compared to complete inactivity. This suggests that significant mental health benefits can be achieved at physical activity levels even below public health recommendations, with additional benefits at reaching public health recommendations but limited benefit beyond that (Pearce et al., 2022).

## CONCLUSION

Female students with low, moderate and high levels of physical activity do not differ in their level of depression. However, even a small level of physical activity is sufficient to achieve mental health benefits, so the obtained result is not entirely unexpected. Future research should examine physical activity in multiple domains such as household, work, transportation, and leisure. For future interventions, it is necessary to identify factors that lead to depressive disorders in this population and enable early detection of those at increased risk of mental disorders. One of these interventions could be a mandatory annual interview with a student psychologist and attendance at educational workshops on mental health. The contribution of this research is that it determined there were no significant differences in symptoms of depression in the observed sample of first and second year female students of different levels of physical activity. The limitations of this research are the subjective measure of physical activity, the division into categories of physical activity by percentiles of the obtained values, and the small sample whose results cannot be generalized.

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# DIFFERENCES IN THE PHYSICAL ACTIVITY LEVEL OF FEMALE STUDENTS FROM ZADAR UNIVERSITY REGARDING THEIR NICOTINE CIGARETTE SMOKING

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## ABSTRACT

The prevalence of physical activity (PA) and smoking nicotine cigarettes (SNC) are a big public health issue in Croatia. The aim of the present research is to establish the level of PA and smoking habits with female students of the University of Zadar and do research on whether there are differences in the level of PA between smokers and non-smokers.

The research consisted of a total of 312 female students of the University of Zadar  $AS=21.68$  years of age and  $SD=1.54$ . The level of PA was evaluated by the Croatian version of the Questionnaire for Physical Activity Evaluation– IPAQ (Craig et al., 2003). Four domains of PA, total physical activity and type of PA were calculated on the basis of the questionnaire items. A type of question with offered answers was used to examine the habits related to cigarette consumption. Based on the answers of the respondents on smoking habits two subsamples were formed; female students who do not smoke and female students who smoke cigarettes. In the total sample, 65.06% of female students were non-smokers while 34.94% female students were classified in the group of smokers.

The research results indicate that female students who do not smoke have a higher level of physical activities in the domain of free time. ( $Me/RQ_{nonsmokers} = 16.50/30.40$  and  $MeRQ_{smokers} = 11.55/25.90$ , with significance level  $p<0.05$ ) even in high intensity activities ( $Me/RQ_{nonsmokers} = 00.00/184.8$  and  $MeRQ_{smokers} = 00.00/8.00$ , with level of significance  $p<0.05$ ) with reference to female students who smoke.

Interventions aimed at increasing the level of PA and reducing the frequency of smoking in the student population are necessary in the planning of student sports at all universities in Croatia, which will result in a better psychophysical status of students.

**Key words:** differences; cigarette smoking; physical activity, university students

## INTRODUCTION

The World Health Organization (WHO, 2022) defines PA as any physical movement that is produced by skeletal muscles and such movement demands consuming energy. Bouchard and Haskell (2012) state that PA covers a large range of activities performed by muscle contraction which results directly in an increase in metabolic frequency through allowed energy consumption, in other words such activities bring the body into a state of increased energy consumption caused by the work of muscles. All physical activities are carried out in four domains: PA in free time, PA carried out for the purpose of transport or transport to and from a certain place, PA carried out during professional activity and PA related to household chores. PA with regards to intensity can be of low, moderate or high intensity. It has been proven that PA in contemporary society has an important role in improving the life of the adult pop-

ulation as well as that of the student population, and in particular when it concerns the improvement and preservation of their health and psychophysical status (Marić, 2020). Moreover, PA contributes to the prevention and treatment of non-contagious diseases such as cardiovascular diseases, cancer and diabetes, reduces the symptoms of depression and anxiety, improves contemplation, learning and the capability of reasoning, ensures healthy growth and development of young people and improves general welfare (WHO, 2022). According to Croatian recommendations, people of 18 years of age or more, which also includes the student population, should spend 150 – 300 minutes a week in aerobic activities of moderate intensity or 75 to 150 minutes a week in aerobic activities of high intensity or combined aerobic activities of moderate and high intensity in the corresponding total duration (Jurakić and Pedišić, 2019). The Mišigoj-Duraković et al. (2005) states that 43% of female gender respondents in the group from 18-34 years of age for the City of Zagreb region were insufficiently physically active, while that percentage is more favourable for the southern region and amounts to 32%.

Smoking nicotine cigarettes is defined as chemical toxicosis which can cause adverse effects of either acute or chronic type on various structures of the body, some of which are the cardiovascular system, respiratory system and organs of epithelial glands (Leone, Landini, & Leone, 2010). According to researches that have taken place until presently on the student population that smoke daily nicotine cigarettes, 30% of students smoke cigarettes while the prevalence of smoking is from 28% to 67% for male students and 19% to 34% for female students (Podgorelec, 2020).

When considering the impact of smoking on the implementation of physical activities, it is emphasized that during exercise, smokers are exhausted before non-smokers. They also cannot run as far or as fast as non-smokers. Further research has revealed about smokers: they benefit less from PA, have poorer muscle strength and poorer flexibility, suffer from shortness of breath almost three times more often than non-smokers, are almost twice as likely to suffer injuries compared to non-smokers and need more time to recover from an injury compared to non-smokers (Smoking and PA, 2023). Furthermore, it has been proven that smokers are less physically active compared to non-smokers that smoking and PA have an influence on one another, and moreover, smoking has a negative influence on the quality of PA performance. (Heydari et al., 2015). The goal of this research was set to investigate the differences between the subsample of female students who smoke and those who do not smoke nicotine cigarettes. Accordingly, the aim of the research was to determine whether there were statistically significant differences in the overall level of PA and in the domains of individual activities of female students of the University of Zadar between female students who smoke and those who do not smoke nicotine cigarettes.

## METHODS

The population, from which the sample of respondents was defined, consists of female students of the University of Zadar from 19 to 26 years of age ( $M=21.68$ ;  $SD=1.54$ ). The research was conducted on sample of female students of the Department for Teacher and Preschool Teacher Education. The total sample consisted of 312 participants. The sample was stratified with regards to the consumption of nicotine cigarettes and two subsamples were created. Female students that have the habit of smoking once a week or more are considered smokers and the others belong to the group of non-smokers. (Kremers, Mudde, and De Vries, 2001). A dichotomous variable was formed: female students who consume nicotine cigarettes and female students who do not consume cigarettes (Table 1).

**Table 1:** Frequency and percentage of female students according to age and the habit of consuming cigarettes

Smoking habit	N	Percentage (%)
Non-smoker	203	65.06
Smoker	109	34.94

Legend: N-number of participants

According to the division criteria with regards to cigarette consumption, 65.06% belong to the group of non-smokers while 34.94% to the group of smokers.

The Questionnaire for Physical Activity Evaluation was used to evaluate PA ("IPAQ", Craig et al., 2003). Four domains of PA, total PA and type of PA were calculated on the basis of questionnaire items. To examine habits related to cigarette consumption, the type of question with an offered answer was used. The research was approved by the Faculty Council of the Department of Teacher and Educator Training, and the respondents participated in the research voluntarily and anonymously.

The median (ME), quartile range (QR), lower and upper quartiles (DG-quartile), curvature (KURT) and asymmetry (SKEW) distribution were calculated for the domain of PA and type of PA. The normality of distribution of variables was tested by the Kolmogorov-Smirnov test. Mann-Whitney U test was used to establish differences in overall PA level and in domains of PA levels between female students who smoke and those who do not smoke. The data was processed by the program package Statistics for Windows Statsoft 13.0.

## RESULTS AND DISCUSSION

Table 2 shows the results of descriptive parameters and the results of testing normality distribution of PA variables and the total PA for subsamples of female students who do not smoke. The total level of their PA amounts to 62.4 metabolic units (MET), and is mostly realized in the domain of PA in transport (19.25 MET-a) and walking activities (29.70MET) (Table 2).

**Table 2:** Descriptive parameters of PA variables and total PA of female students who smoke (N=109)

Level of PA	Me	RQ	DG-quartile	Skew	Kurt	Max D	K-S p
at work	0.00	0.00	0.00-0.00	4.38	19.84	0.51	p < 0.01*
in transport	19.25	25.30	7.70-33.00	1.30	1.78	0.19	p < 0.01*
in household	17.50	23.25	8.75-32.00	2.53	7.51	0.23	p < 0.01*
in free time	11.55	25.90	3.30-29.20	1.39	1.57	0.18	p < 0.01*
PA total	62.40	64.65	35.70-100.35	1.97	5.07	0.18	p < 0.01*
PA-walking	29.70	40.15	11.00-51.15	1.43	2.48	0.13	p < 0.10
PA-moderate int.	21.20	34.17	9.83-44.00	2.12	5.04	0.19	p < 0.01*
PA-high inten.	0.00	8.00	0.00-8.00	3.78	18.05	0.35	p < 0.01*

Legend: PA-physical activity, Me-median, RQ-inter quartile, DG-quartile - lower and upper quartile, Skew-skewness, Kurt-kurtosis, Max D- the largest deviation of empirical from theoretical relative cumulative frequency, K-S p level of significance Kolmogorov-Smirnov test, \* marks statistically significant deviation at level 0.01

The total level of PA of female students who do not smoke amounts to 67.4 metabolic units (MET), and it is mostly realized in the domain of PA in free time (16.50 MET-a) and walking activities (26.40MET-a) (Table 3). Since most variables statistically significantly deviate from the normal distribution (Table 2 and Table 3), the nonparametric statistic methods will be used to test the differences between these two subsamples.

**Table 3:** Descriptive parameters of PA variables and total PA of female students who do not smoke (N=203)

Level of PA	Me	RQ	DG-quartile	Skew	Kurt	Max D	K-S p
at work	0.00	0.00	0.00-0.00	3.20	9.75	0.45	p < 0.01*
in transport	11.70	17.33	5.78-23.1	1.89	5.24	0.19	p < 0.01*
in household	14.83	25.75	7.25-33.0	2.26	5.93	0.19	p < 0.01*
in free time	16.50	30.40	6.6-37	2.53	7.73	0.21	p < 0.01*
PA total	67.40	86.60	36.9-123.5	1.60	2.92	0.17	p < 0.01*
PA-walking	26.40	207.9	12.1-52.8	1.62	3.51	0.16	p < 0.01*
PA-moderate int.	22.00	191.0	9.5-46.5	2.03	4.04	0.19	p < 0.01*
PA-high inten.	0.00	184.8	0-24	2.64	7.16	0.30	p < 0.01*

Legend: PA-physical activity, Me-median, RQ-inter quartile, DG-quartile lower and upper quartile, Skew- skewness, Kurt-kurtosis, Max D-the largest deviation of empirical from theoretical relative cumulative frequency, K-S p level of significance Kolmogorov-Smirnov test, \* marks statistically significant deviation at level 0.01

The results indicate how female students who do not smoke realize a statistically significant higher level of PA in their free time and in PA of high intensity with regards to female students who smoke (Table 4).

The results of this research indicate that one third of the surveyed female students of the University of Zadar smoke cigarettes. The obtained proportion of smokers in the total sample of respondents is also consistent with previous research, which states that every third person in Croatia smokes, which ranks Croats among the top in the world in terms of cigarette consumption. (Knežić and Hudorović, 2014). It has been proven that smoking has a negative influence on the nervous and cardio respiratory system whereby malfunctioning greatly limits physical activity (Tippetts et al. 2014). Due to the aforesaid, smoking can negatively determine the level of motor and functional capacities of female students (Jeon et al. 2021). It has been proven that people who smoke have lower endurance, worse motor performance and increased frequency of injuries compared to non-smokers (Smoking and Physical Activity, 2023). Furthermore, smoking is connected to a lower level of physical activity (Rodriguez and Audrain-McGovern, 2005). Due to the before said and taking into consideration the results of this research that indicate the proportion of Zadar female students who smoke, it would be desirable to lower the proportion of smokers.

**Table 4:** Differences in the level of PA at work, transport, in household and free time and in the total level of PA between female non-smokers (N=203) and female smokers (N=109)

Level of PA	Me (QR)		Mann Whitney Z	p
	Non-smokers	Smokers		
at work	0.00 (0.00)	0.00 (0.00)	0.15	0.15
in transport	11.70 (17.33)	19.25 (25.30)	0.25	0.25
in household	14.83 (25.75)	17.50 (23.25)	0.54	0.54
in free time	16.50 (30.40)	11.55 (25.90)	0.04	<b>0.04*</b>
PA total	67.40 (86.60)	62.40 (64.65)	0.30	0.30
PA-walking	26.40 (207.9)	29.70 (40.15)	-0.20	0.84
PA-moderate int.	22.00 (191.0)	21.20 (34.17)	0.13	0.9
PA-high inten.	0.00 (184.8)	0.00 (8.00)	2.57	<b>0.01*</b>

Legend: Me- median, QR- quartile rank, PA-physical activity, \*statistically significant difference at level p <0.05

The results acquired from this research on the total level of PA of Zadar University indicate that female students have very good level of PA (62.40 and 67.40MET) and better with regards to the research carried out on 1162 students of Zagreb University where the level was from 45.13- 54.17MET (Pedišić, 2011). However, there is room for improvement in the form of increasing the level of PA in the domain of free time (in particular for female students who smoke) and in the domain of transport (in particular female students who do not smoke). Concerning the type of PA in female students, it is necessary to increase PA of high intensity in both subsamples. Due to the fact that a positive connection has been proven between the level of PA and subjective evaluation of health (Alić, Basioli Kasap and Jenko Miholić, 2021), the increase in female student activity will contribute to their better state of health. Furthermore, a large number of studies have studied the connection between the level of PA and smoking habits, and a negative connection between the level of PA and smoking was established (Verkooijen, Nielsen, Kremers, 2008). In the Paavola et al. Research (2004), smoking has a negative connection with the domain of PA during free time, and in the Papathanasiou et al. Research (2012), a negative connection was noticed between smoking and the total level of PA. The afore mentioned quantity of nicotine cigarettes consumed is inversely proportional to the total level of PA (Picavet, Wandel-vos, Vreeken, Schuitand Verschuren, 2011). The research states the fact that the higher PA the lower the smoking frequency (Charilaou, et al., 2009).

When speaking of the acquired results of the present research on the established differences in the level of PA between female student smokers and non-smokers, it can be concluded that those female students that do not smoke have a numerically higher level of PA (higher median value), and that difference is statistically significant for PA carried out in free time and high intensity activities with regard to female students smokers. The research supports the previous findings and thus Boyle et al. (2000) state that smokers are less physically active compared to non-smokers or former smokers. Part of the research concludes that physically active adolescents and those who practice a certain sport are less likely to be regular smokers compared to young people who live a sedentary lifestyle. Previous researches on health-oriented behaviour have the tendency of cluster identification whereby the group of smokers is more often physically inactive compared to others. One of the possible reasons why female student non-smokers have a higher level of PA in the domain of free time and high intensity activities is manifested in the assumption that they have a better perception of personal health. The second possible reason is that non-smokers have a healthier life habit which is proven in the research of Kvaavik, Meyer-and and Tverdal (2004). It is essential to point out the fact that it has been proven that physical activity is stated as a mechanism that reduces the probability of a person in starting smoking cigarettes (Audrian-McGovern et al. 2013), and in such a context the importance of performing PA is pointed out in female students that have not become smokers. In addition, it has been proven that even a moderate increase in PA can result in improved health outcomes by reducing smoking (Ali, Amialchuk and Heller, 2015).

## CONCLUSION

According to the results of the present research, it can be concluded that Zadar female students have realized a very good total level of PA, and additional increase in the level of PA can be realized by increasing activities in the domain of free time and transport. Approximately one third of female students belong to the group of smokers whereby interventions should be directed to reducing that proportion, and PA has proven to be one of the mechanisms that can act in that direction.

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# DIFFERENCES IN PHYSICAL ACTIVITIES AND NUTRITION OF BIOMEDICINE AND HEALTH STUDENTS IN COMPARE OF STUDENTS FROM OTHER SCIENCE FIELD OF UNIVERSITY RIJEKA

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## ABSTRACT

The aim of the article is to determine the differences between physical activities and nutrition between students of biomedical and health sciences and students from other scientific fields at the University of Rijeka. The study included 1170 bachelor and master students of the University of Rijeka enrolled in the academic year 2017/18, from all scientific fields, of which 274 were biomedical students (Faculty of Medicine n=151, 44 male and 107 female students and from the Faculty of Health Studies n=123, 33 male and 90 female students). Descriptive parameters expressed by relative frequencies were calculated and a one-way ANOVA was calculated to test differences between science fields. Statistically significant differences in physical activity engagement were found: engineering and bioengineering science students are more active than students from other science fields. For biomedical and health studies students, the most important factors for motivation in food choices were: food sensory experience, price and accessibility of food. The need for further engagement of academic society in educating students about importance and relationship of physical activity and food quality to health is confirmed.

**Key words:** fields of sciences; physical activity; nutrition; students

## INTRODUCTION

According to the National Sports Programme 2019-2026, only 37.5% of the population of the Republic of Croatia older than 15 years participate in physical activities, while 62.5% of the inhabitants do not participate in physical activities. Among all age groups, physical activity is lowest among adolescents and young adults (15-24 years old). The same document also recognises the role of the compulsory physical education, which is offered to undergraduate students at most Croatian universities. This academic year, the University of Zagreb celebrates 60 years of physical education as a compulsory subject. One of the tasks of physical education at universities is to create curricula in which students can acquire theoretical and practical kinesiological knowledge focused on the specifics of possible professions after graduation, increase work ability and maintain health (Caput-Jogunica 2022). With this work, we aim to contribute to a smaller number of studies that have been conducted on the student population to identify differences



in the areas of quality of life of students according to the field of science. The first study conducted with the aim of determining differences in physical activity of students according to the field of science was conducted on 1651 students of the University of Zagreb (Ćurković, 2010). Differences in the level of physical activity were found, with students of technical sciences (27.44%) significantly more likely to participate in sports and recreational activities than students of other scientific fields. The lowest participation in kinesiology activities was (5.80%).

The physical activity of medical students at the University of Zagreb, as the population whom we expected to promote physical activity as one of the positive factors influencing health in the future, did not differ significantly from that of students in other scientific fields. In the sample of 117 male and 195 female students of the Faculty of Medicine in Zagreb, it was found that half of the sample did not practise sports or sports activity in their free time. The authors of this study suggest educating medical students about the role of physical activity in student health (Matković et al., 2010). After 12 years since the first study was conducted in Croatia, we are interested in whether the differences in physical activity have changed according to the field of science.

The aim of this paper is to determine whether there are differences in engagement in kinesiological activities and motivation in food choices between students of biomedicine and health care at the University of Rijeka compared to students of other scientific fields. Why? Following the proverb: "If you want to change the world, you have to start with yourself", we assume that students of biomedicine and health care are more aware of the positive influence of regular physical activity and quality of nutrition on health than students of other scientific fields. After analysing the data, we proposed the activities as an added value of the study of biomedicine and health care, with the aim that students acquire specific competences from kinesiology during their studies that will be useful in their professional career after graduation.

## METHODS

The study was conducted on 1170 (796 bachelor's and 262 master's students and 104 doctoral students) of the University of Rijeka from different scientific fields. From the total sample, 278 students were from the field of biomedical sciences (Faculty of Medicine, N=151: 44 male and 107 female students and from the Faculty of Health Sciences n= 124, 33 male and 91 female students) and students from other scientific fields, as shown in Table 1. The anonymous questionnaire intended as a measurement tool for students was used (De Privitellio, 2021). In this paper, students' responses on the level of physical activity (KINAKT) and students' motivation on food choices (Food Choice Questionnaire, (FCQ) (Stephens et al., 1995) were analysed. Descriptive parameters expressed by relative response frequencies were calculated for all measures. The one-way method ANOVA was used to calculate the differences in physical activity in relation to scientific fields. Differences between groups (post-hoc) were tested with a 95% confidence interval.

## RESULTS

Statistical significance was achieved for physical activity in the scientific fields ( $F_{7,1084}=7.91; p<.001$ ). Descriptive data are presented in Table 1.

**Table 1** Descriptive data of students' physical activity and physical activity hours per week from different scientific fields

Scientific fields	n	x	SD	95% confidence interval		Median/ Hours perweek	Interquartile range
				lower	higher		
Natural science	30	3.64	0.68	3.37	0.00	0.00	4.25
Technical science	261	3.92	0.65	3.84	3.00	3.00	6.00
<b>Biomedicine and health</b>	<b>275</b>	<b>3.97</b>	<b>0.64</b>	<b>3.89</b>	<b>2.00</b>	<b>2.00</b>	<b>3.50</b>
Biotechnical	65	3.88	0.72	3.70	3.00	3.00	4.00
Social science	371	3.81	0.64	3.74	2.00	2.00	5.00
Humanities	96	3.81	0.71	3.66	2.00	2.00	3.88
Artistic	29	3.09	0.88	2.75	2.50	2.50	4.00
Interdisciplinary	43	3.69	0.65	3.49	2.00	2.00	3.00

Using the Kruskal-Wallis test as a nonparametric procedure for ANOVA, a statistically significant relationship was found between science majors and students' engagement in physical activity calculated by number of hours per week ( $\chi^2=26.56$ ,  $df=7$ ;  $p<.001$ ). Students in technical and biotechnical sciences engaged in more hours per week than students in the other fields of science. We wanted to know if there were differences in food choice motivation between students in different field of science. Students completed the questionnaire, which consisted of 36 statements describing different motivations for food choices on a scale from 1 (extremely unimportant) to 7 (extremely important). Analysing the descriptive data of the FQC questionnaire: F1-F9 (table 2), we can conclude that students of biomedical and health, art, interdisciplinary and biotechnical science fields consider more health aspects in food choices than students of other science fields (F1). When analysing the science fields with a higher number of students (biomedical and health, technical and social), we found that the most important factor in food selection for biomedical and health students was sensory experience, price and accessibility of food, while for other factors students in technical (F9) and social (F2) science fields scored higher.

## DISCUSSION

Eating habits and regular physical activity are important factors in preventive health care. Studies conducted on a sample of Croatian students showed a lack of physical activity among students. In this study, 35% of students from the University of Rijeka did not participate in kinesiology activities, while 30% of them considered starting exercises. Published studies on the eating habits of Croatian students have shown that the quality of food decreases as students get older and the majority of students prefer to eat in canteens, bakeries, and fast food restaurants none of which offer satisfactory ingredients (Lončarić et al., 2017; Božić, 2018). The results of this study showed that taste and smell, as well as sensory appeal, price and availability of food are the most important factors in food selection for the students of the University of Rijeka, who also prefer the mentioned places for food selection. In this study, no higher level of motivation for food selection was found among biomedical and health care students compared to students from other scientific fields. It is known that natural food sources are nutritionally and biochemically healthier, while in our sample, biomedical and health science students did not give much importance to this motive. One of the reasons for this could be the easy availability of food and lower prices, since these areas of the university have their own canteens. Biomedical and health sciences students pay special attention to the price and availability of food when choosing food. We believe that biomedical and public health students should encourage people around them to adopt healthy behaviours, which certainly include dietary habits.

**Table 6** Descriptive data and 95% interval of reliability of students' motivation for food choices from different science fields

FQC factors		Natural n=30	Tech. n=261	Biomed and health n=275	Biotech n=65	Social n=371	Human n=96	Artistic n=29	Interdisc n=43
F1 Health	X	4.66	4.90	<b>5.08</b>	5.03	4.86	4.90	<b>5.17</b>	5.05
	SD	1.31	1.12	1.00	1.01	1.08	1.13	0.68	1.01
	95%lower	4.15	4.76	4.96	4.78	4.75	4.67	4.91	4.73
	95%higher	5.17	5.04	5.20	5.29	4.97	5.13	5.43	5.36
F2 Availability of food choices	X	4.50	4.40	<b>4.69</b>	4.52	<b>4.57</b>	4.49	<b>5.04</b>	4.58
	SD	1.22	1.16	1.00	1.16	1.10	1.25	0.71	1.07
	95%lower	4.03	4.25	4.57	4.22	4.45	4.23	4.77	4.25
	95%higher	4.97	4.54	4.81	4.81	4.68	4.75	5.31	4.92
F3 Food accessibility	X	5.04	4.75	<b>5.03</b>	4.83	4.96	<b>4.88</b>	<b>5.06</b>	<b>5.20</b>
	SD	1.24	1.05	1.06	0.99	1.07	1.06	0.70	1.08
	95%lower	4.55	4.62	4.90	4.58	4.85	4.66	4.79	4.86
	95%higher	5.52	4.88	5.15	5.07	5.07	5.10	5.33	5.53
F4 Sensory experience	X	4.94	5.01	<b>5.15</b>	4.96	5.08	4.96	<b>5.40</b>	<b>5.39</b>
	SD	1.24	1.03	1.01	0.87	1.01	1.11	0.81	0.87
	95%lower	4.46	4.88	5.03	4.74	4.98	4.74	5.09	5.12
	95%higher	5.42	5.14	5.27	5.18	5.19	5.19	5.71	5.66
F5 Natural sources	X	4.22	4.53	<b>4.41</b>	<b>4.66</b>	4.18	4.31	5.07	4.36
	SD	1.49	1.31	1.24	1.30	1.34	1.33	0.97	1.30
	95%lower	3.65	4.37	4.26	4.33	4.04	4.03	4.70	3.96
	95%higher	4.79	4.69	4.56	4.99	4.32	4.58	5.44	4.76
F6 Food prices	X	<b>5.17</b>	4.72	<b>5.00</b>	5.04	4.85	4.98	5.00	<b>5.34</b>
	SD	1.22	1.13	1.10	0.90	1.26	1.22	0.62	0.92
	95%lower	4.71	4.58	4.87	4.81	4.72	4.72	4.76	5.06
	95%higher	5.64	4.85	5.13	5.26	4.98	5.23	5.24	5.63
F7 Body weight control	X	3.75	3.91	<b>4.18</b>	<b>4.22</b>	4.00	4.12	<b>4.57</b>	4.00
	SD	1.59	1.35	1.17	1.24	1.39	1.13	0.78	1.50
	95%lower	3.14	3.75	4.04	3.91	3.86	3.89	4.28	3.54
	95%higher	4.35	4.08	4.32	4.53	4.14	4.36	4.87	4.46
F8 Knowledge of foods	X	3.77	4.16	<b>4.12</b>	<b>4.21</b>	4.05	4.12	<b>4.89</b>	<b>4.26</b>
	SD	1.39	1.09	1.15	1.19	1.16	1.03	0.72	1.28
	95%lower	3.22	4.02	3.98	3.92	3.93	3.91	4.60	3.86
	95%higher	4.31	4.29	4.25	4.51	4.17	4.33	5.17	4.65
F9 Ethics in choosing food	X	2.86	<b>3.44</b>	<b>3.21</b>	<b>3.48</b>	3.16	3.31	<b>3.64</b>	3.02
	SD	1.48	1.34	1.29	1.39	1.42	1.20	1.09	1.19
	95%lower	2.29	3.28	3.05	3.13	3.02	3.06	3.23	2.66
	95%higher	3.43	3.61	3.36	3.83	3.31	3.56	4.06	3.39

## CONCLUSION

With the shared mission of all institutions in the academic community for the quality of life of students, we can encourage students to change their habits and apply health guidelines in their daily lives. The promotion of healthy eating habits should therefore be directed primarily at students who are most likely to have a positive impact on the general population in their future careers. As part of physical education classes at universities, students are informed about the potential negative health consequences of physical inactivity and about kinesiology activities that lead to positive changes in the traits and skills needed to succeed in a particular activity, as well as about the importance of quality nutrition during periods of great mental and physical exertion. With the shared mission of all institutions in the academic community for the quality of life of students, we can encourage students to change their habits and apply health guidelines in their daily lives.

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# CLUB'S EXPERT TEAM CARE FOR PREVENTION AND REHABILITATION OF PROFESSIONAL ATHLETE'S INJURIES: QUALITY OF TEAMS'S ORGANISATION

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## ABSTRACT

**Introduction:** Sports injuries make up the majority of sports injuries in modern western society. Their treatment is demanding, expensive and takes a lot of time, therefore preventive measures have a notable role in sports, both for medical and economic reasons. Most injuries occur during training (60% of injuries), while the largest number of traumatic injuries occur during matches. Injuries cannot be completely prevented, but thanks to preventive measures, the risk of their occurrence can be reduced. According to the latest research by the International Handball Federation from the World Championship in Doha, the most injuries were sustained by outside players (36%), followed by wing players (25.4%), circle players (25.4%) and goalkeepers (7.3%). The most common injuries were sprained ligaments, sprained joints, contusions and hematomas (64%).

**Methods:** With this paper, we wanted to examine club's care for athletes from 1 Croatian and 2 Macedonian handball clubs. Using the method of interviews of handball players and the professional team and an insight into the club's database, it was investigated whether the mentioned clubs use preventive programs and in what way, the frequency of injuries, their relation to the body part and time of occurrence.

**Results:** The obtained results were compared with each other and with the results of research by the European and International Handball Federation. The highest number of injuries within the examined clubs affects the lower limb (ankle joint) 47.3%, as shown by the data of EHF and IHF.

**Conclusion:** Keeping in mind that a large number of injuries occur during training, attention should be focused on educating the professional team to include preventive measures in daily training, and as for matches, the education of handball players should encourage their care and awareness of injuries.

**Keywords:** *expert's team; handball; injuries; prevention*

## INTRODUCTION

Sports occupy a person's life from the earliest age until old age. It implies exercise, play, competition, fun, diversion and rivalry. The human need for movement, for physical strengthening, but also for competition in the spiritual and physical sense has always existed, but it has never been as strong and dominant as it is today (1). Handball is a team contact sport with a ball in which injury is possible. As in all sports, as well as in handball, injuries are divided into acute and chronic (2). It is often heard in the world of sports

that injury is just part of the game, that is, an unavoidable consequence of participating in the game (3). Sports and recreation are phenomena of today's highly civilized society, and their development is followed by sports medicine. In sports medicine, the priority is prevention, because the risk of injury can be significantly reduced by implementing preventive measures (2). The concept of elite sport is aimed at achieving excellent sports results (4). Experts from various fields of science monitor and help progress in modern sports, and their knowledge of the technical and tactical components of sports success, as well as their implementation, has been brought to perfection (5). Handball began to develop more and more in terms of rules, tactics, training and training. Despite the more advanced game, the number of injuries did not decrease, on the contrary, it increased (6). This is supported by the "career" of injuries (table 1) of the successful german handball player, Daniel Stephan, who suffered a series of injuries and retired from the handball world due to chronic pain in his elbow. The example of Daniel Stephan's case is becoming more and more present ("career" injuries of Nora Morck, 9 knee operations) in the world of handball, but also in sports in general. Athletes suffer more and more injuries, undergo operations, and because of competitions in which the title is the primary goal, they fail to fully recover, so every new activity for them represents a risk of a new injury (7). According to the latest research of the International Handball Federation from the World Championship in Doha, the most injuries were sustained by outside players (36%), followed by wing players (25.4%), circle players (25.4%) and goalkeepers (7.3%). The most common injuries were sprained ligaments, sprained joints, contusions and hematomas (64%) (8). Despite the knowledge that the number of injuries in handball is around 320,000 per year, and the total medical costs rise to 400 million euros per year (9), the question arises why handball federations do not implement preventive programs even though they exist and the European Handball Federation (EHF) voluntarily offers over projects. The aim of this paper is to examine the frequency of player injuries and the clubs' preventive programs.

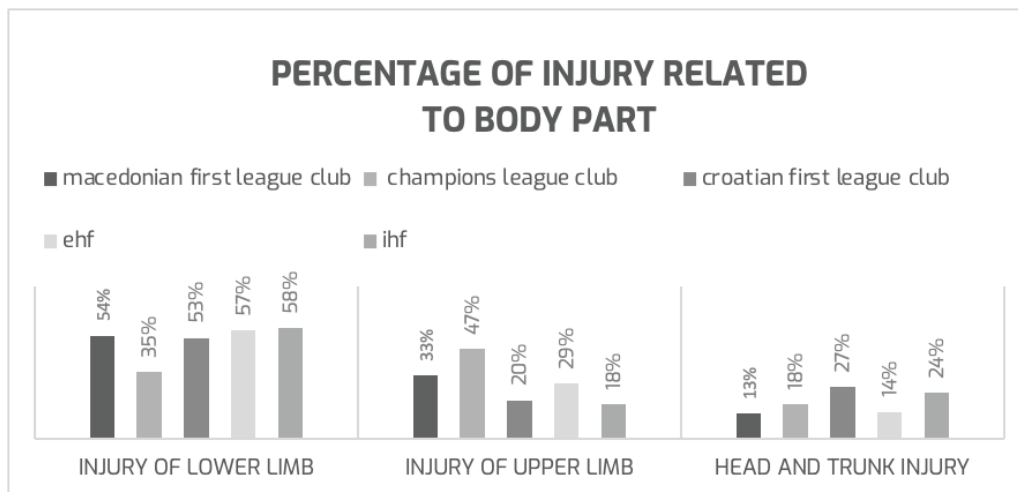
INJURY CAREER OF DANIEL STEPHAN	
1999.	metacarpus fracture
1999.	torn ligament in the foot
2000.	thumb operation
2000.	rupture of capsule at ankle joint
2000.	splintering of the bone at the thumb of operated hand
2002.	Achilles tendon irritation
2003.	Achilles tendon rupture
2004.	elbow injury
2006.	tendon rupture in the right shoulder
2008.	end of career

**Table 1:** Injury career of Daniel Stephan (modified and taken from 7. Luig P., Henke T., Sporst Injuries in Professional and Youth Handball, Ruhr University Sports medicine)

## METHODS

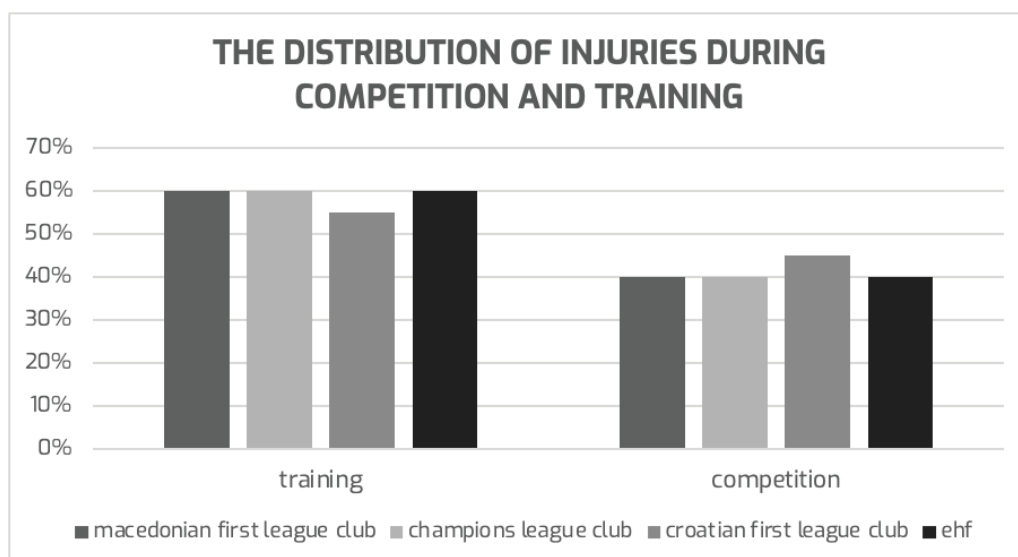
The research was managed through 3 phases in Croatian First League club, Champions league club and Macedonian First League club. The first phase includes an interview with handball players and members of the professional team, the second phase consists of collecting data by looking at the database of clubs, and the third phase includes searching and reading the papers of the European (EHF) and the International Handball Federation (IHF). A data processing method was applied that is considered adequate for solving the problems of this research. The obtained results were compared with the results of EHF and IHF. The data were processed statistically and presented graphically.

## RESULTS



**Figure 1:** Percentage of injury related to body part

Figure 1 shows the distribution of injuries affecting the upper limb, lower limb, and head and trunk. The majority of injuries involve the lower limb, then the upper limb, then the head and torso, although in the Champions league club, the highest number of injuries is on the upper limb, then the lowerlimb, and the head and torso. Comparing the results of the clubs with EHF and IHf, it is evident from what is shown, that according to EHF more injuries are received by the upper limb than the head and torso, while according to IHF the opposite is true.



**Figure 2:** The distribution of injuries during the competition and training

Figure 2 shows the time of injury in clubs and according to the EHF. In all clubs, 60% of injuries occur during training, while the other 40% occur during matches.

**Table 2:** The most frequent injuries according to the clubs

THE MOST FREQUENT INJURIES	MACEDONIAN FIRST LEAGUE CLUB	CROATIAN FIRST LEAGUE CLUB	CHAMPIONS LEAGUE CLUB
1.	ankle injuries	ankle injuries	rotator cuff injuries
2.	knee contusion	elbow injuries	muscle injuries of lower limb
3.	meniscus tear	muscle injuries of lower limb	ACL rupture
4.	ACL rupture	abdominal muscle injuries	ankle injuries
5.	distortion of the wrist and fingers	knee injuries	lateral and medial epicondylitis

Table 2 shows the distribution of injuries by clubs from the most common to the least common. In first league and premier league clubs, the most common injury is upper and lower ankle joint injuries, while in Champions league club it ranks 4th. The most common injury in Champions league club is a rupture of the rotator cuff, which is not so common in other clubs.

## DISCUSSION

From the past to the present day, handball has undergone numerous changes regarding the game itself. Particularly in the world of sports, everyone is oriented towards reaching the title of champion, and in these battles for victory, the game becomes faster and rougher. From the above, it follows that athletes are becoming more prone to injuries than ever before, and preventive programs with physiotherapists in the main role are increasingly important for handball players as part of club care. As the research was conducted in three differently ranked clubs (Croatian and Macedonian First League and Champions League), the goal was to find out if these same clubs use preventive programs and in what way. The specific goal was to find out if there is a difference between the place and time of injury. According to previous research, there is a relatively small number of those who deal with the effect of implementing preventive measures in professional handball.

The results of our research showed that professional clubs do not use preventive measures, except for the use of protective equipment such as orthoses. Furthermore, the results showed that the largest number of injuries affects the lower limb (47.3%) (figure 1), which is confirmed by research by Vila et al. (2022) as well as research by Monaco et al. (10). In their review, Vila and colleagues included 27 papers on this topic and concluded that most injuries occur during matches, 9.9 - 41.0 injuries per 1000 hours of matches (11). Comparing the results of the time of occurrence of injuries with the data on the time of occurrence of injuries of the European Handball Federation, there were no deviations between the results, i.e. the results showed that in the mentioned clubs most injuries occur during training (figure 2), although most researches showed opposite results (12-15). According to the obtained results, the largest number of injuries affects the lower limb (47.3%), followed by the upper limb (38%). Our re-



sults obtained by inspecting the database of the Croatian first league club, as well as the Macedonian first league club, match the data of the EHF, while the results obtained by inspecting the database of the Champions league club deviate from them; the largest number of injuries affects the upper limb. Due to various shortcomings of the club databases, the results are not presented numerically, but are presented by frequency (table 2). In the Croatian first league club, injuries of the ankle joint are the most common, followed by elbow injuries, lower limb muscle strains, abdominal wall muscle strains and knee injuries. In the Macedonian first league club, injuries of ankle joint are the most common, followed by knee contusions, meniscal ruptures, anterior cruciate ligament ruptures, and wrist and finger distortions. The Champions league club has the most injuries of rotator cuff muscle, followed by lower limb muscle strains, anterior cruciate ligament ruptures, ankle joint injuries and elbow epicondylitis. Our results on the representation of the most common injuries are also confirmed by the results of the research conducted at the World Championship in Doha, which showed that the ankle joint suffer the most injuries in handball, as much as 17.2% of all injuries (8). However, the prevalence of ankle joint injuries differs in the Champions league club, which can be attributed to their specific preparation process in which the focus is mostly on developing the motor skills of the lower limb during jumps and landings. The difference between the prevalence of injuries in clubs can be explained by the way preventive measures are implemented or not implemented (everyone uses bandages and orthoses, while only the Champions league club uses basic preventive exercises for the lower limb), then by its quality and the rank of the competition in which the clubs are. Despite the fact that many studies have shown that preventive programs, which include proprioceptive, neuromuscular and eccentric training in professional sports, can prevent the occurrence of new and repeated injuries of the lower limb (16, 17), they are not used, what is visible from our research.

## CONCLUSION

Based on the research on club's care for professional handball players and on the frequency and involvement of injuries in three differently ranked handball, it was seen that regardless of the club's ranking, club's care is reduced to a minimum. In other words, the club's concern is not oriented towards the player but towards the result, which is supported by poor databases as well as insufficient cooperation within the professional team. Many studies have confirmed that preventive measures can help the athlete to recognize situations that have a risk of injury. Likewise, injuries can be prevented with a quality preventive program and a quality professional team. By preventing injuries, the handball player does not miss the field (physical and mental fitness is preserved) and treatment costs are reduced, which become progressive. The reason for this is the repetitive movements on the court (the average distance a handball player covers in a match is 4 km): straight running, running with a change of direction, running with breaks, jumps and landings, slips, falls. Neuromuscular training, proprioceptive training, as well as the use of a bandage or orthosis can significantly reduce the frequency of ankle joint injuries. Also, preventive programs should not focus only on a certain part of the body, but on the body as a whole, because the human body is a compound that should be seen as a whole, not just separate parts.

The question arises, why despite numerous studies on the effectiveness of the use of preventive programs, the frequency of injuries continues to increase and why high-ranking clubs do not do the same?

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The image features a blue-tinted background with a stack of books. The top book is open, showing its pages. In the foreground, there is a soccer ball with a hexagonal pattern and several medals with ribbons. The text is centered over the books.

Theme:

**DUAL CAREER AND  
ACADEMIC SPORT**

# A STUDY OF ATHLETES' CAREER CENTRE: WHAT WE HAVE AND WHAT WE NEED

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## ABSTRACT

The purpose of this study is to determine the current status of categorized athletes in the education system, athletes' knowledge of the special terms and support of dual career and status in employment, and interest in education and employment in the future. For this study, we used an online questionnaire created by the Athletes' Career Centre. The online questionnaire was created in Google Forms and was divided into 4 parts. The study involved 536 (52.4% female and 47.6% male) athletes, most of whom, 48.9%, are between 19 and 29 years old; 24.1% are younger than 18 years, which means that most of the participants in this study are of secondary and higher education age. The results indicate that the Croatian athletes who participated in this study perceive dual career as an important factor and that they are very well informed about the special conditions and support adopted by the Ministry and Croatian Olympic Committee at the national level. Participating athletes were well informed (69.8%) about the special conditions for categorized athletes in the educational system. Most athletes (33.4%) are unemployed and a high percentage (25.9%) have a permanent job. For the athletes who are employed, a high percentage of them (36.9%) are employed in the private sector. Most athletes want a good education, sometimes they just need an understanding person to support them on their way to achieving their goals, in education as well as on the sports field.

**Key words:** career centre, dual career system, interest, skills

## INTRODUCTION

Dual career in sport has been a recognized topic since 2007, when the Croatian Olympic Committee launched the first topic "Categorized athletes in the Croatian educational system (2008- 2012)", with the aim of informing the academic society about the concept of categorized athlete, which includes elite or top athletes, and at the same time to give athletes who are recognized as excellent and talented the opportunity to receive special conditions and support at universities. Since 2012, all activities of the Croatian Olympic Committee and its partners have been guided by the "EU Guidelines for Dual Careers of Athletes" issued by the European Commission. One of the recommendations was the creation of the National Guidelines for Dual Career (*National Program for Career Development and Post-Sport Career 2014-2020*), which we created and which was adopted by the Croatian Olympic Committee (CRO OC) and supported by the National Council for Sport. Dual career is recognized as an important topic in several national documents: *The National Sports Program (2014-2020)*, adopted by the CRO OC, and the *National Sports Program (2019-2026)*, adopted by the Ministry of Tourism and Sports, as well as the new *Sports Law* adopted in 2023. For this introduction, it is important to point out the agreement between



CRO OC and Rector Council (signed by 9 rectors of public universities) and the Croatian Academic Sports Association in 2015. The main result of the agreement was the "Regulation of the Rector Council about students-athletes studying at universities in the Republic of Croatia" (2016). CRO OC has been a member of the European Athletes as Student (EAS) network since 2017 and has since followed the examples of good practise of EAS members.

Numerous activities carried out from 2008 to date focused on several areas: 1. promotional activities (promotional days in the 5 largest Croatian counties), 2. educational activities (academic society - round tables, coaches, sports and local associations, workshops for athletes and panel discussions with athletes and entrepreneurs), 3. policy and regulations (some of the previously mentioned), 4. studies and publications (conference papers or articles, brochures with the project results, handbook and annual reports) and 5. projects (supported by the Foundation for Olympic Solidarity of the European Olympic Committees EOC and IOC and since 2019 by the project ERASMUS + sport). Summarising all this, we have achieved a lot, but we are not satisfied with the implementation of the rules in practice, we still do not have a regulated system and our system depends on the understanding of the people who run schools or colleges. According to CRO OC Registry, we have approximately 4561 categorized athletes in 6 categories: I, II and III top athletes, IV talents and V and VI perspective athletes. The highest number of athletes has III. top-level category (1484) and in IV. category - excellent athletes (1327). The purpose of this study is to determine the current status of categorized athletes in the education system, athletes' knowledge of the special terms and support of dual career and status in employment, and interest in education and employment in the future. We also want to determine more information about athletes' other skills and how the Athletes' Career Centre can use all of their skills as added value to our sports sector and society.

For this study, we used an online questionnaire created by the Athletes' Career Centre. The online questionnaire was created in Google Forms and was divided into 4 parts: A) sociodemographic data, b) sports career, c) skills and knowledge and d) volunteering, professional practice and employment. The sample for this study consisted of active and former athletes. The questionnaire was distributed to all the athletes registered in the registry of CRO OC and also was sent to all National Sport Federations. Quantitative analysis of the questionnaire was performed using Google statistical tools.

## RESULTS

The study involved 536 (52.4% female and 47.6% male) athletes, most of whom, 48.9%, are between 19 and 29 years old; 24.1% are younger than 18 years, which means that most of the participants in this study are of secondary and higher education age, which was confirmed by the results: 51.6% of participants are from secondary schools (24.3% from high schools, 27.3% from technical schools) and 15.3% of participants are students in universities (6.5% bachelor, 3.4% diploma program, 0.6% postgraduate technical program and 0.7% doctoral program), 9.1% are in elementary school and 12% are not in the education system. 64.2% are active athletes (amateur athletes) and 21.3% are professional athletes, 15.5% are currently doing recreational sports. The largest percentage of participants in this study had a professional career of more than 15 years (34.5%), 28.2% athletes with a sports career of 6 to 10 years, 27.8% with 11 to 15 years in sports, and 9.5% up to 5 years, which was expected since this study included young athletes who are students in elementary schools. The second part of the questionnaire was related to sports status (the highest level of participation in competitions and the level of classification (Table 1). Participating athletes were well informed (69.8%) about the special conditions for categorized athletes in the educational system. The types of special conditions used by athletes in this study are shown in Table 2.

**Table 1** Results on the status of athletes and level of competitions

Status of athletes (categorization)		Highest level of competition	
categorization	%	level	%
I. top level	12.7	Olympic Games	7.3
II. top level	11	<b>World Championships</b>	<b>33.4</b>
<b>III. top level</b>	<b>38.6</b>	<b>European Championships</b>	<b>21.8</b>
IV. excellent athletes	10.6	National Championships	28
V. gifted	4.2	other	9.5
VI. gifted	2		
Not categorized	20.9		

**Table 2** Special conditions used by athletes

Special conditions /more answers/ (first answer)			Special conditions/more answers/ (second answer)		
conditions	n	%	conditions	n	%
<b>Scholarship</b>	<b>364</b>	<b>67.9</b>	<b>Scholarship</b>	<b>282</b>	<b>52.6</b>
Tuition subsidy	113	21.1	Tuition subsidy	49	9.1
Accommodation in students dormitory	125	23.3	Accommodation in students dormitory	37	6.9
<b>Special condition in school</b>	<b>173</b>	<b>32.3</b>	<b>Special condition in school</b>	<b>107</b>	<b>20</b>
mentor	29	5.4	mentor	11	2.1
Peer support	26	4.9	Peer support	16	3
Cooperation between school and sports club	96	17.9	Cooperation between school and sports club	44	8.2
Possibility of continuing education	67	12.5	Possibility of continuing education	12	2.2
None of the above mentioned	140	26.1	None of the above mentioned	196	36.6

**Table 3** Employment status and interest for employment

Employment status (n=536)		Interest for employment (n=536)		Sector of employment (n=268)	
type	%	type of job	%	sector	%
Full time employment	9.3	Seasonal work	5	private	36.9
Permanent job	25.9	Permanent job	14.2	public	23.9
Unemployed, looking for a job	8.8	Part-time work	48.9	entrepreneur	11.6
Unemployed	33.4	Professional practice	1.8	other	27.6
Occasional work	22.6	Through student service (secondary students)	14.2		
		Students job (university level)	15.9		

The third part of the questionnaire related to participants' employment status and their interest in employment or practical skills. Most athletes (33.4%) are unemployed and a high percentage (25.9%) have a permanent job. Data on their interests show that most of them (48.9%) are looking for a part-time job. (Table 3). For the athletes who are employed, we asked about the employment sector: a high percentage of them (36.9%) are employed in the private sector. We also wanted to know about the skills of the athletes (foreign language skills: English (524, 97.8%), German (143, 26.7), Italian (121, 22.6%), French (16, 3%), Spanish (19, 3.5%) and others (43, 34.1%), whether they have experience in volunteering (66.1% confirmed this) and whether they are interested in volunteering in the future, which most (56.5%) confirmed. In line with previous studies on Croatian athletes, most of them (44.4%) expressed interest in working in sports and in workshops that would prepare them for the market.

## DISCUSSION

The purpose of this study was to investigate the current status of the Croatian athletes in the educational system, athletes' knowledge of the specific conditions and support for dual careers and status in employment, and interest in education and employment in the future. The results indicate that the Croatian athletes who participated in this study perceive dual career as an important factor and that they are very well informed about the special conditions and support adopted by the Ministry and CRO OC at the national level. The importance of these results lies in the fact that the Athletes' Career Centre of CRO OC, established in 2022, must provide activities for young athletes and their coaches. More specifically, at a practical level, it is important to promote young athletes through the skills and knowledge they acquired, not only through their sport results, with the aim of promoting the skills acquired during their sports career as added value for our sports sector and labour market, with the main objective of facilitating employment after their sports career. Izzicupo et al (2022) concluded that higher education departments and institutions are responsible for implementing dual career policies and regulations that are essential for student athletes. Croatian universities have established career and support centres for all students, and the next step should be to improve mutual communication between them and the Athletes Career Centre of CRO OC. Within the various activities we have conducted since 2007 until today, we have also noticed the lack of dual career visibility in general and in the educational system. Some sports clubs reward their athletes when some of them have successfully obtained a secondary school degree or a university diploma, which contributes to dual career visibility. Previous studies on athletes who are students in sports classes found that athletes just need flexible schedules for exams, seminars, etc., and accommodation from schools and universities (Caput-Jogunica and Jazbec, 2021).

## CONCLUSION

The image of athletes can be that of a person who only knows how to do sports, sometimes even in their own eyes. However, experience shows that during their careers as full-time athletes, they develop specific skills that do not come with a university diploma, but which are highly valued by employers. Analysis of the results of this study confirmed that athletes place a high value on their education. Many of the study participants have developed DC to combine education or career and sports. Most athletes want a good education, sometimes they just need an understanding person to support them on their way to achieving their goals, in education as well as on the sports field. The results suggest that the Athletes' Career Centre is a good strategic decision by CRO OC, a place where active and former athletes can get information and support. This is the first survey conducted by the Career Centre in which more than 500 athletes participated, which is another indicator of athletes' interest in working with the Centre. In collaboration with various stakeholders at the national, regional and local levels, we need to work closely with the entire education sector to shape the dual career system and the implementation of the policy in practise, to provide categorised athletes with more development opportunities alongside sport, and to increase the number of top athletes studying (Vervoorn, 2015).

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# ANALYSIS OF THE CURRENT SITUATION AND TRENDS IN COMPETITIVE AND RECREATIVE UNIVERSITY SPORTS

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## ABSTRACT

The aim of this paper was to analyze the current situation and trends in competitive and recreational sports at the University of Split. The sample of respondents included students of the University of Split who participated in recreational and competitive activities in the organization of the Split University Sports Association in the academic years 2018/2019, 2019/2020, and 2020/2021. The obtained results indicate a significant decrease in the frequency of physical activity due to the occurrence of a pandemic caused by the Covid 19 virus. There was also a significant difference between male and female students in the variables of recreation and competition, related to the frequency of participation in these activities. Based on the results, it is concluded that it is necessary to continue analyzing trends in university sports and interventions needed in programs that will increase the number of female students in competitive activities and on the other hand the number of male students in recreational activities.

**Keywords:** sport, recreation, students, physical activity, student standard

## INTRODUCTION

After the students started organizing academic sports, revolutionary changes took place in the university community. In many ways, it contributed to breaking down the isolation of the academic world and helped raise awareness of universities. (Lewis, 1970). Today, university sport plays an important role in developed countries. The most powerful examples are American universities, which direct a large part of their investments into the development of sports infrastructure, scholarships for athletes, and generally for the development of sports in their community. Sport is also used as an advertisement to attract new students, business cooperation, and promotion at the local, national, and international levels. In addition to the mentioned benefits, it is a fact that participation in sports and recreational activities has many positive effects on health and quality of life. Research conducted by Gary et al. (2002) on 342 randomly selected students from Western University showed an association in 4 out of 6 measures of health and quality of life. Measures included satisfaction with life, satisfaction with how free time is spent, amount of energy, how much emotional health affects social life, and how much physical health affects social life.

The strong influence of university sports has spread to our areas. Academic sports are considered to be the closest to professional sports. It excludes large costs and includes the possibility of achieving sports results at a high level and has an important role as a stakeholder in the national education system. Therefore, student sports represent the future of sports in Croatia and as such will soon be the bearer of national quality in most sports in developed European countries. The umbrella organization of university sports in Croatia is the Croatian Academic Sports Association (HASS). HASS has 19 members and organizes sports and recreational activities for about 180,000 students of higher education institutions, which makes it one of the largest sports systems in Croatia. One of the members of HASS is the Split University Sports Association. The main activities of the association are the organization of recreational activities, the official championships of the University and the care of university teams. Recreational activities do not have a competitive character and are carried out on a weekly basis. This type of recreation has been implemented since 2016 and includes about 10 different programs. However, the championships of the University of Split include competitions in which students from all faculties of the University can participate and fight for the title of University champion for the current academic year.

Physical activity is recognized as an extremely important segment of people's health. In addition to preventing numerous chronic and tumor diseases, engaging in some form of exercise has numerous benefits for an individual's health status. Playing sports in the academic population has been studied in research over the past years. For example, Miloshova (2020) investigated the levels of physical activity among university students in Sofia. The results showed that approximately 12% of respondents had no physical activity other than walking. Both men and women engaged in various physical activities, usually 2 times a week. Thomas et al (2019) published a study in which they wanted to examine the frequency, intensity, time, and type of physical activity among Canadian university students. Men preferred more intense programs, while women preferred aerobic ones. The biggest obstacle was stress, lack of self-confidence and lack of friends and the influence of the environment. The trend of reduced physical activity has been noticed in recent years due to the COVID-19 pandemic. Sekulić et al. (2020) conducted a study on the adolescent population in which they noted a significant decrease in physical activity during the pandemic.

Considering the importance of physical activity for young people and unfavorable global trends, the goal of this research was to determine the current state and trends in university sports at the University of Split over three academic years, in recreational and competitive activities, as well as possible gender differences within the variables of recreation and competitions.

## METHODS

The sample of participants includes male and female students of the University of Split who participated in the recreational and competitive activities of the Split University Sports Association in the academic year 2018/2019. (1030 respondents, 714 male and 316 female students), 2019/2020. (1364 respondents, 536 male and 836 female students), and 2020/2021 (1325 respondents, 733 male and 591 female students).

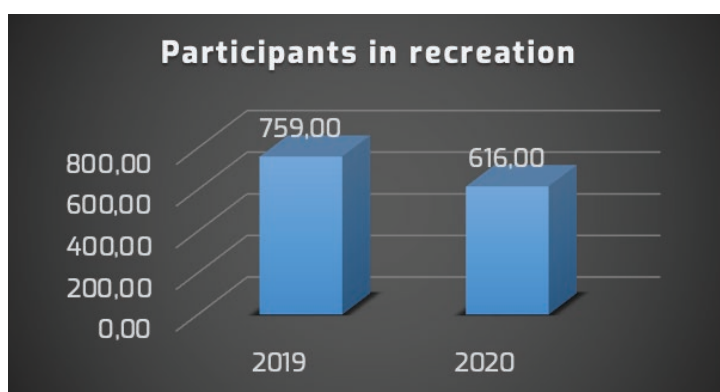
The sample of variables consists of all programs grouped into two larger groups, recreation and competitions, observed over 3 time periods. Recreation is made up of the following programs: Workout, Dance fitness, Pilates, Kickboxing, Running school, Lacrosse, Climbing, Swimming, Futsal and basketball. The second group of variables is grouped into competitions: Chess, Badminton, Table Tennis, Tennis, Volleyball, Water Polo, Handball, Futsal League, Basketball League, Cross Country League, Rowing and Sport Climbing.

Data were collected over three academic years in a database that groups participants by years of activity, type of program or competition, component and gender. Descriptive statistics parameters were

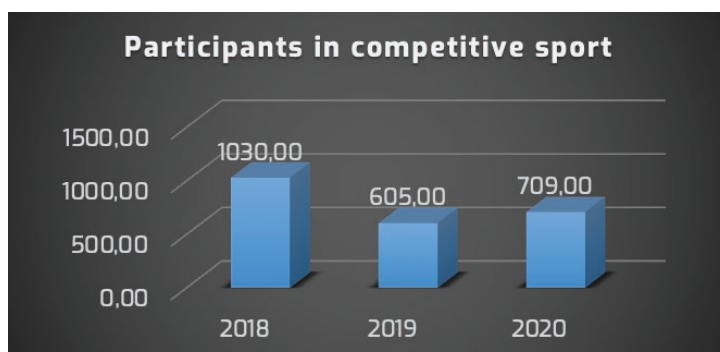
calculated, which include the calculation of the frequency (absolute value) of student participation in recreational and competitive activities. The chi-square test was used to determine differences between academic years and gender. The computer program Statistica Ver 13.5.0.17 was used for the purpose of data processing and analysis.

## RESULTS

Graphs 1 and 2 show data for the total number of recreation and competition participants in the observed academic years.



**Graph 1.** Participants in the recreation



**Graph 2.** Participants in competitive sport

The results of the Chi-square test are presented in the tables 1. to 4.

Recreational sport			
Year	2019/20	2020/21	$\chi^2$ (p)
Participants	759	616	13,3 (0,01)
Total students on University of Split	18190	18054	

**Table 1.** Frequency of participants in recreational activities

Competitive sport				
Year	2018/19	2019/20	2020/21	$\chi^2$ (p)
Participants	1030	605	709	113,5 (0,01)
Total students on University of Split	18379	18190	18054	

**Table 2.** Frequency of participants in competitive university sport activities

Male and female participants in competitions 2020/21			
Gender	Male	Female	$\chi^2$ (p)
Participants	563	146	360,2 (0,01)
Total students on University of Split	7815	10239	

**Table 3.** Frequency of male and female students in competitive activities

Male and female participants in recreation 2020/21			
Gender	Male	Female	$\chi^2$ (p)
Participants	170	445	59,7 (0,01)
Total students on University of Split	7815	10239	

**Table 4.** Frequency of male and female students in recreational activities

The results suggest that men are significantly more involved in competitive sports, while women prefer recreational activities. Also, a significant decline in active participation in competitive sports due to the COVID pandemic is noticeable.

## DISCUSSION

There are two main findings of this research. First of all, we can notice a decrease in the number of participants who took part in recreational and competitive activities in the academic years 2019/2020, and 2020/21, compared to the academic year 2018/19, when they are not, restrictive measures are not in force. Another finding indicates a significant difference between the genders in the frequency of engaging in physical activity.

First of all, a significant impact of Covid 19 on the frequency of physical activity at the University of Split was noticed. Namely, with the advent of the pandemic caused by impact of Covid 19, there were numerous restrictions that affected all aspects of social life, including sports. Epidemiological measures that directly related to sports activities included a ban on holding sports competitions and training, except for certain categories, a ban on the operation of gyms, fitness centers, sports and recreational facilities.

The aforementioned measures prevented many forms of organized physical activity that directly affected the implementation of a large part of the recreational program and competitive activities of the Split University Sports Association. So, for example, in 2020, only recreational programs were conducted that had the conditions to be conducted in an open space, such as running school, futsal and basketball. These findings are consistent with similar research. Masmanidis et al. (2009) conducted research

aimed at examining the impact of restrictions on recreational participation in sports activities. The most significant factors influencing physical activity were accessibility and lack of knowledge. These two factors have come to the fore even more with the onset of the pandemic. Also, Thomas et al. (2019) just before the onset of the pandemic also looked for restrictions that affect the frequency, intensity, time and type of physical activity among students and concluded that the biggest obstacles were stress, lack of self-confidence and lack of friends and the influence of the environment, and all the mentioned factors were even more pronounced during the pandemic.

Another finding of this research shows a significant difference in the ratio of male and female students engaged in recreational and competitive activities. Namely, the percentage of female students is significantly higher compared to male students engaged in recreational activities. On the other hand, the number of male students engaged in competitive activities is much higher compared to female students. Differences in motivation between men and women during participation in sports and exercise, in general, were investigated by Eliah et al. (2012) among university sports science students. He found that male students participated more in team ball sports and weight training, while female students preferred aerobics, walking/running and swimming. This kind of division corresponds to the relationship between male and female students engaged in recreational and competitive activities at the University of Split. The reasons for such a disparity should be sought in the proposed activities that are offered to students to choose from in both variables. Likewise, the reasons should be sought in intrinsic motivation, which is not covered by this work. The second part of the research conducted by Sekulić et al. (2020) shows differences in the change in the level of physical activity during Covid 19 between women and men, which indicates the connection between boys' participation in organized sports.

Also, possible reasons for such differences are found in cultural habits according to which men prefer to participate in team and competitive sports, while women are more inclined to different types of physical activity primarily to improve their physical appearance. Research conducted by Kilpatrick et al. (2018) and Grajek et al. (2021) indicates the correctness of such an assertion. The competitions, which are entered by male students at the University of Split in much greater numbers than female students, provide enough challenges and are promoted in such a way. Battles for medals and awards and the most successful component at the University is a concept that is more suitable for the male population of students. On the other hand, we have recreational programs whose main goal is to preserve and improve health status and therefore physical appearance. There is also a large number of programs that are close to the female population. These include circular forms of training, dance programs and pilates programs, which are still chosen by female students in much greater numbers than male students.

## CONCLUSION

This research indicated a significant negative impact of Covid-19 on the frequency of physical activity at the University of Split. Also, a significant difference between the sexes was found in the type of physical activity in which they participate.

Seen through the expert contribution, the findings of this paper point to dangers that can potentially limit the implementation of organized physical activity and according to which it is necessary to find a model for the organization of training and competition in limiting circumstances, in this case during a pandemic. On the other hand, significant information was detected that indicates a reduced number of students participating in recreational activities and a reduced number of female students participating in competitions at the University of Split. Based on these conclusions, it is necessary to intervene in order to increase the number of male and female students who access recreation or competitions.

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# WOULD STUDENTS WANT MORE SPORTS AND MORE PARTICIPATION IN SPORTS ACTIVITIES AT THE UNIVERSITY OF RIJEKA?

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## ABSTRACT

Students at the University of Rijeka participate in organised sports through the Unisport League programme. It includes tournaments and sports competitions between student sports clubs. According to the available research, a large part of students in Croatia and at the University of Rijeka do not perform regular physical activity. During the study period, the decreasing trend in students' physical fitness is worrying. The Sports Office of the University of Rijeka surveyed students in three academic years from 2020/2021 to 2022/2023. The total number of participants in these three years was 8116 students of the University of Rijeka. Students were surveyed at the beginning of each academic year using structured questionnaires. The aim of this study was to compare the questionnaire results on the participation of students in sports activities in the period of three years, in two years of the pandemic COVID -19 and one year after the pandemic COVID -19. The differences between the three years studied were determined, which showed a significant difference between the number of participants in sports activities at the university ( $p=0.0003$ ), the number of categorised athletes ( $p=45.63$ ) and the number of students who want to participate in university sports competitions ( $p=0.001$ ). The results confirmed previous research showing that only a small number of students participate in sports. Further studies in the coming academic years with more questions about sports activities at the University of Rijeka are guaranteed.

**Keywords:** participation, sport, students

## INTRODUCTION

Since 2004 the students of the University of Rijeka participate in organised sports competition. In the academic year 2005/2006, a system of student competitions was introduced, which is implemented through the Unisport League programme. It includes tournaments within student sports clubs and sports competitions between student sports clubs, through which university teams are formed to participate in national and European competitions. The University of Rijeka hosted two World and four European University Championships, which were held in Croatia for the first time, and organised the European University Games Zagreb - Rijeka 2016. Kinesiological activities at the University of Rijeka are carried out through Physical education and health culture, sports competitions for students and recreational activities for students and staff. At the University of Rijeka, Sports competitions have been organised for 18 years and physical education and health culture have been carried out within study programmes

for more than 40 years. Rijeka University Sports Association is a member of the Croatian Academic Sports Federation, the governing body of student sports in the Republic of Croatia. Rijeka University Sports Association also coordinates the work of student sports clubs at the University's constituents. According to the available research, a large part of young people and students in Croatia do not exercise regularly. Research conducted by the State Central Office for Sport in 2017 showed that only 37.5% of the population of the Republic of Croatia older than 15 years of age engage in some form of physical activity at least once a week, while 62.5% of them are completely inactive. Research among high school and university students nationally confirms that more than 40% of students have inadequate levels of physical activity. About 56% of students do not engage in physical activity outside of class, despite the fact that 95% of students consider physical activity to be very important (Vračan et al. 2009; Ćurković, 2010; Pedišić, 2011). These findings confirm a study conducted among students at the University of Rijeka (Kinkela, Đonlić, Moretti 2008; Berčić, Đonlić 2009; Ćurković 2010; Anić, Đonlić, Lulić-Drenjak, Moretti 2021, De Privitellio 2021). In addition, the trend of the decline in the physical level of student activities during studies is worrying (Buntić, 2006; Ćurković, 2010). Young people who regularly engage in physical activity experience more positive moods and emotions, they participate more actively in the teaching process and set higher educational goals. Considering the above facts, encouraging students to participate in sports and recreational activities is essential (Guidelines for the development of sports at the University of Rijeka 2022 – 2025).

The purpose of the surveys was to find out how many students participate in sports, what kind of sports system students are participate in, how many categorised athletes there are at the university, and whether there is a need to integrate sports content into academic life. We hypothesized that the number of students of the University of Rijeka who are participating in sports activities has significantly decreased, the number of student competitors, as well as the number of categorized athletes, and that the number of students willing to participate in student sports has significantly increased.

## **METHODS**

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### **Participants**

Participants were university students (n = 8116) surveyed by the Sports Office of the University of Rijeka, in three academic years, in 2020/2021(n = 2856), 2021/2022 (n = 2697) 2022/2023 (n = 2563). Students were surveyed at the beginning of each academic year using structured questionnaires.

### **Variables**

Variables observed were academic year, gender (male, female), engagement in sports activities, system of sports in which they participate, sports categorization, desire to participate in university sports competitions.

### **Statistics**

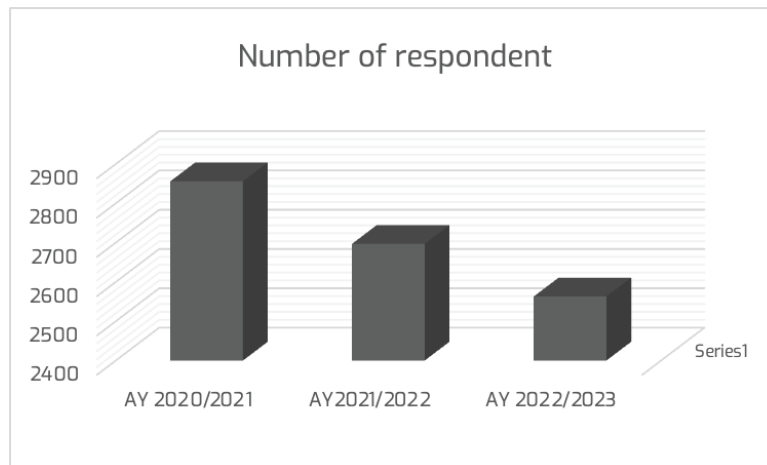
To evaluate differences between student answers in three academic years, a Chi-square test was performed. Statistica 14.0.0.15 (Tibco Software Inc.) was used for all calculations, and the p-level of 95% was applied.



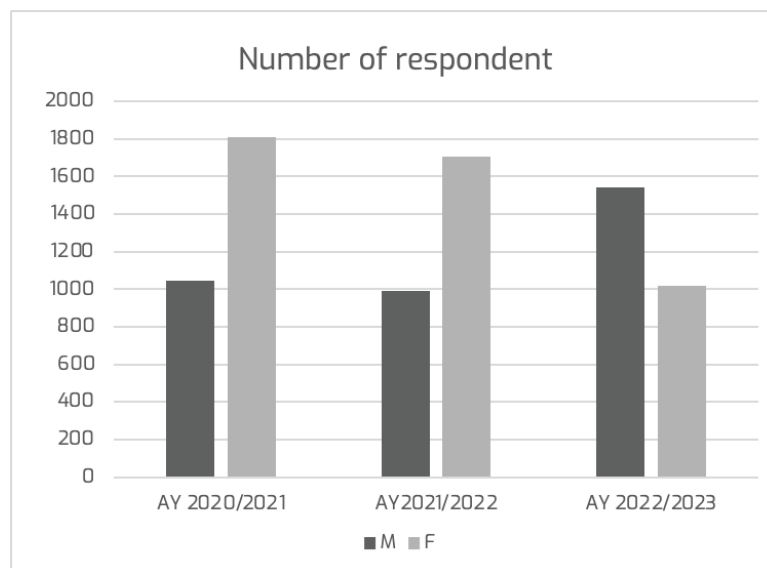
## RESULTS

The total number of students who responded to the questionnaire are presented in the Figure 1. and for the number of male and female students who responded to the questionnaire are presented in the Figure 2.

**Figure 3:** The total number of students who responded to the questionnaire



**Figure 4:** The number of female and male students who responded to the questionnaire



Engagement in sport activities in studied university students are presented in Table 1. Chi square reveal significant differences between three academic years ( $p=0.0003$ ). Over 44% of university students in every three academic years were engage in sport activities.

**Table 1:** Engagement in sport activities in studied university students (F-frequencies;%-percentages)

	AY 2020/2021		AY 2021/2022		AY 2022/2023	
	F	%	F	%	F	%
yes	1259	44.08	1236	45.84	1269	49.51
no	1597	55.92	1461	54.16	1294	50.49

Chi square: 16.5; p=0.0003

**Table 2:** Kind of sport system in which university students are participate (F-frequencies;%-percentages)

	AY 2020/2021		AY 2021/2022		AY 2022/2023	
	F	%	F	%	F	%
competitive	266	21.13	231	18.69	236	18.60
recreational	990	78.87	1004	81.31	1029	81.40

Chi square: 3.3; p=0.19

In Table 2. Chi square did not reveal significant differences between examined academic years

**Table 3:** Sports categorization among university students (F-frequencies;%-percentages)

	AY 2020/2021		AY 2021/2022		AY 2022/2023	
	F	%	F	%	F	%
yes	108	40.60	102	44.16	39	16.53
no	158	59.40	129	55.84	197	83.47

Chi square: 45.63; p=0.001

In Table 3. Chi square reveal significant differences between three academic years

**Table 4:** Desire to participate in university sport competitions (F-frequencies;%-percentages)

	AY 2020/2021		AY 2021/2022		AY 2022/2023	
	F	%	F	%	F	%
yes	754	26.40	763	28.29	941	36.71
no	2102	73.60	1934	71.71	1622	63.29

Chi square: 75.87; p=0.001

In Table 4. Chi square reveal significant differences between examined academic years.

## DISCUSSION

The Sports Office of the University of Rijeka, as part of the enrollment process for the academic years 2020/2021, 2021/2022, 2022/2023, offered students a questionnaire about physical activities.

In the academic year 2020/2021, the survey was conducted in collaboration with university components and 2822 students participated. In the sample survey, 44.08% of students engaged in some form of physical activity. Compared to the results of the survey conducted by the State Central Office for Sport in 2017, this is 6.0% more than in the total population of the Republic of Croatia. The physically active

student population mainly engages in recreational sports (78.87%), mostly training without professional supervision (69.60%). Of the total student population, 26.40% of students want to participate in student sports.

In the academic year 2021/2022, 2697 students responded to the survey. In the sample conducted, 45.84% of students are physically active in some form. 81.31% of physically active students participate in recreational sports. Of the total number of students, 28.29% of students plan to participate in university-organised sport events. There were 102 categorised athletes among the respondents, representing 3.72% of the total surveyed population.

In the academic year 2022/2023, 2563 students responded to the survey. In the sample conducted, 49.51% of students engage in some form of physical activity. The majority of physically active students participate in recreational sports and most exercise without professional supervision. Overall, 36.71% of students plan to participate in university-organised sports activities, an increase of nearly 10% in the total number of respondents compared to previous years. Among the respondents, there were 39 categorised athletes, which represents 1.52% of the total number of respondents. The chi-square reveals significant differences between the three academic years in terms of university students' engagement in sports activities among the university students. The results show that the number of students participating in sports activities significantly increased, not decreased, from 44.08% in the academic year 2020/2021 to 45.84% in 2021/2022 to 49.51% in 2022/2023. Our study hypothesis that the number of the students participating in sports activities significantly decreased was not confirmed. If we remember the negative effects of the COVID -19 pandemic caused by the closure of faculties, sports and recreational facilities and clubs, we thought that the number of students participating in some form of sports activity would also decrease. We can assume that some students became more active during the COVID -19 because they had more free time and that they longed for social contact and sports activities, especially at the beginning of the 2022/2023 academic year, after the end of the pandemic and the opening of all socialization venues.

In the study of Masmamanidis et al. "Accessibility," followed by "Lack of Knowledge" was found to be the most important constraint that affects participation in sport activities. Campus recreation administrators need to develop effective strategies to design and promote campus sports and recreational programs to increase the students' participation rate in sport activities (2009).

The chi-square did not reveal significant differences between examined academic years when we speak about the number of student competitors. Our second study hypothesis that the number of student competitors has significantly decreased was not confirmed. Although the percentage of students participating in competitive sports decreased from 21.13% in the 2020/2021 academic year to 18.60% in the 2022/2023 academic year, it did not decrease in a statistically significant way.

The chi-square reveal significant differences between three academic years at the number of categorized athletes. Our third study hypothesis that the number of categorized athletes has significantly decreased was confirmed. Although the number of student competitors did not decrease significantly, the number of categorized athletes decreased from 44.16% in the 2021/2022 academic year to only 16.53% in the 2022/2023 academic year. There is a noticeable drop in the number of categorized athletes has noticeably decreased, and the closure of sports clubs, the abandonment of leagues, and the failure to compete during the pandemic have certainly contributed to the refusal of outstanding athletes and top athletes to continue training and competing. A study by Raiola et al. showed that interest in competitive sports declined during the pandemic and was replaced by physical activities for psycho-physical well-being (2021). The chi-square shows significant differences between the three academic years in the number of students willing to participate in student sports. Our fourth study hypothesis, that there was a significant increase in the number of students wanting to participate in student sports, was confirmed. It was expected that the number of university students wishing to participate in student competitions would increase (36.71% in 2022/2023 compared to 26.40% in 2020/2021), after the years when we were mainly indoors and away from social gatherings, because sports competitions are places for socialising.

## CONCLUSION

The differences between the three years studied were determined, which showed a significant difference between the number of participants in sports activities at the university, the number of categorised athletes and the number of students who want to participate in university sports competitions. The results showing that only a small number of students participate in sports and university sport. Further studies in the coming academic years with more questions about sports activities at the University of Rijeka are guaranteed. In conclusion, we can state that students in the post-pandemic year would like to see more sports and more participation in sports activities.

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# THE IMPORTANCE OF INFORMATION IN THE SYSTEM OF ACADEMIC SPORTS

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## **ABSTRACT**

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The importance of informing students about sports activities is extremely important, and the purpose of this paper is to analyze which communication channels are most preferred by students when it comes to sports. Sport and physical activity includes the organized way of competition through the system of academic sports, but also the unorganized form that refers to sports activities outside the system of academic sports, and recreation of students in their free time. The progress of university sports in the Republic of Croatia in the past years is visible and noticeable, which can be largely attributed to the way of communication with the target audience, namely the students as the bearers of all sports activities. All universities in the Republic of Croatia that are part of the academic sports system approach the organization of sports activities and their promotion in different ways with the support of the Croatian Academic Sports Association. The digital tools that the organizers of sports activities have at their disposal enable easier and more direct communication with students, but with different effects. This paper wants to put an emphasis on informing about student activities in such a way and to determine what are the preferences when we talk about the way of communicating about sports activities among students. The research was conducted on students of the Osijek Faculty of Kinesiology, one of the three kinesiology faculties in the Republic of Croatia, whose activities have the task of being monitors and generators of the further development of academic sports in the Republic of Croatia.

**Key words:** *academic sports, information, digital tools, sports management*

## **INTRODUCTION**

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Digital tools have become an indispensable part of all social activities, which is reflected in the life habits of each individual, as well as in the constant digital transformation of many processes at all levels. The digital transformation of the way students are informed about student sports is a positive example of the use of digital tools, since students are more inclined to use new communication tools, but also easier to adopt novelties. Digital tools allow us to get information on time in today's busy time, regardless of where we are. This research aims to determine whether students use online tools for information

about sports activities or are still more inclined to traditional offline methods. Of course, this does not depend exclusively on the students, but it is very important to note that here it is even more important that the organizers of sports activities, on the one hand, recognize which are the most effective methods of information, and on the other hand, that they have adequate competences for using exactly these methods of communication. Sport is however, not always explicitly mentioned within university strategic plans and not all universities have a sports strategy. This makes it more difficult for those in positions of leadership and management in university sport to fully capitalise on sport (Brunton & Mackintosh, 2017). In recent decades, the sports sector has seen a great development, not only in terms of participants, but also in terms of the supply of different sports services and infrastructures (Ros-Castello et al., 2019). Organizational changes related to people, processes, strategies, structures and dynamics are the challenges and represent the opportunities for each university. (Corejova et al., 2020). University and its faculties should facilitate complete education, or education that goes over just pure academic knowledge and offers possibilities for complete, harmonious development (Popeska et al., 2015). Because Universities Sports plays a fundamental role in the Higher Education Institution's governance, as well as in the life of the students who attend them and the academic community (Lacerda-Magalhães & Almeida, 2018). New technologies, scientific findings and new or refined kinds of sport as well as national and international contests determine the image of university sports. There is no doubt that university sports are a growing area and will play an important role in the future. Their significance will increase in particular with the increase of knowledge about the positive effects of sports. (Weiss, 2010). Students is being significantly transformed from and academic, social, emotional, and motoric aspect. Both the academic obligations and responsibilities are being increased; the lectures and the studying demand more efficient management of the time. The students often complain on loneliness, nostalgia, conflicts and disorders in the communication with their peers, as well as an increased stress (Colleen, Conley, Travers, & Bryant, 2013). The research was conducted on students of the Faculty of Kinesiology Osijek, Josip Juraj Strossmayer University in Osijek, since, according to the specifics of the study they are studying, sports activities are closest to these students and they are the most knowledgeable about sports activities among students. Accordingly, the students of the Faculty of Kinesiology, regardless of where it is located, should be the most numerous in participating in sports activities, but also the most knowledgeable about them. Kinesiology faculties at certain universities are the bearers of academic sports. Sport is often heard anecdotally to help enhance the student experience (Roberts et al., 2015) The increased body weight and obesity, are very often responsible for 5% of the mortality in people at the global scale. Globally, one out of three adult persons are insufficiently active (WHO, 2004).

## METHODS

The sample of respondents consisted of 50 undergraduate and graduate students of the Josip Juraj Strossmayer University in Osijek who voluntarily completed an online survey sent to the e-mail addresses of all students of the Faculty of Kinesiology in Osijek. The sample included 17% of the total number of full-time students of the faculty. The sample of variables consisted of the particles of 20 questionnaires that were designed for the purposes of this research. After the data was collected through the online questionnaire, the results were transferred to an Excel spreadsheet and were used for data processing. Basic descriptive parameters were calculated (response frequency, mode and mode frequency, and minimum and maximum score). Pearson's correlation coefficient was used to calculate the correlation between questionnaire items.

## RESULTS

**Table 1.** How do you most often find information about general student activities at our University (for example, a panel discussion by a well-known lecturer, freshman event, student action, or competition)?

	Mode	Frequency Of Mode	Min	Max
1. directly at the university	6	9	1	7
2. website of the faculty	2	12	1	7
3. some other websites	1	22	1	7
4. Facebook	1	20	1	7
5. offline media - TV, radio, newspapers	1	43	1	5
6. from colleagues, friends, acquaintances, and the like	7	18	1	7
1. directly at the university	1	21	1	7

**Table 2.** How do you most often find out information about sports activities at our University (you mean, for example, a basketball tournament, a competition between years in a sport at your college or university)

	Mode	Frequency Of Mode	Min	Max
1. directly at the university	Multiple	12	1	7
2. website of the faculty	1	12	1	7
3. some other websites	1	30	1	7
4. Facebook	1	25	1	7
5. offline media - TV, radio, newspapers	1	45	1	6
6. from colleagues, friends, acquaintances, and the like	7	21	1	7
1. directly at the university	1	26	1	6

**Table 3.** What and to what extent is important to you to visit one of the interfaculty sports competitions? (presentation of your faculty/department)

	Mode	Frequency Of Mode	Min	Max
15. performance of your faculty/department	7	19	1	7
16. performance of his friends from other faculties/departments	7	17	1	7
17. watching the sport I love	7	18	1	7
18. good atmosphere at the competition	7	14	1	7
19. good conditions on the sports field	6	11	1	7
20. other	1	19	1	7

The survey questionnaire results show that students are most often informed about activities at the college, including sports activities, through mutual communication. Tables 1 and 2 show that the modal value is 7, which means that they most often get information from colleagues and friends, and also in Table 1 it is evident that they also get information directly at the university.

It is also evident from the results that they get the least amount of information on websites and other social networks.

Personal interest in the university and the sport that interests them turned out to be one of the main reasons they attend sports competitions.

**Table 4.** To what extent do the following activities meet your needs and interests in sports activities.

	Mean	Mode	Frequency Of Mode	Min	Max
extracurricular sports activities	4	3	11	1	7
recreational activities	4	Multiple	11	1	7
extracurricular non-sports activities	4	3	12	1	7

The results on satisfaction with extracurricular and recreational activities at the university show that students are quite dissatisfied with the way sports activities are carried out at certain faculties of the Josip Juraj Strossmayer University in Osijek.

The results of the correlations ( $r = 0.30 - 0.79$ ) show a high correlation between the way of information both for sports activities and for other activities that take place at colleges. It is also visible that there is a high correlation between the reasons for attending sports events at the university and the way of information, where it is evident that most often students get information directly from the faculties and through mutual communication. It is also visible that there is a high correlation between the reasons for visiting sports activities, and it can be concluded that it is important for students to socialize with each other and have a pleasant social environment in which they spend their free time.

## DISCUSSION

The results of the research showed that students prefer to use digital tools, starting with the fact that 100% of the respondents answered that they access the Internet several times a day, and to the greatest extent they do it through their mobile phones, while they do it the least often through a computer at the college or another public computers. The use of mobile devices to access information enables us to have personalized access to the user and send information to exactly the user to whom the information is addressed. For example, it is possible to send information to individual students specifically for their faculty or their preferred sport. When talking about the way of informing students about general sports activities compared to the way of informing about sports activities, there is an increased number of those students who most often get their information orally from friends or acquaintances. From the above, it can be concluded that there is clearly room for improvement here, because if students find their information by word of mouth, then it can be concluded that they are not informed about the existence of other communication channels, especially digital ones such as websites or social networks. Another reason may be the fact that the information available to students is not timely or that it is not communicated to students at all. This fact is particularly important if one takes into account the whole range of digital tools that students have at their disposal, from which it can be concluded that the aforementioned tools, such as the unisport mobile application, are not sufficiently used by the aforementioned respondents. When talking about inter-faculty competitions, the most common answer is that students want to follow the performance of their faculty, their colleagues or their friends.



On the other hand, on a scale from 1 to 7, the majority of respondents marked their knowledge of sports activities at college (28%) and at the University (26%) with a score of 5. It is immediately followed by a score of 7 for university sports activities (22%) and college sports activities (20%). From the above, it can be concluded that students still think that they have information about sports activities, but they get it mostly by word of mouth, and not through the official channels of the university sports association or the faculty.

## CONCLUSION

Advances in the use of information communication technologies and the use of the Internet have changed the way in which sports services can be delivered to consumers and clients. (Tomić, 2021) Sport is certainly a medium, and it is Novak (2006) who claims that sport should be seen integrally as one of the media of communication, which means that sports always send a certain message. Beech and Chadwick (2010) claim that there is a wide range of ways and complexities in which sports organizations use the Internet, and thus Internet sites, as well as profiles on social networks, differ in their professionalism, content and features. All of the above indicates that informing students about sports activities is very important, and that the use of digital tools for this purpose is a model that should be used and worked on as much as possible. In future research, it is necessary to expand the sample to other Kinesiology Faculties in the Republic of Croatia in order to obtain comparable data, and therefore data on the state of student sports at those universities.

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# THE ROLE OF ICT IN POPULARIZING STUDENT SPORTS

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## ABSTRACT

The research is focused on students' attitudes about the popularization of student sports and the role of information and communication technology (ICT) in that context. The study showed that the majority of respondents are aware of the benefits of student sports for health and socialization and that they are generally satisfied with the state of student sports at the University. However, there was a growing trend of students engaging in independent fitness activities instead of team sports, which may have contributed to the decline in student participation in sports. Regarding the use of ICT, students recognized its importance in promoting student sports, and social networks are the most popular tool. However, there is a high percentage of undecided answers and different opinions about other ICT models such as computer games, online courses and video guides. The research also revealed a positive correlation between students' belief in the University's support for student sports and their perception of the effectiveness of using ICT tools, especially social networks and computer games, for popularization. The need for better information and education about student sports and legal regulations was highlighted. In conclusion, the study suggests that the combination of student sports and ICT can contribute to the popularization of student sports. However, the importance of a balanced use of ICT and the need for additional education and information of students, especially through social networks, in order to encourage their involvement in student sports, is highlighted.

**Keywords:** *computer games, social network, kinesiology*

## INTRODUCTION

The role of Information and Communication Technology (ICT) in popularizing student sports has become increasingly significant over the years. According to a study by UNESCO (2015), the integration of ICT in the sports industry has facilitated significant advancements in the promotion of sports activities among students.

Social media platforms have played a vital role in promoting student sports by enabling students to share their experiences and connect with other athletes. David et al. (2018) suggests that platforms like Instagram, Twitter, and Facebook have allowed students to generate a wider audience, increase awareness of their sports activities, and build communities that support the growth of their sports activities. Moreover, these social media platforms have made it easier for students to access information about sports events, news, and scores, contributing to their engagement in sports activities (Cable & Motterhead, 2018).

The use of online sports platforms has also made it easier for students to access sports-related information. Platforms like ESPN, BBC Sport, and Sky Sports provide up-to-date information on sports events, news, and scores, keeping students informed and engaged with their favorite sports and teams (Cable & Mottershead, 2018). Moreover, the integration of ICT in the organization of sports events and competitions has made it simpler for students to participate in sports activities. Online registration and scheduling tools like TeamSnap and SportsEngine have made it easier for students to sign up for events,

track their schedules, and receive real-time updates on event details, increasing their participation in sports activities (Papastergiou, 2010).

Participation in sports has many benefits for both physical and mental health. Student sports, in particular, have the potential to positively impact students' overall well-being, academic performance, and social development. However, despite the many benefits, student sports often face challenges in terms of participation and popularity. In recent years, ICT has played an increasingly important role in various aspects of society, including student sports. This article discusses the importance of student sports, the challenges they face, and how ICT has evolved in recent years and its impact on the promotion and popularization of student sports.

Regular physical activity has been associated with a decreased risk of obesity, type 2 diabetes, cardiovascular disease, and some types of cancer (Warburton et al., 2006). Additionally, regular exercise has been shown to improve mental health by reducing stress, anxiety, and depression (Stathopoulou et al., 2006). Student sports offer additional benefits, such as improving academic performance, promoting social skills, and developing self-esteem (Eime et al., 2013). In short, student sports can positively impact all aspects of students' lives.

Despite the many benefits of student sports, there are challenges facing their promotion and popularization. These challenges include limited resources, lack of funding, inadequate facilities, and declining interest and participation (Hashim, 2012). Additionally, students may face competing demands on their time, such as academic pressures and part-time work, that may limit their ability to participate in sports (Haynes et al., 2021). Moreover, some students may feel discouraged from participating in sports due to the perception of sports as being competitive and exclusive (Turnnidge et al., 2014). These challenges highlight the need for innovative approaches to promote and popularize student sports.

ICT has the potential to address some of the challenges facing student sports by providing new and innovative ways to promote and popularize sports. Social media platforms, such as Twitter, Facebook, and Instagram, have been used successfully to engage students in sports activities and promote sporting events (Zeren et al., 2022). Additionally, mobile applications, such as Strava and Nike Run Club, provide an easy and accessible way for students to track their physical activity and connect with other students who share similar interests (Creaser et al., 2021). Finally, virtual reality technology has been used to provide students with immersive sports experiences that can motivate them to participate in sports (Bird, 2020). These ICT tools can be powerful tools to promote and popularize student sports, but they also present challenges, such as the need for technical skills, access to technology, and potential issues related to privacy and security.

Student sports have many benefits for both physical and mental health. However, they face challenges related to limited resources, inadequate facilities, and declining interest and participation. ICT has the potential to address some of these challenges by providing new and innovative ways to promote and popularize student sports. Social media platforms, mobile applications, and virtual reality technology are just a few examples of ICT tools that can be used to promote and popularize student sports. However, there are also challenges associated with these tools that must be addressed. The use of ICT in student sports requires careful consideration of both the benefits and potential drawbacks to ensure that student sports continue to provide a positive impact on students' lives.

According to the Sports Strategy of the University of Zagreb prepared by Balekić et al. (2014), among other things, one can read an evident loss of interest in student sports.

After analyzing the experiences of European countries, Caput-Jogunica et al. (2012) propose guidelines for the popularization of student sports and the possibility of flexible attendance.

Likewise, the integration of ICT into student sports can lead to significant advancements in the sports industry, contributing to the growth and popularity of sports activities among students. It is expected that the continued integration of technology into sports will play an increasingly significant role in the promotion of sports activities among students. Accordingly, it was necessary to investigate the views of students on the possibilities of popularizing student sports through the use of ICT.

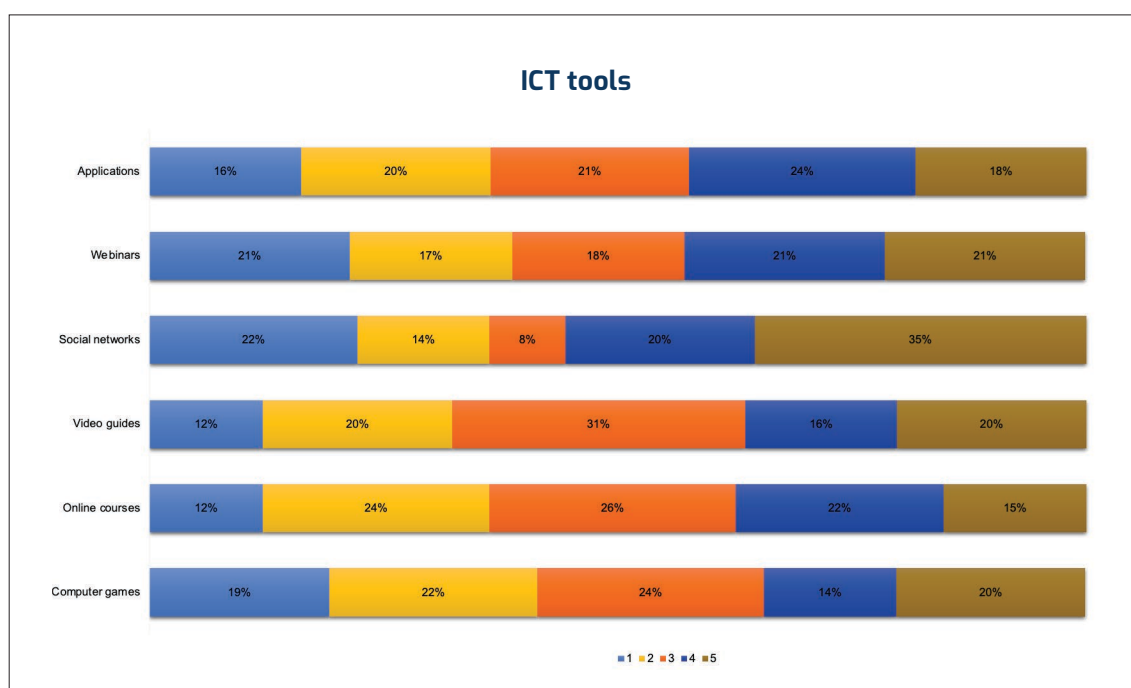
## METHODS

For the purpose of research, a survey questionnaire was constructed and distributed to all students participating in student sports at the University of Osijek. The survey consists of 18 items. 157 students participated in the survey, and the results were processed using standard statistical procedures using the Statistica software package.

The first part of the questionnaire related to the respondents' knowledge about the state of student sports at Croatian universities, the legislative framework that regulates student sports, the university's support for sports and the possible impact on the health, social and sports life of students. The second part of the questionnaire referred to the respondents' views on the use of ICT in the popularization of student sports. Stratification of the sample was performed on the basis of study direction and study year of the respondents, and the correlation between variables was determined using the chi-square test.

## RESULTS

37.4% believe that the state of student sports at Croatian universities is satisfactory, 28.3% of respondents believe that the legal framework in Croatia is good, but also 27.3% believe that this framework is insufficient. 41.4% believe that student sports have a positive effect on prolonging a sports career. The largest number of respondents (58.6%) have a positive experience related to better socialization among students who play student sports. Likewise, 52.6% of them believe that student sports can prevent obesity and hypokinesia. A statistically significant relationship was established between the views of respondents who mostly believe that the University supports and encourages student sports and who believe that ICT can help in this popularization by using social networks ( $p=0.0217$ ) and computer games ( $p=0.0164$ ). Regarding the choice of ICT tools according to the preferences of the respondents, it can be seen from Graph 1., from which it is evident that students prefer the use of social networks in the popularization of student sports. It just shows the trends in the use of technology among the student population.



Graph 1. Choice of ICT tools according to the preferences of the respondents

## DISCUSSION

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The research results showed that there is an equal number of respondents by gender and that they are mostly undergraduate students, which is somewhat understandable since the Kinesiological Culture course is an undergraduate course, and then they are in contact with the subject teacher, i.e., kinesiology.

According to the obtained results, we can say that students are largely aware of the value of student sports in terms of health, i.e., the reduction of subcutaneous fat, but they highly value the value of socialization, which Sabin & Marcel (2014) also talk about in their work. In the entire survey, these two particles related to health and socialization have the highest percentage of responses in a positive direction. It is known that students themselves like to exercise and take care of their health and social status (Kohl III & Cook, 2013), but lately they are increasingly doing it independently or in fitness centers (Kaur et al., 2020), while team sports (which dominate student sports) are increasingly being avoided. Such student behavior probably led to dropouts, and it is necessary to respond to the popularization of student sports. In the districts where attitudes about the state of student sports were examined, 37.4% of them consider it satisfactory, but many (38.4%) are also undecided. A high percentage of those who are undecided can also be read in articles that question the legal regulations and encouragement of the University, which indicates insufficient information among students or their lack of interest.

Nowadays, students are increasingly and sometimes completely attached to ICT (Engel et al., 2018), so the results obtained in this research are not surprising. Thus, to the question "ICT plays a significant role in the popularization of student sports", students most often (38.4%) answer in a positive direction, and we are of the opinion that its use is necessary. The percentage of those who are undecided is also very high (34.3%), which indicates indecision, and possibly poor knowledge of ICT and the possibility of its application. In the further answers regarding the model of popularizing student sports through ICT, we can see very diverse answers, and a large number of undecideds. The only item that brings a high percentage in a positive direction is the question about the use of social networks (55.6%), which could be interpreted as their great popularity and use. Other tools whose importance in the popularization of student sports was evaluated by students did not receive a significant percentage, and these tools are computer games, online courses, video guides, podcasts, webinars, live broadcasts and educational applications.

Finally, a correlation was made that established a statistically justified connection in a positive direction between the attitudes of respondents who mostly believe that the University supports and encourages student sports and who believe that ICT can help in this popularization and use through social networks and computer games. Based on these results, we conclude that there are acceptable models of using ICT in the popularization of student sports.

## CONCLUSION

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ICT is something that has been in the lives of people, including students, for a long time. Likewise, all research has shown that too much use of technology can negatively affect health status. Maybe it was precisely the new technologies that led to the decline of interest in student sports, but it is precisely in the combination of these two domains that we see possible progress in the popularization of student sports.

According to the research results, we can conclude several things. It seems that students are not sufficiently informed about the legal regulations and the state of student sports, and they need to be taught.

There is also a large percentage of undecideds regarding the use of different ICT models, with the exception of social networks. We see the solution in additional education and information for students through social networks, but also in the versatile inclusion of other models.

Based on the statistically supported correlation, we found a positive connection between respondents' attitudes towards the University's support for student sports and their belief in the effectiveness of using ICT, such as social networks and computer games, for popularizing and engaging in sports. Thus, we can conclude that there are viable ICT models for promoting student sports.

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# VARIOUS ASPECTS OF MEDIA RELATIONS PRACTICES IN CROATIAN NATIONAL FEDERATIONS OF OLYMPIC SPORTS: A SIZE-BASED COMPARATIVE PERSPECTIVE

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## ABSTRACT

This study investigated various aspects of media relations activities conducted by fifteen Croatian umbrella national federations of Olympic sports categorized by their official number of registered athletes in groups of small (up to 2 000, N=6), medium (2000-10000, N=5) and large (more than 10 000, N=4). Key deciding individuals holding prominent positions within each federation participated in qualitative online questionnaire survey and the answers that comprised two sections were rated on a 5-point Likert scale, enabling the expression of level of engagement, agreement or satisfaction. The results indicate significant variations among different categories of Croatian umbrella national federations of Olympic sports with larger federations, which represent all four most popular team ball sports, demonstrating higher engagement in various aspects of media relations activities, with multiple dedicated staff engaged in large-scale production of media material, including extensive improvements of digital communication infrastructure during the COVID-19 pandemic. Smaller federations predominantly rely on existing staff and prioritize social media and internal communication. On the other hand, federations as whole expressed high satisfaction with both the media-image, and communication efforts on official digital channels, while also highly emphasizing its organizational accessibility regarding media inquiries.

**Keywords:** media relations, sports organizations, digital communications, COVID-19 pandemic

## INTRODUCTION

The communication practices of sports organizations embody diverse levels of engagement, target audiences, and communication channels (Stoldt et. al., 2021). The design of an organizational structure of sports organizations thrives on principles such as division of labor and departmentalization, chain of command, span of control, authority, and coordination (Lussier, 2019 as cited in Pedersen et al., 2021: 148-150). Non-profit organizations like national sport federations should incorporate different elements of planning into their daily operations, mirroring the practices of profit-driven organizations (Škorić et. al., 2014). Limited resources can present obstacles in effectively managing various aspects of sports organizations, particularly media and communications activities. Building collaborative relationships between sports organizations and the media is crucial for promoting sports and reaching a wider audience. In order to navigate the complexities of media communication, sports organizations often rely on the expertise of professionals or their own dedicated departments in areas of media and public relations. Media relations professionals face challenges in maximizing positive coverage and maintaining good relationships with media representatives (Covell et. al., 2007). Understanding audience engagement drivers is crucial for managing this aspect and creating targeted campaigns, while at the same time, different activities and areas of media relations collectively shape the public perception of a sports organization. The aim of this study was to investigate potential differences in media communication practices and the perception of organizational media and digital communication image among three categories of Croatian national umbrella sports federations, taking into consideration the federation's size as a factor influencing available resources.



## METHODS

The research sample consisted of fifteen Croatian national umbrella sports federations of Olympic sports. The study involved key individuals holding prominent positions within each federation, including two presidents, one director, one executive director, ten general secretaries, and one secretary. The research was conducted in May 2022. The sample was categorized into three groups based on the official number of registered athletes in federations:

- Large federations (N=4) with over 10,000 registered athletes (Croatian national football, basketball, handball, and volleyball federations)
- Medium-sized federations (N=5) with 2,000-10,000 registered athletes (Croatian national judo, athletics, swimming, gymnastics, and water polo federations).
- Small federations (N=6) with up to 2,000 registered athletes (Croatian national tennis, taekwondo, alpine skiing, boxing, table tennis, and cycling federations).

An online-questionnaire survey was conducted in order to investigate the extent of representation of different media relations activities of Croatian umbrella national federations of Olympic sports and their satisfaction with reaching the audience on digital channels and organizational image in the media coverage. The answers that comprised two sections were post-rated on a 5-point Likert scale, enabling the expression of level of engagement, agreement or satisfaction.

The first section (P1) of the study examined various aspects of media relations activities conducted by Croatian umbrella national federations of Olympic sports through five variables. The initial variable (P1-1) focused on the presence of dedicated personnel responsible for the federations' media and communication activities, while the second variable (P1-2) assessed the extent of involvement of public relations agencies in media relations during time of hosting larger-scale sport events. The third variable (P1-3) captured the level of activity and development of digital communication channels during the COVID-19 pandemic. The fourth variable (P1-4) examined the federations' engagement in preparing informational materials specifically targeted for the media, and the fifth variable (P1-5) addressed federations assessment of their own target media activities as reflection of media coverage.

The second section (P2) evaluated the satisfaction of Croatian umbrella national federations of Olympic sports with their organizational image in the media and their communication efforts on official digital channels. The first variable in this section (P2-1) assessed the accessibility of federations in their communication with journalists and their ability to provide timely and necessary information. The second variable (P2-2) measured overall satisfaction with the media coverage of sports federation activities. The third variable (P2-3) focused on the federations' satisfaction with communication on official digital channels, while the fourth variable (P2-4) examined their satisfaction with the effectiveness of reaching their target audiences through digital channels. However, two variables (P1 and P3) were excluded from further analysis due to zero variance (no variability in answers).

All data were presented as the mean and standard deviations (SD), following the confirmation of data normality using the Kolmogorov-Smirnov test. To assess the differences between groups in P1 and P2 items, a one-way analysis of variance (one-way ANOVA) was performed. Levene's test was applied to assess the homogeneity of variances. If the result was significant, the one-way ANOVA was replaced with Welch's F test which is Welch's F test more robust to heterogeneity of variance (De Beuckelaer, 1996). Effect sizes are presented as partial eta-squared ( $\eta^2$ ) to determine the meaningfulness of the results. As suggested by Cohen (Cohen, 1977), threshold values for effect size were set at 0.01 (small), 0.06 (medium), and 0.14 (large). For pairwise comparisons, the Bonferroni post-hoc test was used following ANOVA, and the Games-Howell post-hoc test was used after Welch's F test. The level of significance was set at  $p < 0.05$ . All statistical analyses were carried out using the SPSS 29 statistical package (Chicago, IL, USA).

## RESULTS

Table 1 shows the results of a one-way ANOVA and Welch's F test performed to assess differences in the first section (P1) of the study, which examined various aspects of media relations activities conducted between large, medium, and small-sized Croatian umbrella national federations of Olympic sports. The ANOVA revealed statistically significant differences in the presence of *dedicated personnel responsible for the federations' media and communication activities* (P1-1) and the federations' *engagement in preparing informational materials specifically targeted for the media* (P1-4). According to the subsequent Bonferroni post-hoc analysis, large federations scored higher on P1-1 variable compared to medium (mean difference: 1.96,  $p > 0.01$ ) and small federations (mean difference: 1.92,  $p > 0.01$ ). A similar pattern was observed for P1-4, where large organizations had higher values than medium (mean difference = 2.05,  $p > 0.01$ ) and small organizations (mean difference: 1.58,  $p > 0.01$ ). The Welch's F test revealed significant differences between groups regarding *level of activity and development of digital communication channels during the COVID-19 pandemic* (P1-3), and the Games-Howell post-hoc analysis showed that larger federations had higher scores than smaller organizations (mean difference: 2.08,  $p > 0.01$ ).

**Table 1.** Differences on various aspects of media relations activities (P1)

variable	large (n = 4)		medium (n = 5)		small (n = 6)		W	p	$\eta^2$	
	mean	± SD	mean	± SD	mean	± SD				
P1-1	4.75	± 0.50	2.80	± 0.84*	2.83	± 0.98*	7.84	-	>0.01	0.57
P1-2	2.00	± 2.00	3.80	± 1.79	2.67	± 1.97	1.03	-	0.39	0.15
P1-3 <sup>a</sup>	4.75	± 0.50	3.00	± 2.00	2.67	± 0.82*	-	12.00	>0.01	-
P1-4	4.25	± 0.96	2.20	± 1.10*	2.67	± 1.03*	4.68	-	0.03	0.44
P1-5 <sup>a</sup>	3.75	± 0.50	3.20	± 1.30	3.00	± 1.55	-	0.79	0.49	-

Legend: data are presented as mean ± standard deviation (SD); <sup>a</sup> – equal variances not assumed; F – f test; W – Welch's F test; p – probability value;  $\eta^2$  – effect size (partial eta squared); \* – significantly different from large group (Bonferroni post-hoc); # – significantly different from large group (Games-Howell post-hoc).

Differences between large, medium, and small-sized Croatian umbrella national federations of Olympic sports considering their satisfaction with organizational image in the media and through their communication efforts on official digital channels (P2) are shown in table 2. One-way ANOVA showed no statistically significant differences between groups in any of the applied variables ( $p < 0.05$ ).

**Table 2.** Differences on organizational image in the media and communication efforts on official digital channels (P2)

variable	large (n = 4)		medium (n = 5)		small (n = 6)		F	p	$\eta^2$
	mean	± SD	mean	± SD	mean	± SD			
P2-2	4.00	± 0.82	3.60	± 0.89	2.67	± 1.03	2.73	0.11	0.31
P2-4	4.00	± 0.82	3.40	± 1.34	3.67	± 0.82	0.38	0.69	0.06

Legend: data are presented as mean ± standard deviation (SD); F – f test; p – probability value;  $\eta^2$  – effect size (partial eta squared);

## DISCUSSION

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The results indicate significant variations in the media relations activities among different categories of Croatian umbrella national federations of Olympic sports.

Larger federations, which includes four most popular team ball sports, demonstrate higher engagement in various aspects of media relations, including dedicated personnel responsible for media and communication activities, preparation of informational materials for the media, activity on and development of digital communication channels during the COVID-19 pandemic.

Many olympic sports organizations in general have established sections or jobs in media management approached through integrated marketing communication (Camy et. al., 2007), which embodies all aspects of the communications mix into one effort by devising a customer-focused programme that provides synergy between all activities (Masterman, 2004). Larger national sports federations capabilities in higher level of engagement in media relations activities could most likely be correlated with their higher budget since they represent tens of thousands of athletes, and are also representing most popular team ball sports. As visible from scale-categories, all large sports federations have dedicated multiple professional personnel responsible for the federations' media and communication activities with multiple staff or have a long-term cooperation with the public relations agency. In contrast, medium-sized and small federations typically delegate media relations activities to existing staff members, usually secretaries, or through permanent and occasional engagement of external professional associates.

There are two distinct levels in context of media relations activities in sports organizations: communicative and interactive. The communicative level involves public announcements and preparation of media materials, such as statistical reports, media-kit and media guides. The interactive level encompasses press conferences, media events, and interviews (Nicholson, 2007).

Differences between the federations were found in scale of engagement in preparing informational materials specifically targeted for the media, where large Croatian umbrella national federations of Olympic sports frequently preparing such materials, while small and medium-sized federations either do not prepare them or do so infrequently, which can be attributed to the number of professionals engaged in media relations within the federation.

Large national sports federations demonstrated a higher level of activity and development in digital communication channels during the COVID-19 pandemic. According to scale-categories, they focused on developing their digital infrastructure, internal digital communications, and upgrading official digital channels, including websites, streamings and social media platforms. In contrast, small and medium-sized federations primarily intensified communication through social media platforms and utilized digital tools for internal communication. To compare, in study conducted on communication managers of 45 Spanish umbrella national sports federations, 41 percent of federations adopted digital communication channels such as streaming and social media platforms (Estanyol et. al., 2023).

## CONCLUSION

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Varied media relations activities exist among Croatian umbrella national sports federations with larger federations showing greater engagement in terms of multiple dedicated staff engaged in large-scale production of media material, with thorough improvements of digital communication infrastructure during COVID-19 pandemics. Smaller federations predominantly rely on existing staff and prioritize social media and internal communication. Croatian umbrella national sports federations as whole expressed high satisfaction with both the media-image, and communication efforts on official digital channels, while also highly emphasizing its organizational accessibility regarding media inquiries.

Future research should consider conducting qualitative content analyses of digital communication channels (official website and / or social media), which would provide assessment of the current state of communications and identify potential areas for improvement. Furthermore, investigating the effectiveness of media relations through questionnaires administered to sports journalists would offer valuable insights into the efficiency and impact of communication strategies that sports federations employ.

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The background is a solid blue color with various technical and data-related graphics. At the top, there are several circular gauges or pie charts with percentages: 55%, 45%, 68%, 35%, and 18%. Below these, there are various geometric shapes, lines, and arrows, suggesting a digital or scientific theme. In the center, a silhouette of a tennis player is shown in a dynamic, forward-leaning pose, holding a tennis racket. The player's shadow is cast on the ground below. The text is overlaid on the player's silhouette.

Theme:

# ANTHROPOLOGICAL FEATURES OF UNIVERSITY STUDENTS

# PHYSICAL ACTIVITY AND ITS PREDICTORS AMONG STUDENTS OF THE UNIVERSITY OF SPLIT

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## ABSTRACT

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The importance of physical activity at all ages is a well-known fact all over the world. Despite the knowledge about its positive effect, today's global problem is precisely the reduced level of physical activity. The main goal of this research is to examine the level of physical activity among the student population at the University of Split, predictors of physical exercise, gender differences in the frequency of physical activity and factors that influence the level of physical exercise. For the purpose of data collection, a survey was conducted among 263 students for the academic year 2021/2022. A computer statistical program STATISTICA version 13.0 was used for data processing. The results showed that university students in Split regularly or occasionally carry out some form of physical activity, with male students being more active than female students. A significant difference was observed in the regularity of exercise and leisure activities. In carrying out physical activity, the majority of respondents are most motivated by the positive effect of physical exercise on health. Many students are as well motivated by the effect of reducing stress and improving physical appearance. Socialization is the least important factor of motivation.

**Keywords:** physical activity, students, predictors, motivation

## INTRODUCTION

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The term physical activity includes all movements of the locomotor system that require energy expenditure. Although physical activity is perceived as exercise, daily movement when going to work and performing job activities, doing household chores, recreational activities and traveling are also considered physical activity (Caspersen et al., 1985). Physical activity can help reduce the risk of contracting various diseases (hypertension, diabetes, arthritis...). It also has numerous advantages in the function of improving psychophysical health. In addition to the preventive effect, it can work on perfecting and improving abilities. The positive effects of engaging in physical activity in the psychological aspect are manifested by improving mental health, reducing the risk of depression and cognitive decline, and reducing the risk of developing dementia (Caspersen et al., 1985). For the effect of physical activity on improving health



and quality of life, there are age-specific recommendations for daily/weekly levels of physical activity. Thus, according to the WHO (World Health Organization), young people, i.e. children and adolescents, are recommended to carry out physical activity of moderate or high intensity for at least 60 minutes a day. For adults, it is recommended that they should practice 150 minutes of moderate-intensity aerobic physical activity or 75 minutes of high-intensity aerobic activity. In addition, it is recommended to perform 2 or more times a week strength training involving larger muscle groups. Despite the fact about the importance of physical activity, today's major global problem is insufficient movement, i.e. physical inactivity of the general population. Numerous studies speak of a decline in the level of physical activity in the period between adolescence and adulthood, and students are precisely the population that belongs to that transitional period. The reason probably lies in the fact that, despite the knowledge of the consequences of not moving, students still want to live a leisurely life, considering that physical exercise requires various sacrifices in life, such as taking away free time, which nowadays is mostly devoted to technology (Poljak, 2015). In the same way, the problem arises with the financial possibilities of students to afford participation in organized forms of sports activity, and they lack motivation for independent exercise. In research related to students' motivation to engage in physical activity, it has been proven that there are differences between those who play sports and those who practice other forms of exercise. Thus, for students who participate in sports, the main motive is enjoyment and competence, and for students who exercise, the biggest source of motivation is improving their physical appearance and coping with stress more easily. The University of Split encourages students to be physically active, and the main organizer of all sports and recreational activities that are intended exclusively for students is the Split University Sports Association (better known as Unisport Split). The association's main activities are the organization of official University championships and free recreational activities, which are carried out throughout the academic year so that students can be active continuously throughout the year.

## METHODS

The research was conducted in the academic year 2021/2022. on a sample of 263 students at the University of Split. The questionnaire was filled out by 194 women and 69 men, aged 19 to 30. Students of all study years from 16 faculties are included. The data was collected using an online questionnaire consisting of a total of 26 questions. The first part of the question related to demographic data: gender, age, faculty and year of study. This was followed by questions about involvement in recreational programs and the frequency of engaging in them. The second part of the question examined the factors involved in physical activity, i.e. the main motives for exercise. Descriptive static indicators, frequencies and percentages for variables related to the level of physical activity and motivation for physical exercise were calculated using the computer statistical program STATISTICA version 13.0. A non-parametric version of the T-test (Mann-Whitney test) was used to determine the differences between the genders, considering that these were non-parametric variables of the ordinal type. The Chi2 test was used to determine differences for non-parametric variables of the nominal type.

## RESULTS

The questionnaire initially asked questions related to physical activity. So the students of the University of Split were examined for involvement in recreational programs, i.e. engaging in recreation, the regularity of physical activity (either through recreation and/or sports), and activities in their free time that require physical effort for the past 7 days.

**Table 1.** Frequencies (F), percentages (%), and gender differences for the observed variables

	ALL		M		W		MW/ $\chi^2$ (p)
	N	%	N	%	N	%	
<b>Doing recreation</b>							
Yes, regularly	93	35.36	31	44.93	62	31.96	5,18(0,07)
Yes, occasionally	90	34,22	22	31,88	68	35,05	
No	77	29,28	14	20,29	63	32,47	
<b>Regularity in exercise (sport/recreation)</b>							
Once or twice a week	62	23,57	11	15,94	51	26,29	9,01(0,03)*
Three or four times a week	88	33,46	28	40,58	60	30,93	
Almost every day, but at most one training session per day	25	9,51	12	17,39	13	6,70	
Almost every day, sometimes more than one training session a day	18	6,84	4	5,80	14	7,22	
<b>Activity in the past 7 days</b>							
No physical activity	45	17,11	8	11,59	37	19,07	-2,13(0,03)*
1-2	93	35,36	21	30,43	72	37,11	
3-4	80	30,42	26	37,68	54	27,84	
5-6	32	12,17	9	13,04	23	11,86	
7	10	3,80	5	7,25	5	2,58	

Frequencies and percentages for the observed variables and differences between groups by gender are shown in Table 1. As for recreation, the table shows that the observed sample of respondents regularly or occasionally engages in some form of recreational activities. There is no significant difference between the genders in this variable. When we look at the results for the other two variables, we can see that there is a significant difference between male and female students in both. Male students practice 3-4 times a week, while female students 1-2 times. For activities in their free time that require physical effort in the past 7 days, most respondents answered that they did them 1-2 times a week (significantly more female students), but a large number did them 3-4 times a week (significantly more male students). This is confirmed by numerous studies that show that female students are less physically active than male students. The answer to the question of why girls are less active was attempted by Telford and colleagues. The study concluded that girls are less active due to weaker encouragement for physical activity in primary and secondary school, due to less parental support and weaker promotion of sports among the female population (Telford et al., 2016).

Then the predictors of engaging in physical activity were examined. In this case, motivation is one of the most important factors. This is how we got information on what motivates students to exercise the most, and what motivates them the least.



**Table 2.** Frequencies (F), percentages (%), and gender differences for motivation for physical exercise

	ALL		M		W		MW test
<b>Physical appearance</b>	N	%	N	%	N	%	
It doesn't motivate me at all	10	3.80	4	5.80	6	3.09	0.74(0,46)
	35	13,31	13	18,84	22	11,34	
	72	27,38	17	24,64	55	28,35	
	86	32,70	17	24,64	69	35,57	
It motivates me a lot	60	22.81	18	26.09	42	21.65	
<b>Positive effect on health</b>							
It doesn't motivate me at all	3	1,14	1	1,45	2	1,03	2,75(0,01)*
	1	0,38	1	1,45			
	34	12,93	15	21,74	19	9,79	
	69	26,24	21	30,43	48	24,74	
It motivates me a lot	156	59.32	31	44.93	125	64.43	
<b>Reducing stress</b>							
It doesn't motivate me at all	8	3.04	3	4.35	5	2.58	2,86(0,01)*
	19	7,22	9	13,04	10	5,15	
	50	19,01	15	21,74	35	18,04	
	57	21,67	19	27,54	38	19,59	
It motivates me a lot	129	49.05	23	33.33	106	54.64	
<b>Socialization</b>							
It doesn't motivate me at all	53	20.15	13	18,84	40	20.62	-0,56(0,57)
	46	17,49	13	18,84	33	17,01	
	82	31,18	19	27,54	63	32,47	
	46	17,49	12	17,39	34	17,53	
It motivates me a lot	36	13.69	12	17.39	24	12.37	

Table 2 shows descriptive static indicators, frequencies, and percentages for variables related to motivation for physical exercise and differences between male and female respondents. The majority of respondents stated that the positive effect on health motivates them a lot, and for the same variable, a statistically significant difference between the genders was observed. The second most important motive is the effect of physical exercise on reducing the level of stress, whereby men are statistically significantly less motivated than women. For the surveyed students, appearance and socialization proved to be less important sources of motivation. For men, appearance is a greater incentive compared to women, and socialization is a more important motive, for women, but the differences are not statistically significant.

## DISCUSSION

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In the observed sample, obtained results show that male and female students of the University of Split are physically active in their free time. In the total sample, the smallest percentage stated that in the past 7 days, they had not carried out any activity involving physical effort, i.e. they were physically inactive. In this study, it was shown that male students are more active in their free time compared to female students, and this has also been shown by numerous previous studies. The problem with the study of the level of physical activity of students at the University of Split is that, even though female students are physically active, according to the results, it was shown that they perform activities mostly 1-2 times a week. According to research conducted by Kimm et al. In 2016, adolescent girls who performed some form of physical activity occasionally, i.e. 1-2 times a week, were categorized as a sedentary group. One of the goals of this study was to examine what most motivates male and female students to be physically active. It is already well known to everyone that physical activity has positive effects on health, and this is precisely one of the main reasons why people carry out various forms of physical activity. On the population of students from this research, it was also shown that the positive effect on their health is their primary source of motivation in engaging in physical activity. The results showed the following order of motives (in order of importance) for the majority of respondents: Positive effects on health, Stress reduction, Appearance, and Socialization.

## CONCLUSION

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At the University of Split, male students are more physically active than female students. They are regularly involved in various recreational programs, while female students occasionally engage in some form of recreation. It has been shown that students exercise more often (either through recreation or sports) and are physically active 3-4 or more days a week. The results obtained confirm numerous studies that were conducted earlier. For the majority of respondents, the positive effect of physical activity on health is the main motive for doing it. The second most important motive is the effect of physical activity on reducing stress. Less important motives are appearance and socialization, which was unexpected.

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# MAIN MOTIVES FOR EXERCISE AND EXCESSIVE EXERCISE ACTIVITY COMPARING KINESIOLOGY STUDENTS AND RECREATIONAL ATHLETES

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## ABSTRACT

The aim of this study was to examine the relation between the main motives for exercise and excessive exercise activity. Data were collected on a sample of 233 young adults comprising of 124 kinesiology students (from the three faculties of kinesiology – Osijek, Zagreb and Split - 53.2%) and 109 recreational athletes (46.8%). There were 107 males (45.9%) and 126 females (54.1%). The socio-demographic data questionnaire and The Obligatory Exercise Questionnaire (OEQ) were used in the research. This study is to understand whether there are correlations between main motives for exercising such as positive health, body image, challenge and enjoyment, socializing with friends, competition, other and any of three dimensions of OEQ (Exercise frequency and commitment, Exercise preoccupation and intensity, Exercise emotionality). The correlations between observed variables were generally low ( $r = -.28$  to  $.30$ ), but some results show significance. Respondents who exercise more often and are more dedicated chose competition as the main motive for exercising ( $r = .30$ ), while other reasons such as help in overcoming stress, increasing strength, endurance ( $r = -.17$ ) are less important for them. In terms of gender relations, men exercise more often and are more dedicated ( $r = -.24$ ), they are more focused and exercise more intensely ( $r = -.15$ ). They generally scored higher values on the exercise dependence scale (overall score,  $r = -.18$ ). The findings suggest that male respondents who chosen competition as the main motive for exercising are more committed to exercise, exercise more often and more intensely.

**Key words:** kinesiology students, recreational athletes, OEQ, motives for exercising, obligatory exercise

## INTRODUCTION

Numerous studies have proven the positive effects of regular physical activity that helps to cope with daily stress, reduce obesity, the emergence of risky diseases, improve mental and physical health (Berczik et al., 2012; Hackney, 2006; Mišigoj-Duraković & Duraković, 2014). But despite the large number of positive effects of physical activity, there can be an overdose in physical activity that can lead to the emergence of exercise addiction. Addiction is an apt, commonly understood word to use with respect to excessive behaviours but it has the disadvantage that it has come to be overly identified with drug taking. Excessive amounts of exercise can negatively affect neuroendocrine, immunological, cardiovascular, and musculoskeletal systems (Adams & Kirby, 2001). Although generally acknowledged as health-enhancing, exercise has also been recognised as having the potential to become a damaging obsession (Warner & Griffiths, 2006). Exercise addiction is a condition in which regularly exercising individuals lose control over their exercise behavior, as manifested by reoccurring compulsive urges to exercise and symptoms of dependence, resulting in negative consequences to their personal and/or social lives (Szabo et al. 2016). However, excessive exercise can become a compulsive behaviour, where individuals feel compelled to exercise despite injuries, obligations or attempts to reduce their activity

(Hausenblas and Downs, 2002). A prevalence rate of 42% was found for exercise dependence among clients of a Parisian fitness centre (Lejoyeux et al., 2008), whereas in a study on occurrence of exercise dependence among college students a prevalence of 45.9% was found (Zmijewski & Howard, 2003). In another study, 52% runners had been found exercise dependence as reported by Blaydon and Lindner (2002). In another similar study by Gun and Agirbas (2019), 15.8% female students were found exercise addiction whereas 52.5% subjects were considered for being addicted and no association were found between BMI and exercise dependence. It can be concluded that exercise dependence is very much prevalence across different sections of population.

Being physically active is one of the most important things people of all ages can do to maintain and improve their health. Research shows that regardless of age, youth and adults participate in physical activity for similar reasons, responses generally fall among the following categories: fun, competence, affiliation, and fitness. The overall purpose of this research was to examine the factor structure of the OEQ, then to explore the relationships between the relevant motives for exercise and obligatory exercise activity.

## METHODS

The sample consisted of 233 young adults comprising of 124 kinesiology students from the three Croatian faculties of kinesiology – Osijek, Zagreb and Split (53.2%) and 109 recreational athletes (46.8%). There were 107 males (45.9%) and 126 females (54.1%). The age range was 18-38 years ( $M=22.2$ ,  $SD=3.34$ ). All participants are engaged in some type of physical activity.

Major sociodemographic information (age, gender, group – students and exercisers) and information regarding body height and body mass, motives for exercising were collected. *The Obligatory Exercise Questionnaire (OEQ; Thompson and Pasma, 1991)* is a general standardised measure of exercise activity and is an adaption of the Blumenthal, O'Toole, and Chang (1984) Obligatory Running Questionnaire. The OEQ consists of 20 items and was translated via a standard forward-backward translation procedure. Respondents rate their exercise behavior (e.g. "If I miss a planned workout, I attempt to make up for it the next day") on a 4-point Likert scale (from 1-never to 4-always). A high score indicates a greater tendency toward exercise as obligation. There is no set cutoff score for the OEQ which is indicative of obligatory exercise. Previous researches have shown internal consistency coefficients above 0.9 (Thompson and Pasma, 1991; Terry, Sabo, and Griffiths, 2004), and in Croatian sample of athletes and exercisers 0.86 (Škegro, 2014). No consistent factor structure is shown (one-factor (Thompson and Pasma, 1988), three-factor (Steffen and Brehm, 1999; Ackard, Brehm, and Steffen, 2002; Duncan et al., 2012), and four-factor structure (Škegro, 2014), hence is factor structure examine in this study. List of motives for physical exercise was applied in a way to choose one from six motives: positive health, body image, enjoyment and challenge, socializing with friends, competition, and OTHER (stress management, strength, affiliation,..).

The data were collected during the summer semester of the 2019/2020 academic year. The survey was administered in an online form via Google documents. Participants were informed about the purpose of the research, and that participation is anonymous and voluntarily. The survey took approximately 10 to 15 minutes to complete. An exploratory factor analysis was conducted to examine the factor structure of the OEQ. Data were analysed by Statistical Package for the Social Sciences (SPSS version 20.0, IBM, Chicago, IL, USA). Furthermore, the correlation was used to determine the relationship between exercise motives and exercise dependence. Statistical significance was determined at the .01 and .05 level of confidence.

## RESULTS

The analyses revealed three factors underlying the OEQ: exercise frequency and commitment, exercise preoccupation and intensity, exercise emotionality. The results of the principal-axis factor analysis included 4 items that failed to make a meaningful contribution and one item that cross-loaded on more than one factor. Inter-factor correlations were tolerable and ranged as moderate ( $r_{1.2} = .32$ ;  $r_{2.3} = .39$ ;  $r_{1.3} = .30$ ). This study is to understand whether there are correlations between main motives for exercising such as health, body image, challenge and enjoyment, socializing with friends, competition, other reasons (stress management, strength, affiliation) and any of three dimensions of OEQ (Exercise frequency and commitment, Exercise preoccupation and intensity, Exercise emotionality). The correlations between observed variables were generally low and moderate ( $r = -.28$  to  $.30$ ), but some results show significance (Table 1).

**Table 1.** Relations between OEQ Dimensions and Main Motives for Exercising

	F1	F2	F3	OEQ	5-PH	6-BI	7-EC	8-SF	9-C	10 -O	11-G
F1 - Exercise frequency and commitment	1	.32†	.30†	.73†	-.03	-.07	.03	-.09	.30†	-.17*	-.24†
F2 - Exercise preoccupation and intensity		1	.39†	.72†	-.11	-.04	.01	-.02	.09	.03	-.15*
F3 - Exercise emotionality			1	.78†	-.13*	.01	.06	.0	.12	-.08	-.02
4 - OEQ_total				1	-.12	-.05	.04	-.03	.23†	-.11	-.18†
5 - Positive health					1	-.28†	-.32†	-.06	-.21†	-.26	-.01
6 - Body image						1	-.25†	-.05	-.16†	-.20†	.04
7 - Enjoyment and challenge							1	-.06	-.19†	-.24†	.06
8 - Socializing with friends								1	-.04	-.05	.11
9 - Competition									1	-.15*	-.28†
10 - Other										1	.14*
11- Gender											1

Legend: Correlation is significant at the \* $P < 0.05$ , † $p < 0.01$  level

Exercise frequency and commitment was moderate correlated with competition ( $r = .30$ ,  $p < .01$ ), and negatively weakly associated with other motives for exercise ( $r = -.17$ ,  $p < .05$ ). In terms of gender relations, men exercise more often and are more dedicated ( $r = -.24$ ), they are more focused and exercise more intensely ( $r = -.15$ ). They generally scored higher values on the exercise dependence scale (overall score,  $r = -.18$ ). Exercise preoccupation and intensity was weak but significant correlated with gender ( $r = -.15$ ,  $p < .05$ ), and Exercise emotionality was negatively weakly associated with positive health motives for exercise ( $r = -.13$ ,  $p < .05$ ).

## DISCUSSION

These results suggest that the OEQ contains 3 factors consistent with Steffen and Brehm (1999) and Ackard et al. (2002). The results of the current study are similar with the structure reported by Steffen and Brehm, in which the three factors are represented by preoccupation with exercise, exercise behavior, and emotionality. The highest relation in this study was between factor Exercise frequency and commitment and competition motive. Respondents who exercise more often and are more dedicated chose competition as the main motive for exercising ( $r = .30$ ), while other reasons such as help in overcoming stress, increasing strength, endurance ( $r = -.17$ ) are less important for them. Sport commitment is a dynamic, psychological state that can vary over time, through seasons, and over the course of careers (Williams, 2013). Individuals' level of commitment influences behavior in the form of choice, persistence, and effort. A commitment to physical activity is necessary for personal health, and is a primary goal of physical activity practitioners. Of particular interest to physical activity and health professionals is creating environments in which individuals not only participate in physical activity, they will persist in being physically active. The findings suggest that male respondents who chosen competition as the main motive for exercising are more committed to exercise and exercise more intensely. Individuals who demonstrated lower emotionality scores ( $r = -.13$ ), were found to be in weak negative relation with positive health motives. This relation can be indicated by the fact that participants sometimes exercise and despite medical recommendations not to do so, which can negatively affect their health (e.g., I have exercised when advised against such activity (i.e. by a doctor, friend, etc.)). Men and women report different exercise habits and reasons for exercise. Specifically, male exercisers are more likely to report that they exercise for social and competitive reasons (Markland and Hardy, 1993), demonstrates greater exercise quantity compared to female participants (Azevedo, et al., 2007)

The samples used for analyses in the present work were composed primarily of 'regular exercisers,' which in some cases included individuals who exercised only twice per week. In the future, researchers would do well to examine obligatory exercise using a sample comprised entirely of individuals who can be classified as obligatory exercisers to get better relations with relevant motives for exercising.

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# QUANTATIVE CHANGES OF STUDENT ANTHROPOLOGICAL STATUS FOLLOWING THREE MONTHS OF EXERCISE

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## ABSTRACT

A group of 25 students practiced intensive circuit training regularly for two hours a week and ran for one hour a week. Before starting the exercises, body composition, motor and functional abilities were measured, nutritional knowledge and dietary habits were checked, as well as values of satisfaction with one's own appearance and the level of self-confidence. Once the practice program and the performance of outdoor activities were over, body composition, motor and functional abilities were measured, and an improvement in all variables was established. Research showed statistically significant changes in the test to assess repetitive trunk strength, test for the assessment of functional abilities (running at 3200 meters) and resting heart rates. There was an improvement in all anthropological measures but it was not statistically significant. Students with higher knowledge on nutrition were at the same time satisfied with their own general appearance. Students with less improvement in the results between the first and second measurement were satisfied with their general appearance for they had fulfilled the questionnaire on general appearance prior to starting exercise and it was presumed that they had satisfying results of anthropological characteristics. The research results indicate that intensive circuit training can change positively the anthropological status of an individual and that carrying out such programs is recommended and offered to students during their studies.

**Key words:** anthropological characteristics; physical activity, university students

## INTRODUCTION

The student lifestyle period is a very important period when it concerns health and creating attitudes on regular physical activities. A number of studies indicate that overweight and obese children are likely to remain overweight and obese as adults and are at risk of chronic diseases (WHO 2010) which could lead to higher morbidity and mortality in adulthood. (Biro et al. 2010). Change of residence and being separated from the family creates issues of adaptation to a new way of eating and organizing physical activities for most students. There is not a single anthropological characteristic of an individual such as morphological characteristics, motor and functional abilities, psychological characteristics, sociological characteristics or health characteristics that are not positively affected by physical activity (Beedie et al. 2000). Even though we can probably indicate the satisfaction of aesthetic criteria as the main reason for physical training in students, morphological traits are highly correlated with motor and functional abilities, and all the stated anthropological characteristics are connected with the health status. Through training processes for strength development, as well as other kinesiology activities, we can significantly influence the transformation of soft tissues. The training of strength has a significant influence on volu-



minousness that mainly refers to active muscle mass and the total quantity of fat tissue (Sekulić and Me-tikoš, 2007). Satisfying aesthetic criteria is not the main goal of physical exercise for some students but it is health improvement, physical strength improvement and enjoying physical activities. Being satisfied with one's appearance as well as progress in exercise results can have an influence on self-confidence.

The Center for Exercise and Student Sports of Zadar University offers students different physical activities through elective courses in the winter and summer semesters. One of the courses carried out in the summer semester is the Sports and Health course where students acquire knowledge through theory lectures, learn the basics of kinesiology, anatomy and physiology and sports medicine. A different selection and distribution of content, the most adequate modalities and exercise components are used in the student training. According to the program, intensive circuit training is carried out and it is based on exercises for the development of all motor capabilities, most often from 8 to 12 exercises in a determined period of time. The exercises are performed by loading one's body using elastic bands, Trx bands, cuffs with weights, dumbbells, kettlebells, balance disc and pilates ball and various benches. A short break is taken after one circuit of exercises and three to four series are then repeated. The number of repetitions, exercise time period and pause depend on the intensity and external load. Students ran for one more hour according to their individual program based on initial measurement. Goals are defined and final measurement results are analysed based on the measurement of the initial states of the student's anthropological status. Depending on the field of interest, students present written seminars. By conducting field classes, which are carried out through outdoor hiking and camping activities, students are taught how to spend their free time actively and have a healthy lifestyle, as well as a positive attitude towards the protection of nature.

The aim of the present work is to establish the anthropological status changes in students following three months of exercise performance of three hours a week and all the activities carried out outdoors.

## METHODS

### *Sample of respondents' work program*

Research was carried out in academic year 2020/2021 during the summer semester on a sample of 25 respondents, 14 male and 11 female students. 10 morphological variables were measured (height, mass, body mass index, % fat tissue, % muscle mass, % visceral fats, upper arm, waist, upper leg and lower leg circumference), four tests for the evaluation of motor capacity were applied (test to assess flexibility, repetitive arm and shoulder girdle strength, repetitive trunk strength and explosive leg strength) and the functional capacity evaluation test (running at 3200 meters). Students measured heart rate at rest three days in a row and recorded the average mean value. All tests were measured in two time intervals, at the beginning of the lessons and at the end of the summer semester lessons. At the beginning of the lessons, students fulfilled questionnaires on self-esteem (Rosenberg Self - Esteem Scale), satisfaction with one's appearance (Body Esteem Questionnaire for Adolescence and Adult; BES; Mendelson, Mendelson and White, 2001) and a questionnaire on nutrition knowledge and dietary habits.

Knowledge on sports nutrition as well as dietary habits were established through corresponding questionnaires. Questionnaire on Sports Nutrition Knowledge (50 questions) was set up as to established the knowledge of students on nutrition in general, on the ingredients necessary to ensure sufficient amounts of energy for training, on nutritional supplements, meals before training and competition, as well as during recovery and the importance of fluids, dehydration and rehydration during training. Dietary habits were established with questions for respondents to answer on the number of meals taken per day, skipping meals, the consumption of single foods from different parts of the nutrition pyramid, the consumption of liquids and sports beverages and dietary supplements, with special reference to specific supplements used by athletes.

### Methods of data processing

The statistical significance of differences between the groups in the first and second measurement were measured by the t-test for dependent samples. The connection between self-esteem, satisfaction with general appearance, knowledge about nutrition and dietary habits, and progress in improving body composition, motor and functional abilities (the difference between the first and second measurement), was assessed using the Pearson correlation coefficient.

## RESULTS AND DISCUSSION

Table 1 shows the t-test results for dependent samples where it can be seen that there has been a statistically significant improvement in the results of the test for evaluating the repetitive strength of the trunk "reptrunk", the test for evaluating the functional abilities "3200m" and the average value of the heart rate at rest "rate at rest". Improvement was realized in all measurements of morphological status and motor capabilities but it is not statistically significant. A three-month program of exercise was carried out with students of the Maritime Department of the University in Zadar which also showed significant positive results in the anthropological status of students (Ivković, G. et al. 2016). The results of a research on a group of students who completed a similar program (Ivković, G. 2022) showed statistically significant changes in the reduction of subcutaneous fat tissue and an increase in the percentage of muscle mass with an increase in the circumference of the upper leg. Strength training can influence significantly the reduction of body mass, and not only on the increase of muscle mass when speaking of the influence of strength training on the morphological characteristics of anthropological status (Kim et al., 2018). Depending on the results of the initial measurements, the individual definition of the goal of the exercises as well as the intensity of the group's training, different people will have different results in changing their anthropological status. The results of the remaining researches also indicate progress in anthropological status changes in applying functional trainings (Benassi, I. et al. 2018) with various groups of respondents. There still are a number of different factors that can influence the anthropological status of an individual and one of them is surely the knowledge of nutrition and dietary habits and their choice of food.

**Table 1** T-test results for dependable samples between the initial and final measurement

1 measurement -2 measurement	AS1	SD1	AS2	SD2	t	df	p	N
mass 1, 2	73.84	13.30	72.84	12.00	0.28	48	0.78	25
bmi vs. - bmi2	23.21	2.72	22.91	2.07	0.43	48	0.67	25
% fat tissue vs. 1, 2	24.26	9.35	22.89	9.71	0.50	46	0.62	25
% muscle 1,2	35.42	7.16	36.13	7.51	-0.33	46	0.74	25
% visc fats 1,2	4.40	1.83	3.96	1.49	0.92	46	0.36	25
upper arm circumference 1, 2	28.90	3.64	28.73	3.43	0.16	47	0.87	25
forearm circumference 1,2	26.27	2.64	25.77	2.87	0.63	47	0.53	25
waist circumference 1,2	79.31	7.06	77.60	5.56	0.94	47	0.35	25
thigh circumference 1,2	56.20	5.19	55.08	5.24	0.75	47	0.45	25
lower leg circumference 1,2	37.56	2.72	37.34	2.80	0.28	47	0.78	25
Flexibility 1,2	61.12	12.98	67.46	13.23	-1.69	47	0.10	25
pushup 1,2	32.20	20.19	42.06	20.94	-1.69	48	0.10	25
reptrunk 1, 2	59.24	18.66	70.80	16.80	-2.30	48	0.03*	25
standing long jump 1,2	202.40	36.07	210.04	36.03	-0.75	48	0.46	25
3200m 1,2	18.06	2.67	16.65	1.81	2.20	48	0.03*	25
rate at rest 1,2	64.40	2.53	6.28	2.30	3.10	48	0.00*	25

\* established statistically significant difference at level  $p < 0.05$

The connection of self-esteem, general appearance satisfaction, nutrition knowledge, dietary habits and the improvement of exercise results have been evaluated with the assistance of the Pearson coefficient correlation. The results indicate that students who have better knowledge on nutrition are more satisfied with their general appearance. We can see from the results the negative connection of student satisfaction with their own body with progress in exercise results. This can be explained by the fact that students with good and high results in the initial measurement are satisfied with their general appearance and have less progress for a small increase in high results is logical. Mostafavi-Darani, F. et al. (2013) and Heiman, T., and Olenik-Shemesh, D. (2019) have established the connection of dietary habits with general appearance satisfaction.

**Table 2** Pearson correlation coefficient

Variable	Self-esteem	General appearance satisfaction	Knowledge	Habits	Improvement
self-esteem	1.00				
gen. appearance satis.	0.00	1.00			
knowledge on nutrition	-0.10	0.57*	1.00		
nutrition habits	0.20	0.06	0.02	1.00	
Improvement in exercise results	0.11	-0.42*	-0.15	-0.20	1.00

\* utvrđena statistički značajna razlika na nivou  $p < 0.05$

## CONCLUSION

Physical exercise during the study period is exceptionally important due to acquiring health habits of movement as well education on proper nutrition. The present research shows the t type of exercises during the elective course of Sports and Health where through programmed training students can follow the effects of exercise on anthropological characteristics. Students performed intensive circuit training two hours a week for three months in order to develop their strength and one hour a week of interval running. Ten tests of body composition, four tests of motor abilities, and a test of functional abilities were measured at the beginning and at the end of the exercise. The research results showed statistically significant changes in the trunk repetitive strength test and the functional ability test. Positive progress was indicated in all test but they are not statistically significant. At the beginning of the measurement, students filled out questionnaires on knowledge about nutrition, dietary habits, satisfaction with general appearance and self-esteem, and the progress in all tests for assessing body composition, motor and functional abilities was calculated. The connection of self-esteem, satisfaction with general appearance, knowledge of nutrition, dietary habits and progress in exercise performance was assessed using Pearson coefficient correlation. The results showed that students with better knowledge on nutrition are also more satisfied with their appearance. The research results showed that systematic training can have an influence on positive changes of anthropological characteristics. The introduction of elective courses at the University is recommended with contents of different exercise programs and theory lectures on proper exercise, proper nutrition and the control of transformation processes as well as the organization of outdoor activities.

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# COMPARATIVE ANALYSIS OF MORPHOLOGICAL CHARACTERISTICS OF TWO GROUPS OF STUDENTS

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## ABSTRACT

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In this paper, we wanted to see if there is a difference in morphological characteristics between two groups of students of the same study program. The research was conducted in different time periods on different groups. Seven skin folds were measured on the first group of 30 students in 2012, and their body composition was determined based on the results, while the same research was conducted on the second group of students in 2023. The authors' goal was to see to what extent the development of society and the standard of living affects the lifestyle and morphological status of the student population. Comparative, descriptive statistics and t-test were made on the variables of skin folds and body composition of students who were measured in 2012 and students who were measured in 2023. Only one variable of the skin fold of the upper arm showed a statistically significant difference, while in the total percentage of subcutaneous fat, i.e. body composition, these two groups did not statistically differ. We found that according to the anthropometric tables, both groups are within the average for the male population.

## INTRODUCTION

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Human health status largely depends on their morphological characteristics, which are correlated with physical activity. The World Health Organization (WHO) constantly points out the problems that result from insufficient physical activity in people, and unfortunately, we witness that young people in the Republic of Croatia are not exempt from these claims. The paradox is that the "Urban way of life" that enables and facilitates daily living for people often takes its toll and causes unwanted consequences for human health. The consequences of physical inactivity are often obesity and elevated levels of subcutaneous fat tissue, which ultimately become a public health problem. However, body weight is not the only indicator of the state of human morphology. Body composition assessment is a tool in a large number of areas of human interest (Baščevan, Vučetić, Rodić 2010.) In this paper, the results of research on morphological characteristics made on two different groups of students of the Faculty of Forestry and Wood Technology at the University of Zagreb.

## GOAL OF THE STUDY

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The goal of the study is to determine whether there are significant differences in body composition between two groups of students of the same academic program and chronological age, but who live in different times. Measurements were taken on the first group of students in 2012 and on the second group in 2023. The standard of living significantly affects the habits of students. Our goal was to determine the extent to which changes in the standard of living over eleven years have an impact on the habits and morphological characteristics of young people. Based on the morphological characteristics, or body composition, which we determined by measuring skinfolds, we compared the results of research conducted on one group of students in 2012 with the results obtained in 2023 on another group of students.

## METHODS

Subcutaneous fat measurement was performed on a sample of thirty students from each of the two groups, aged between 19 and 22 years, at the Faculty of Forestry and Wood Technology, to determine their body composition. The measurement was taken on the first group in 2012 and on the second group with an eleven-year interval, in 2023. The measurement was taken on male students in the first and second year of undergraduate studies who attend regular classes in the subject of Physical education, and these were not homogeneous groups of students. The analysis was based on research conducted by Jackson and Pollock and their generalized quadratic equations. These authors made a significant contribution to the development of such equations for adults (Jackson, Pollock 1985). Their equations for determining body density include sums of seven or three skinfolds, different by gender, and the correlation coefficients of the resulting body density and density obtained by underwater weighing are between 0.83 and 0.91 (Mišigoj-Duraković 2006). The same measuring instrument, the Harpenden caliper, was used to measure skinfolds both times, and body composition was determined based on the regression equation and measurements of seven skinfolds. Data were analyzed using the Statistica 13.3 TIBCO software package.

$GT = 1.11200000 - 0.00043499(7KN) + 0.00000055(7KN)^2 - 0.0002574 \times \text{YEAR}$ . (GT - body density; KN - skinfold thickness)

Measured skinfold thicknesses:

- Chest skinfold
- Axilla skinfold
- Triceps skinfold
- Back skinfold
- Abdomen skinfold
- Suprailiac skinfold
- Thigh skinfold

After obtaining the results of measuring the above skinfold thicknesses, a descriptive analysis and t-test were performed to identify possible differences in the body composition of these two groups of students.

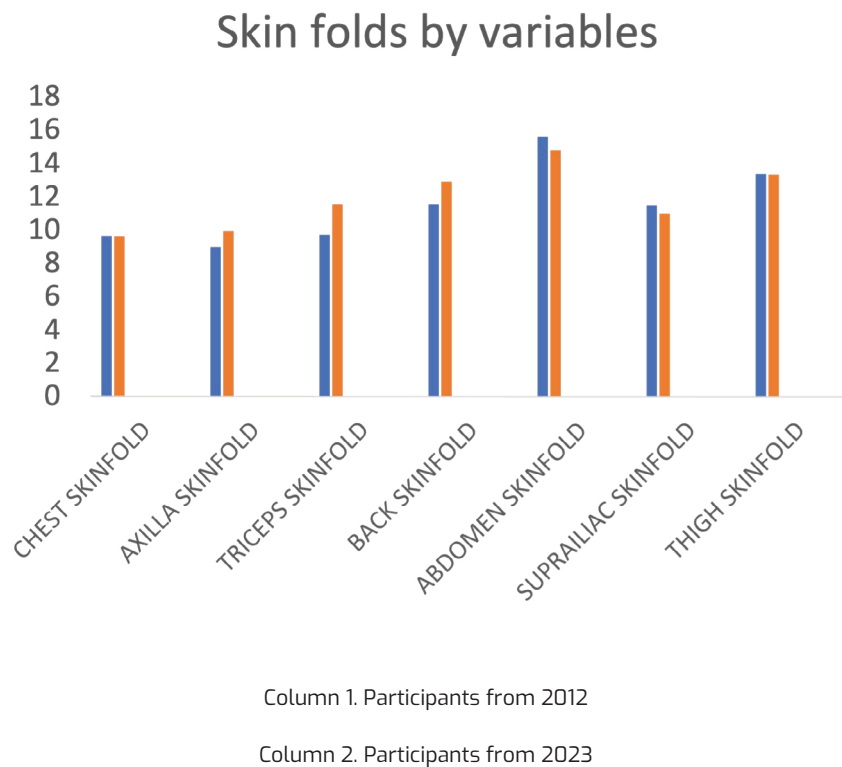
## RESULTS AND DISCUSSION

Descriptive statistics based on seven variables, seven skinfolds of both groups of students provided us with insights into the mean, minimum, and maximum values of each variable, as well as the standard deviation. Similar average values of skinfolds of the chest and thigh were found, while slightly higher values were observed on the skinfolds of the axilla, arm, back, and suprailiac in students of the 2023 generation. Values of the skinfold of the abdomen were slightly higher in the 2012 generation. Noticeable higher dispersion of results is also visible, for example, in the standard deviation of the group measured in 2023.

**Table 1.** *Skinfolds - Descriptive statistics.*

Variable	Descriptive Statistics						
	Valid N	Mean	Minimum	Maximum	Std.Dev.	Skewness	Kurtosis
CHEST SKINFOLD 2012	30	9,60	4,60	18,50	2,86	1,03	1,85
AXILLA SKINFOLD 2012	30	8,95	5,10	15,20	2,50	1,09	0,72
TRICEPS SKINFOLD 2012	30	9,69	6,40	14,90	2,07	0,45	-0,23
BACK SKINFOLD 2012	30	11,49	7,40	23,20	3,04	2,09	6,76
ABDOMEN SKINFOLD 2012	30	15,60	5,50	27,00	5,22	0,50	-0,11
SUPRAILIAC SKINFOLD 2012	30	11,46	5,20	22,10	4,33	1,02	0,40
THIGH SKINFOLD 2012	30	13,34	6,00	23,60	4,57	0,59	-0,52
CHEST SKINFOLD 2023	30	9,56	4,30	17,20	3,74	0,67	-0,48
AXILLA SKINFOLD 2023	30	9,92	4,90	18,70	3,86	0,85	0,02
TRICEPS SKINFOLD 2023	30	11,48	5,00	17,40	3,49	-0,08	-0,88
BACK SKINFOLD 2023	30	12,89	7,10	23,10	3,45	0,95	1,58
ABDOMEN SKINFOLD 2023	30	14,78	7,20	26,50	4,64	0,02	-0,12
SUPRAILIAC 2023	30	10,94	5,60	19,60	3,58	0,46	-0,41
THIGH SKINFOLD 2023	30	13,31	8,50	20,50	3,15	0,40	-0,58

**Graph 1.** *Graphic display of values by variables*



To determine if there were statistically significant differences between variables among the groups, a t-test was performed, which revealed certain differences. By applying the Student's t-test, a statistically significant difference was found on the variable of skinfold thickness of the upper arm between the two groups ( $t = -2.4179$ ;  $p = 0.0188$ ), while there were no statistically significant differences in the other variables.

**Table 2.** Student's t-test 2.

Variable	T-tests; Grouping: Group 1: (2012) Group 2: (2023)										
	Mean 1	Mean 2	t-value	df	p	Valid N 1	Valid N 2	Std.Dev. 1	Std.Dev. 2	F-ratio Variances	p Variances
CHEST SF	9,60	9,56	0,0465	58	0,9631	30	30	2,86	3,74	1,7114	0,1539
AXILLA SF	8,95	9,92	-1,1559	58	0,2524	30	30	2,50	3,86	2,3747	0,0229
TRICEPS SF	9,69	11,48	-2,4179	58	0,0188	30	30	2,07	3,49	2,8364	0,0064
BACK SF	11,49	12,89	-1,6719	58	0,0999	30	30	3,04	3,45	1,2865	0,5018
ABDOMEN SF	15,60	14,78	0,6405	58	0,5243	30	30	5,22	4,64	1,2695	0,5246
SUPRAILIAC SF	11,46	10,94	0,5040	58	0,6162	30	30	4,33	3,58	1,4630	0,3112
THIGH SF	13,34	3,31	0,0296	58	0,9765	30	30	4,57	3,15	2,1012	0,0500

Analyzing the body composition obtained through the regression equation and comparing the mean values of the percentage of body fat for each group (Group 1: 10.63, Group 2: 11.08) with the aim of determining differences between them, we used the formula to calculate the t-value:  $t = (x_1 - x_2) / (s * \sqrt{2/n})$ ;  $t = (10.63 - 11.08) / (1 * \sqrt{2/30}) = -1.84$

In the equation, s denotes the total standard deviation, and n denotes the total number of participants in both groups. Based on the calculation and comparison of the t-value, where  $t = -1.84$ , with the critical t-value of  $\pm 2.002$  for a significance level of 0.05, and taking into account the null hypothesis, we conclude that there is no statistically significant difference in body composition between these two groups of participants.

Although various studies warn about the reduced physical activity of young people and about the possible consequences that are the product of insufficient activity, our research does not point to significant differences between the measured groups of students.

By analyzing the results obtained by measuring skin folds and determining body composition for the mentioned groups of students, we concluded that there is a difference in only one variable, which is the skin fold of the upper arm, while there are no significant deviations in the other variables. The results of the percentage of fat tissue in the total mass for both groups are within the average values according to the anthropometric tables, and with regard to the sex and age of the subjects (Wilmore and Costill 2004).

But although the t-test shows that there are no statistically significant differences between these two groups of subjects, it is indicative that differences were observed on the skinfold of the back and significant differences on the skinfold of the upper arm. Studies and many authors state that these two folds are indicators of body composition changes. We must not ignore the greater dispersion of the results of the respondents who were measured in 2023, which also indicates the lack of physical activity of individuals and bad lifestyle habits, which result in greater deviations from the average of the generation. It is important to know that the highest ratio of the non-fat part to the fat part of the body composition is reached around the age of 20 and that the proportion of fat and lean components can only be influenced by modifying dietary habits and physical activity (Mišigoj-Duraković 2006).



## CONCLUSION

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We are witnessing changes that the urban and accelerated development of society brings with it, as well as the impact on young people who are somehow forced to follow trends that result in a lack of physical activity and an increased risk of various diseases. In this study, our aim was to determine the extent to which the development of society and modern technology affect the status of young people, their lifestyle habits, and their morphological status. Our goal was to determine whether there are any differences in the morphological status between the generation of students in 2012 and the generation in 2023, and to what extent. By analyzing the results obtained by measuring skin folds and determining body composition for the aforementioned groups of students, we concluded that there was a difference only in one variable, namely the skin fold of the upper arm, while there were no significant deviations in other variables. The kinanthropometric analysis, which deals with the comparison of morphological characteristics of humans and their association with physical activity, showed us that there were no statistically significant differences between these two groups of students. It can also be concluded that the research results for both groups of students at the Faculty of Forestry and Wood Technology regarding the percentage of body fat in total mass are within the optimal values shown in anthropometric tables.

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# CORRELATIONS BETWEEN STROKE RATE AND NUMBER OF STROKES WITH RESULT IN FIRST AND SECOND 25 METERS OF 50 METERS FREESTYLE

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## ABSTRACT

This research was carried out at the beginning of the summer semester in March and was conducted on 76 third year students of the Faculty of Kinesiology, University of Zagreb. The goal was to determine correlations between stroke rate and stroke number with each 25 meters of 50 meters freestyle. Although the results in all variables showed statistically significant differences for each 25 meters of 50 meters freestyle, the stroke rate and stroke number of the first 25 meters and stroke rate and stroke number of the second 25 meters were also statistically significant correlated with times of first and second 25 meters of 50 meters freestyle. The conclusion is that swimmers who scored better times in 50 meters freestyle had a higher stroke rate but a lesser number of strokes. That can be mostly explained by the quality and efficiency of kick, stroke, and coordination while swimming.

**Keywords:** *swimming, students, race parameters*

## INTRODUCTION

Students are the most competent segment of every generation of young people (Lončar, 2017). At the Faculty of Kinesiology, teaching the subject Competitive Swimming is part of the education of a future kinesiologist. Therefore, teaching students and knowledge transfer is a challenge for professors. Through practical examples, they try to bring the sport of swimming closer to students. Swimming speed depends on many factors. The specific interaction of physiological (energy generation), biomechanical (ideal swimming technique) and psychological efficiency (motivation and persistence) will determine how fast the swimmer will move through the water (Šiljeg et al. 2010). Knowing the importance of the influence of aspects of biomechanics (kinetic, kinesthetic, kinematic, neuromuscular) on the result in swimming is part of the development process of a future kinesiologist and swimming coach. Kinematic parameters (swimming speed, stroke length and frequency, stroke index and acceleration) greatly influence the final result of swimming (Toussaint et al. 2006; Morais et al. 2016). Swimming technique is generally examined through such parameters as stroke index, propelling efficiency, stroke length and stroke rate (Seifert & Carmigniani, 2021) probably because in using the crawl technique, where the propulsive part of working with the hands provides up to 85% of the final propulsion of swimming (Hollander et al. 1988). Koga et al. (2020) emphasize that stroke velocity is determined by stroke frequency (SF) and stroke length (SL). Therefore, when swimmers improve either or both parameters, they increase SV.

The aim of this research was to see if there is a statistically significant coefficient of correlation between stroke rate and stroke number with time in the first 25 meters of 50 meters freestyle and also, if there will be a statistically significant coefficient of correlation between stroke rate and stroke number with time in second 25 meters of 50 m freestyle.

## **METHODS**

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### **Participants**

Third year students of the Faculty of Kinesiology, University of Zagreb participated in this research. The total number of students was 76 (22 female and 54 male). The research was carried out during a "Competitive swimming" class at the beginning of the semester in March. All participants were informed about the research and willingly participated.

### **Procedure**

Every student swam 50 meters freestyle from the starting block. On the given mark (sound signal) the participant would dive in the water and swim 50 meters freestyle at full velocity. Three timekeepers would start their Finis stopwatch at the same mark. Mark for the time of first 25 meters was the first touch of the wall by the participant's hand or feet. Stroke rate was taken after the first two full circles of freestyle stroke through mode on Finis stopwatch. Timekeepers also counted every stroke for the stroke number variable.

### **Variables**

Total of six variables were used in the research – time of first 25 meters in swimming 50 meters freestyle, time of second 25 meters in swimming 50 meters freestyle, stroke rate of first and second 25 meters in swimming 50 meters freestyle and stroke number of each 25 meters in swimming 50 meters freestyle. Three timekeepers recorded the results of each variable on the Finis stopwatch and average value for every variable was used.

### **Statistical analysis**

Descriptive parameters were described using Statistic 14.0. and Shapiro-Wilk W test to inspect if given variables were normally distributed. Since the results in given variables weren't normally distributed nonparametric statistical tests were used for further analysis. Wilcoxon Matched Pairs Test was used to determine if there were statistically significant differences between variables of time, stroke rate and number of strokes in first and second 25 meters of 50 meters freestyle. Spearman rank R test was used to determine a correlation between stroke rate and stroke number with a time of swimming in the first 25 meters of 50 meters freestyle and a correlation between stroke rate and stroke number with a time of swimming in the second 25 meters of 50 meters freestyle.

## RESULTS

Research was carried out on 76 (54 male and 22 female) third year students at the Faculty of Kinesiology, University of Zagreb.

Table 1. displays participant's descriptive parameters values such as mean, minimum and maximum with their associated variance and standard deviation for a total of six variables – time in the first 25 meters and time in the second 25 meters in 50 meters freestyle, stroke rate and stroke number for each 25 meters of 50 meters freestyle.

**Table 1.** Descriptive parameters of participants

Variable	Number	Mean	Minimum	Maximum	Variance	Standard Deviation
Time - first 25m freestyle	76	17,68	12,35	26,30	7,61	2,76
Time - second 25m freestyle	76	22,08	13,25	29,42	13,85	3,72
Stroke rate - first 25m freestyle	76	43,68	31,00	70,00	60,09	7,75
Stroke rate - second 25m freestyle	76	41,14	30,00	66,00	46,98	6,85
Stroke number - first 25m freestyle	76	20,46	11,00	38,00	20,92	4,57
Stroke number - second 25m freestyle	76	25,41	14,00	40,00	21,18	4,60

In Table 2. are showed the results of Wilcoxon Matched Pairs Test. The statistical significance was determined on the level of  $p < 0,01$ . For each variable, statistically significant difference in results between values in the first and second 25 meters was noticed.

**Table 2.** Wilcoxon Matched Pairs Test

Pair of variables	T	Z	p-value
Time – 1 <sup>st</sup> and 2 <sup>nd</sup> 25 meters	0,00	7,57	0,00
Stroke rate – 1 <sup>st</sup> and 2 <sup>nd</sup> 25 meters	187,50	6,25	0,00
Stroke number - 1 <sup>st</sup> and 2 <sup>nd</sup> 25 meters	31,50	7,41	0,00

Table 3. presents results for Spearman Rank R correlations between time variables for each 25 meters of 50 meters freestyle and two measured race parameters – stroke rate and stroke number. The statistical significance was determined on the level of  $p < 0,05$  and all results showed statistically significant coefficient of correlation. Results in variable stroke rate showed a higher correlation than results in variable stroke number. The negative sign in the stroke rate variable appeared because time is an inversely scaled variable and a better score in time variables has an absolute smaller value on the scale.

**Table 3.** Spearman Rank R

Compared variables	Spearman Rank R
Time of 1 <sup>st</sup> 25 meters and stroke rate of 1 <sup>st</sup> 25 meters	-0,60*
Time of 1 <sup>st</sup> 25 meters and stroke number of 2 <sup>nd</sup> 25 meters	0,32*
Time of 2 <sup>nd</sup> 25 meters and stroke rate of 2 <sup>nd</sup> 25 meters	-0,46*
Time of 2 <sup>nd</sup> 25 meters and stroke number of 2 <sup>nd</sup> 25 meters	0,45*

## DISCUSSION

It is evident that results in stroke rates are higher in the first 25 meters than in the second 25 meters. That can be explained by fatigue and less quality swimming technique in the second part of 50 meters freestyle swim. Also, the stroke number is higher in the second 25 meters than in the first 25 which can be explained with two reasons. The first one is start from the starting block in the first 25 meters while in the second 25 meters participant only had push off the wall. The other reason can also relate to fatigue and decreasing the level of swimming technique quality (Toussaint et al., 2006).

The background to divide 50 meters freestyle into two segments of 25 meters was because Wilcoxon Matched Pairs Test showed that results in all variables (time of each 25 m, stroke rate, stroke number) showed statistically significant difference. Given these differences, it was necessary to divide 50 meters freestyle into two segments for further statistical analysis.

The greater result in the Stroke rate than in Stroke numbers confirms the results of Greco et al (2006) who claimed that the result in 25 meters freestyle is more determined by stroke rate than the stroke number.

The higher correlation between time and stroke number variables in the second 25 meters than in the first 25 meters can be simply explained by the fact that push off the wall in the second 25 m had a much smaller impact on the result in swimming than the start from the starting block in first 25 m which gave participants higher velocity at the beginning (García-Ramos, et al. 2015).

## CONCLUSION

To conclude, swimmers who scored better times in 50 meters freestyle had higher stroke rates but a lesser number of strokes. That can mostly be explained by the quality and efficiency of kick, stroke, and coordination while swimming. Lesser number of strokes means less energy loss.

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# DIFFERENCES BETWEEN BODY CHARACTERISTICS, MOTOR SKILLS AND FUNCTIONAL CAPACITIES AMONG YOUNG MALE AND FEMALE ROWERS

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## ABSTRACT

Rowing is a sport that involves propelling a boat through water using one or more oars. Examining the contrasting traits of male and female rowers, identifying variances and commonalities in anthropometric attributes that can impact not only training protocols but also serve as cues for talent identification programs, holds significant significance in the realm of rowing. The participants were members of the Croatian Rowing Club Vukovar from Vukovar. The sample consisted of 19 rowers (11 boys, 8 girls). Statistically significant differences by gender were found only for forced expiratory volume in 1 second (FEV1) and maximal voluntary ventilation (MVV) values. Male participants had significantly higher FEV1 values compared to female participants (mean difference (MD) = +0.84;  $p = 0.045$ ). MVV values were also significantly higher in males compared to females (MD = +36.22;  $p = 0.01$ ). There were no statistically significant differences between male and female participants in the results obtained by bioelectrical impedance ( $p > 0.05$ ). There were statistically significant differences between male and female participants on flexibility and strength tests. Male participants had significantly lower values on the flexibility test (MD = -9.58;  $p = 0.04$ ), while they had significantly higher values on the number of squats in one minute (MD = +12.70;  $p = 0.000$ ) compared to female participants.

**Key words:** rowing, body composition, maximal strength, lung capacity

## INTRODUCTION

Rowing is a sport that involves propelling a boat through water using one or more oars. The difference from other sports that also use oars is that the oars are attached to the side of the boat, while the rower is positioned towards the bow of the boat, resulting in the production of different components of dynamic force (Lorenzo-Buceta, 2014; Baudouin, 2002). The main classification of rowing modalities distinguishes between boats with moving or fixed seats (Lorenzo-Buceta, 2015). Analyzing the differences between male and female rowers, finding differences and similarities in anthropometric characteristics that could determine not only training programs but also offer indicators for talent detection programs, is of great importance for rowing (Kerr et al, 2007; Winkert et al, 2019; Schranz et al, 2010). Taller rowers can perform a wider stroke in the water, and a greater range of stroke is directly related to better

rowing performance. A similar trend is found in the body mass of rowers because higher values appear to be associated with competition success (Ingram et al, 2002). These characteristics are mainly found in heavy weight categories, while in light weight categories, differences and correlations with rowing success are less evident (Schranz et al, 2010). Studies have shown that in heavy weight categories, body mass does not have a negative impact, and even greater weight positively contributes to power production. However, in light weight categories, this fact is not as strongly supported. The profitability of rowers may have a greater impact. Nevertheless, a higher percentage of body fat can be a disadvantage (Kerr et al, 2007). Studies on the anthropometry and body composition profile of traditional rowing are very limited. Some researchers have studied the relationship between anthropometric characteristics and the performance of traditional rowing, and some of these findings appear to coincide with the modality of Olympic rowing, such as higher body mass and fat-free mass appearing to have a positive effect on rowing performance (Izquierdo-Gabarren et al, 2010). However, there are some differences such as lower muscle mass (Sebastia-Amat et al, 2020) or lower average heights that do not seem as important for the performance of traditional rowers (León-Guereño et al, 2010). Body composition is a critical issue for rowers, whose goal is to increase output power by increasing lean muscle mass while minimizing total body fat (Morris & Payne, 1996). The goal of this research is to find if there are any differences between body characteristics, motor skills and functional capacities among young male and female rowers, and if there are any, where they are located and whether they are significant or not.

## METHODS

The participants were members of the Croatian Rowing Club Vukovar from Vukovar. The sample consisted of 19 rowers (11 boys, 8 girls). The inclusion criteria was a minimum of 70% attendance at rowing trainings in the last three months.

Four measurers conducted the research, divided into pairs for objectivity and measurement accuracy. The participants started the measurement at 08:00 in the morning and came for measurement after overnight fast. Participants were measured for: height, weight and body composition, respiratory volumes and capacities, flexibility, pulling on the lat machine, and squats. The measurement was carried out at the Laboratory for Measurement and at the Fitness Center of the College of Applied Sciences Lavoslav Ružička Vukovar. All measurements were performed in one day.

Height was measured by stadiometer Seca 700 (Seca, Hamburg, Germany). The participant stands barefoot on stadiometer with back facing the stadiometer, and the height of the body is measured.

Tanita MC-780MA (Tanita, Tokio, Japan) was used to measure: body mass, BMI, fat mass in kg, fat mass in %, muscle mass in kg, skeletal muscle mass in kg and bone mass in kg. This segmental analyzer measures body mass and body composition using bioelectric impedance method.

Biopac MP36R (Biopac Systems Inc, USA) was used to measure respiratory volumes and capacities: Tidal Volume (TV), Inspiratory Reserve Volume (IRV), Expiratory Reserve volume (ERV), Inspiratory Capacity (IC), Vital Capacity (VC), Forced Vital Capacity (FVC), Forced Expiratory Volume in 1. second of expiration (FEV1), and Maximal Voluntary Ventilation (MVV). Tiffeneau index was calculated from measured FEV1 and FVC.

Flexibility was assessed by V-test: The participant sits on the mat with their back and head against the wall. Legs are spread out of the mat, arms stretched one on top of the other in front of the body on the mat. The measuring tape is placed from the top of the fingers forward in front of the participant. The participant performs trunk flexibility three times forward and the final result, i.e., the distance the participant touches on the measuring tape, is measured.



Pulling on the lat machine: The participant sits on the bench of the lat machine and performs one pull below the chin. The maximum load in kilograms that the participant can pull in one attempt is measured.

Squats in one minute: The participant stands in front of the bench with hands on hips. In one minute, the maximum number of times the participant sits on the bench and stands up is performed. The maximum number of repetitions is measured using a stopwatch.

Statistical analysis: The data obtained from the measurement were analyzed using IBM SPSS Statistics 26 (SPSS Inc., Chicago, Illinois, USA 2019). Descriptive statistics were performed, and the results were presented in tabular form. The normality of variable distributions was determined using the Kolmogorov-Smirnov test, with a significance level set at  $p < 0.05$ . To determine differences by gender, a GLM (General Linear Model) multivariate analysis with Bonferroni correction was used. The level of statistical significance was set at  $p < 0.05$ .

## RESULTS

**Table 1.** Distribution of Spirometry Results by Gender

gender		age	TV	IRV	ERV	IC	VC	FVC	FEV1*	TIFIdx	MVV*
male	AS	15	0,74	1,60	0,76	2,35	3,11	3,93	3,28	83,73	97,85
	SD	2,19	0,34	0,60	0,35	0,77	1,06	1,03	0,93	5,83	34,17
	min.	13	0,38	0,9	0,3	1,52	1,96	2,03	1,88	71,77	47,1
	max.	18	1,5	2,8	1,28	3,66	4,94	5,67	5,2	92,61	149
	number of participants	11	11	11	11	11	11	11	11	11	11
female	AS	13,75	0,75	1,35	0,82	2,10	2,92	3,20	2,45	75,52	61,63
	SD	1,16	0,27	0,46	0,47	0,70	1,03	0,68	0,66	11,29	13,82
	min.	12	0,37	0,52	0,12	0,89	1,23	1,93	0,99	51,30	47,95
	max.	15	1,19	2,05	1,4	3,24	4,59	3,86	3	87,5	92,95
	number of participants	8	8	8	8	8	8	8	8	8	8
total	AS	14,47	0,75	1,50	0,79	2,24	3,03	3,62	2,93	80,27	82,60
	SD	1,90	0,30	0,55	0,39	0,73	1,02	0,95	0,91	9,26	32,56
	min.	12	0,37	0,517	0,12	0,89	1,23	1,93	0,99	51,30	47,1
	max.	18	1,5	2,8	1,4	3,66	4,94	5,67	5,2	92,61	149
	number of participants	19	19	19	19	19	19	19	19	19	19

Legend: TV - tidal volume; IRV - inspiratory reserve volume; ERV - expiratory reserve volume; IC - inspiratory capacity; VC - vital capacity; FVC - forced vital capacity; FEV1 - forced expiratory volume in 1 second; MVV - maximal voluntary ventilation; \*statistically significant difference by gender at a significance level of  $p < 0.05$ .

Statistically significant differences by gender were found only for forced expiratory volume in 1 second (FEV1) and maximal voluntary ventilation (MVV) values. Male participants had significantly higher FEV1 values compared to female participants (mean difference (MD) = +0.84;  $p = 0.045$ ). MVV values were also significantly higher in males compared to females (MD = +36.22;  $p = 0.01$ ).

**Table 2.** Distribution of Results by Gender Obtained with Bioelectrical Impedance

gender		V	TT	BMI	FATM	FATP	MM	SMM	BM
male	AS	174,23	67,57	22,20	14,38	20,56	50,49	30,11	2,70
	SD	8,74	14,39	4,55	6,66	6,00	9,13	5,42	0,44
	min.	160,5	42	16	6,5	15,2	33,6	20,1	1,9
	max.	183,5	87,3	32,5	26,9	32,7	62,3	37,1	3,3
	number of participants	11	11	11	11	11	11	11	11
female	AS	166,25	61,95	22,16	17,24	26,43	42,43	25,31	2,29
	SD	6,23	18,91	5,68	8,48	6,06	10,33	6,15	0,54
	min.	157,5	40,3	15,7	7,3	18,2	30,8	18,4	1,7
	max.	177	87,7	28,6	27,6	36,5	57,8	34,5	3,1
	number of participants	8	8	8	8	8	8	8	8
total	AS	170,87	65,21	22,18	15,58	23,03	47,09	28,09	2,53
	SD	8,60	16,20	4,90	7,40	6,57	10,23	6,08	0,51
	min.	157,5	40,3	15,7	6,5	15,2	30,8	18,4	1,7
	max.	183,5	87,7	32,5	27,6	36,5	62,3	37,1	3,3
	broj ispitanika	19	19	19	19	19	19	19	19

Legend: V - height in centimeters; TT - total weight in kilograms; BMI - body mass index in kg/m<sup>2</sup>; FATM - fat mass in kilograms; FATP - body fat percentage; MM - muscle mass in kilograms; SMM - skeletal muscle mass in kilograms; BM - bone mass in kilograms

There were no statistically significant differences between male and female participants in the results obtained by bioelectrical impedance ( $p > 0.05$ ).

**Table 3.** Distribution of Results by Gender on Flexibility and Strength Tests

gender		VTB*	ČUČ*	VUČ
male	AS	48,55	61,82	60,45
	SD	7,89	5,60	17,24
	min.	40	52	35
	max.	65	69	80
	number of participants	11	11	11
female	AS	58,13	49,13	46,88
	SD	10,38	7,12	7,99
	min.	43	42	35
	max.	74	59	55
	number of participants	8	8	8
total	AS	52,58	56,47	54,74
	SD	10,01	8,87	15,41
	min.	40	42	35
	max.	74	69	80
	number of participants	19	19	19

Legend: VTB - V - flexibility test in centimeters; ČUČ - maximum number of squats in 1 minute; VUČ - one repetition maximum; \*statistically significant difference by gender at a significance level of  $p < 0.05$ .

There were statistically significant differences between male and female participants on flexibility and strength tests. Male participants had significantly lower values on the flexibility test (MD = -9.58;  $p = 0.04$ ), while they had significantly higher values on the number of squats in one minute (MD = +12.70;  $p = 0.000$ ) compared to female participants.

## DISCUSSION

The findings of this research study suggest that there may be gender differences in physical fitness profiles among rowers, which could have important implications for training and performance outcomes. One potential explanation for the gender differences observed in FEV1 and MVV values is differences in lung capacity and respiratory function between male and female rowers. These differences may be related to anatomical and physiological factors such as body size, muscle mass, and hormonal differences. For example, testosterone has been shown to have an anabolic effect on muscle tissue and may contribute to greater strength levels in male athletes.

In terms of strength and flexibility, the gender differences observed in this study may have implications for rowing technique and performance. For instance, male rowers may be better suited to tasks that require muscular strength and power, such as rowing sprints or lifting weights, while female rowers may be better suited to tasks that require flexibility and range of motion, such as navigating tight turns or maintaining proper form during long-distance rowing. Coaches and trainers may want to take these differences into account when designing training programs for their athletes, with the goal of optimizing performance and reducing the risk of injury.

However, it is also important to consider the potential impact of gender stereotypes and societal expectations on the physical fitness profiles of male and female athletes. For example, female athletes may face greater pressure to conform to traditional gender norms around body shape and size, which could impact their training and performance outcomes. In addition, male athletes may be more likely to receive encouragement and support for developing muscular strength and power, while female athletes may be encouraged to focus on cardiorespiratory fitness or endurance.

To promote gender equity in sports and ensure that athletes of all genders have equal opportunities to develop their physical fitness and achieve their full potential, coaches and trainers may want to consider strategies such as creating inclusive training environments, providing equal access to training resources and equipment, and challenging gender stereotypes and biases. By promoting gender equity in sports and creating an environment where all athletes can thrive, we can help to ensure that the physical fitness profiles of male and female athletes are determined by their individual strengths and abilities, rather than by gender stereotypes or societal expectations.

## CONCLUSION

Based on the findings of this research study, it can be concluded that there are gender differences in some aspects of physical fitness among members of the Croatian Rowing Club Vukovar from Vukovar. Specifically, male participants demonstrated significantly higher values for FEV1 and MVV compared to female participants, indicating that they have better lung function and respiratory capacity. Additionally, male participants showed higher strength levels compared to female participants, as demonstrated by their ability to perform more squats in one minute. On the other hand, female participants demonstrated greater flexibility compared to male participants. It is important to note that no significant differences were found between male and female participants in terms of body composition, as measured by bioelectrical impedance.

These findings suggest that there may be differences in the physical fitness profiles of male and female rowers, which could have implications for training and performance. Rowing coaches and trainers may want to take these gender differences into account when designing training programs for their athletes. Overall, this study highlights the importance of considering gender differences in physical fitness when working with athletes, in order to optimize training and performance outcomes.

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# STUDENT ATTITUDE TOWARDS SPORTS AND RECREATIONAL ACTIVITIES AT EDWARD BERNAYS UNIVERSITY

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## ABSTRACT

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**INTRODUCTION** - Some studies indicate that participation in student sports activities is closely related to certain later life habits, i.e. that the freedom of choice to participate in a particular sport at the university is connected with the intrinsic motivation to compete in all fields, which is very important in the later phase life. The main goal of this work was to investigate how active in sports students of the Edward Bernays Faculty are, how much they are involved in competitive activities for the faculty, which sports activities they do in their free time, how active they are daily and what are the main reasons for not playing any sports.

**METHODS** - 77 students of all years at Edward Bernays University participated in the research. To collect data in this study, the survey method was used, which belongs to sociological methods, and which consists of a series of prepared questions with which we received the most important answers about how often students play sports on a weekly basis, whether they participated in competitions for the college, how many steps per day they are active on average, and what are the main reasons for playing and not playing sports.

**RESULTS** - The results carried out on students of Edward Bernays University indicate that students most often play sports 2-3 times a week and at a recreational level. The concerning fact is that 23 students do not play any sport. As the most common reason for not playing sports, students cite a lack of time due to university obligations, while 35 students regularly play sports. The daily number of steps students usually take is 5,000-10,000 steps per day.

## DISCUSSION and CONCLUSION

Further research in this area is needed to obtain a clearer picture. The author's suggestions is to go in the direction of including a larger sample of students and greater promotion of the importance and benefit of health activities on human health.

**Keywords:** sport, health, habits, college.

## INTRODUCTION

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Edward Bernays is a private university named after the founder of public relations, Edward Louis Bernays, which enrolls students who show a special interest in education in the fields of communication and tourism. Undergraduate studies in Communication Management and graduate studies in Public Relations Management enable participants to acquire the most up-to-date academic and professional

knowledge that is closely related to the future employer. One of the components of Edward Bernays is management in sports. Sport has a great influence on the entire education system, including the high education system. In developed countries, university sports greatly influence the choice of future students about the institution where they want to study. University sport often affects the quality of studying because, in addition to allowing students to engage in physical activity, it enables them to spend quality free time, but at the same time, due to the social role of sport, it provides an opportunity to make new social contacts and network with each other (Galic et al., 2020). Academic sport, or sport intended for students, in its largest part belongs to non-profit sport because its main goal is to meet the health needs of students. Some studies have confirmed that participation in student sports activities is closely related to certain later life habits, i.e. that the freedom of choice to participate in a particular sport at the university is connected with the intrinsic motivation to compete in all fields, which is very important in the later phase of life (Kimball and Freysinger, 2010). Vračan et al. (2009) concluded that students are very well informed about the importance of physical activity, as 94% of them consider physical activity very important. However, the fact that even 56% of students from the sample of their research are not involved in any form of physical activity outside of physical and health education is worrying. From all the above benefits of sports for health, the aim of this work was to investigate how active in sports the students of the Edward Bernays University are, how much they are involved in competitive activities for the faculty, which sports they like the most, which sports activities they engage in in their free time, how much are they daily active and what are the main reasons for not doing sports?

## METHODS

77 students participated in the research, 57 female and 20 male students from all years of study at the Edward Bernays University. To collect data in this study, the survey method was used, which belongs to sociological methods, and which consists of a series of prepared questions (Haralambos & Holborn, 2002), with which we received the most important answers about how often students play sports on a weekly basis, whether they participated in competitions for the college, how many steps per day they are active on average, and what are the main reasons for playing and not playing sports. On the basis of the questionnaire, the frequencies (F) and percentages of responses (%) related to each of the above-mentioned categories that we investigated with the questionnaire were calculated.

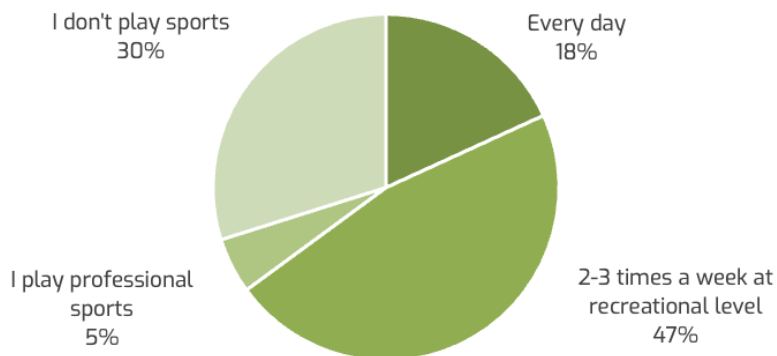
## RESULTS

The results of the research carried out by the survey questionnaire in all domains will be expressed as the number of responses or frequencies in the tables (table 1, table 2, table 3, table 4, table 5) while in the pictures (picture 1, picture 2, picture 3, picture 4, picture 5) the percentage of responses will be displayed.

**Table 1.** Frequency of responses on How often do you play sports?

Answer	F
Every day	14
2-3 times a week at recreational level	36
I play professional sports	4
I don't play sports	23

**Figure 1.** How often do you play sports? (77 answers)

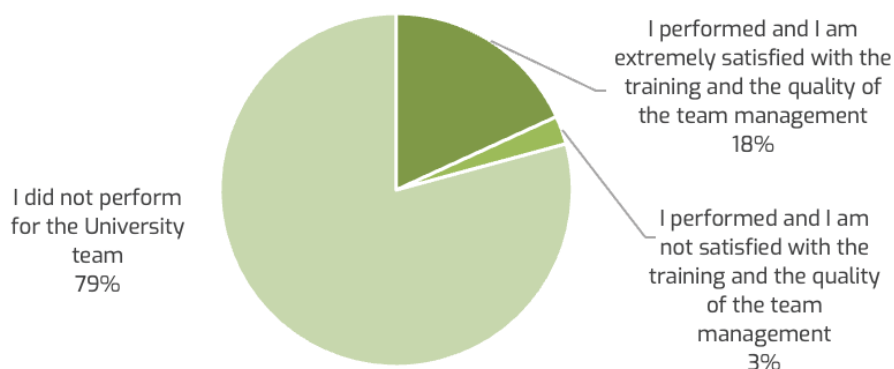


The results of the conducted research indicate that most students exercise 2 to 3 times at a recreational level. The fact that 23 students do not play sports at all is worrying, while a very small percentage play sports at a professional level.

**Table 2.** Frequency of answers whether you performed for the university team Edward Bernays and how satisfied are you with the training and leading the team at the university competition?

Answer	F
I performed and I am extremely satisfied with the training and the quality of the team management	14
I performed and I am not satisfied with the training and the quality of the team management	2
I did not perform for the University team	61

**Figure 2.** Did you performed for the university team Edward Bernays and how satisfied are you with the training and leading the team at the university competition?

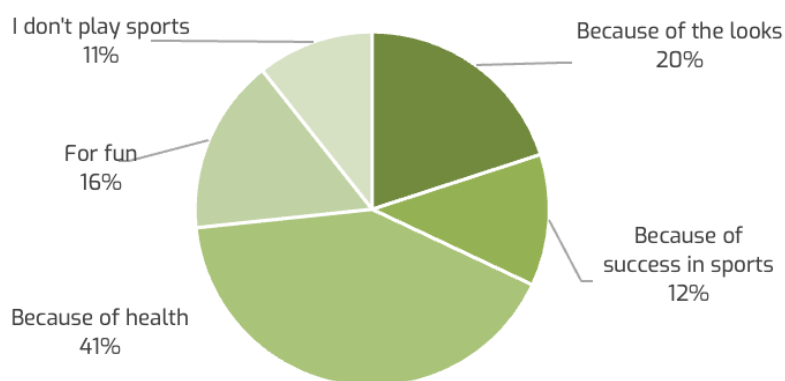


Considering that the majority of this survey is female and considering that volleyball is the only female sport in which Edward Bernays participates in the University competition, for the same reason most students did not perform for the university team, and those who did were satisfied with the training and management of the team.

**Table 3.** Frequency of responses in the domain of the questionnaire I do sports because?

Answer	F
Because of the looks	15
For hanging out with friends	0
Because of success in sports	9
Because of health	31
For fun	12
I don't play sports	8

**Figure 3.** I do sports because



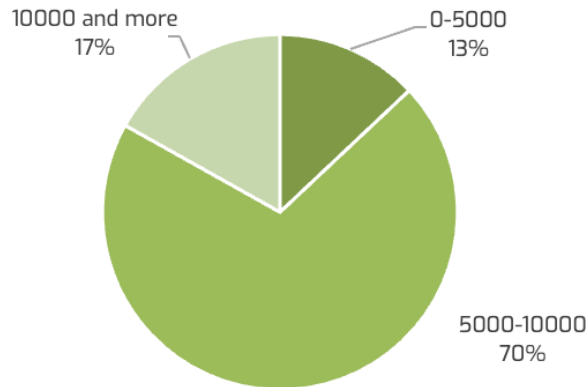
The results show that most students play sports for health (41%).

**Table 4.** Response frequency, how many steps do you take on average on a daily basis?

Answer	F
0-5000	10
5000-10000	54
10000 and more	13



**Figure 4.** How many steps do you take on average on a daily basis?

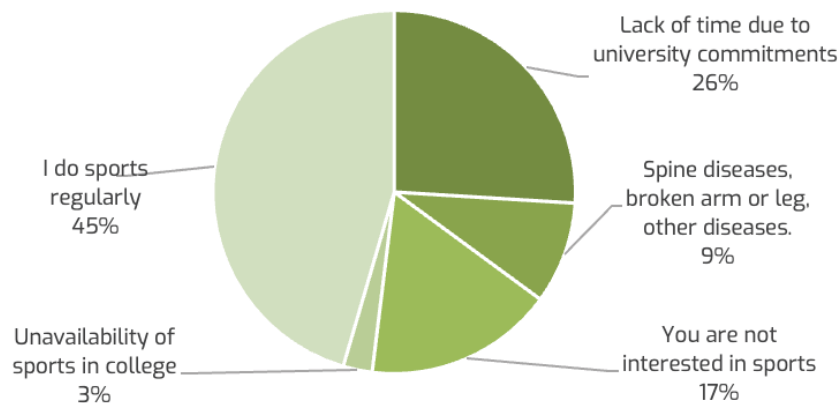


The results indicate that most students walk 5,000 to 10,000 steps a day. The fact that 13% of students do not take more than 5,000 steps is worrying.

**Table 5.** Response frequency, what is the main reason why you do not play sport more or you do not play sport at all?

Answer	F
Lack of time due to university commitments	20
Spine diseases, broken arm or leg, other diseases.	7
You are not interested in sports	13
Unavailability of sports in college	2
I do sports regularly	35

**Figure 5.** What is the main reason why you do not play sport more or you do not play sport at all?



The results indicate that a little less than half of the students play sports regularly. The biggest reason for not playing sports is the lack of time due to university duties. Given that it is a young population, a very small part of them do sports because of spine problems.

## DISCUSSION AND CONCLUSION

The results of the research conducted on the students of the Edward Bernays University indicate that the students most often play sports 2-3 times a week and at the recreational level. The fact that 23 students do not play sports is worrying. As the most common reason for not playing sports, students cite a lack of time due to university obligations, while 35 students regularly play sports. The daily number of steps students take is usually 5,000-10,000 steps per day. Given that it is a private study and that the number of students is small, most of them did not perform for the university team Edward Bernays, and those who did were satisfied with leading the team at the competition. Research conducted by Breslauer et al. (2013) on 36 students of sports and tourism management at the University in Čakovec, indicates that 94% of students are engaged in sports activities, in contrast to this research, which indicates that only 46% of students are engaged in sports activities at the Edward Bernays Faculty. The reason for this may be the smaller sample of respondents in the study by Breslauer et al. (2013) and the higher percentage of male students involved. This indicates to us the fact that female students should be more involved in sports activities. By that, the research conducted by Caput - Jogunica et al. (2007) on the students of the Faculty of Agriculture indicates that 74% of students do not engage in any physical activity, 20% engage in recreational (2-3) times a week, and only 0.6% engage in physical activity regularly. Thus, 42% of female students do not engage in any physical activity at all, and 48% of them engage in recreational activities up to 2 times a week. Pejić et al. (2008) researched the students of the Lavoslav Ružička University and obtained the results that the majority of students engage in sports activities in their free time. Also, their research they stated a lack of interest in exercise and a small selection of sports as the main reason for not exercising. Taking into account the relatively small sample of respondents who participated in this research and the fact that this is the first study that investigated the attitudes of Edward Bernays University students towards sports, it is necessary to point out the limitations of the research.

We can conclude that further research in this area is needed to obtain a clearer picture. The author's suggestions is to include a larger sample of students, and greater promotion of the importance and benefit of health activities on human health.

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# THE IMPORTANCE OF PREPARATION PROTOCOLS BEFORE DANCE TRAINING IN AMATEUR FOLK DANCE GROUPS

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## ABSTRACT

The main goal was to examine the warm-up routine prior to physical activity in some amateur folk dance groups. The survey was conducted after receiving the responses of the participants of an anonymous online questionnaire which consisted of 12 questions. 100 female and 39 male respondents aged between 14 and 60 completed it. The respondents were members of 41 different amateur folk dance groups. The results show that 37 groups (87.8%) practice regular warm-up activities prior to dance training. The duration of warm-up is 10 minutes in 17 groups (47.2%), while the other groups practice warm-up in the duration of 5 or 15 minutes. The number of dance training sessions per week also varies. Two sessions per week are held by 27 groups (65.9%), one session by 12 groups (29.2%) and 3 sessions by 2 groups (4.9%). The duration of the sessions varies from 60-120 minutes. 24 groups (58.5%) conduct 120-minute sessions, one group conducts 60-minute sessions, while the rest of the groups conduct 90-minute sessions. 125 respondents believe that a warm-up is important or very important before a dance training. The results have also shown that 29 respondents, (20.9%), got injured during the dance training. The inclusion of a kinesiologist in the amateur folk dance groups to increase the safety of folk-dance practitioners is a big step forward.

**Key words:** *warm-up, dance training preparation, amateur folk dance group, folk dance*

## INTRODUCTION

Folk dance is an aesthetic acyclic activity that presents the customs of a certain nation in an artistic manner. Croatian folk tradition is extremely rich in dances distributed over four ethnochoreological zones: Alpine, Pannonian, Adriatic, and Dinaric dancing zone (Ivančan, 1996). To which of the zones a certain dance belongs to is defined by the dances' unifying musical, rhythmical, stylistic, spatial, and other characteristics. Preserving originality and authenticity of folk dance, song, and music as a part of traditional culture is the main goal of the professional (Lado) and amateur cultural artistic societies (also known as "folklore societies"). Most of the dances in Croatian folklore can be considered as a high intensity physical activity, which involves the use of both aerobic and anaerobic energy systems. Thus, the dancers need to have substantially developed functional abilities because of the high level of physical strain they are exposed to during the performance of dance choreographies in public or at training sessions (Mraković, 2017).

The introductory-preparatory part of dance rehearsals should include active warm-up activities, in preparation for the strain that the dancers will be under, raising the body temperature with various exercises (Sargeant, 1987; Bishop, 2003). Aerobic exercises of low and moderate intensity (Houmard, 1991; Cè et al., 2008; Frikha et al., 2016) have a greater metabolic effect, have a greater metabolic effect, conditioning for better preparedness for exertion in upcoming activities. (Gray and Nimmo, 2001; McGowan, 2015). Proper balancing of physical strain and exercise length during warm-up activities is extremely important to prevent extensive weariness (Bishop, 2003). Decas (2020) has determined a connection between warm-up and the dance injuries by conducting a survey among dancers of differing dancing status. He concludes that the implementation of cardiovascular exercises into dance warm-up plans is the best way to prepare for a dance training, and that it has a positive effect on reducing injury risk. Malliou et al. (2007) have researched and determined a correlation of injury incidence with the duration of warm-up and cool-down routines on an aerobics dance instructor, before and after an aerobics dance class; in the case of an approx. 15-minute warm-up, the number of occurred injuries was reduced significantly. Folk dance, as a highly intensive and specific activity, requires a suitably specific approach with warm-up activities. The aim of this research was to determine warm-up routine tendencies in amateur folklore societies.

## METHODS

The subject sample pool consisted of members of 41 amateur folklore societies (N=139; W=100; M=39), between the ages of 18 to 64. The variable sample pool was made up of 12 questions in an online questionnaire: general information (age, gender), opinions on the importance of warm-up exercises, warm-up habits in their folklore societies, engagement in other additional physical activities and injuries resulting from the folklore society activities. The anonymous questionnaire data points were analysed by the means of descriptive statistics by the means of particle frequency.

## RESULTS

**Table 1:** *The sample of subjects according to the age and gender*

AGE	M	W	TOTAL
<b>younger than 18</b>	3	12	15
<b>18-24</b>	10	43	53
<b>25-34</b>	17	23	40
<b>35-44</b>	7	11	18
<b>45-54</b>	1	7	8
<b>55-64</b>	1	4	5
<b>TOTAL</b>	39	100	139

139 responses were collected by the anonymous questionnaire (W=100 (71,9%); M=39 (28,1%)) from the members of 41 amateur folklore societies, 39 of which are in Croatia, and the remaining 2 being members of Croatian diaspora societies.

The questionnaire consisted of 12 questions, 9 of which were obligatory, while completing the 3 remaining questions depended on previous responses.

**Table 2:** Responses to the questions

<b>Number of dancing rehearsals?</b>	
<b>Number of rehearsals</b>	<b>Number of folklore associations</b>
1	12
2	27
3	2
<b>The duration of the dancing rehearsal in minutes?</b>	
60'	1
90'	16
120'	24
<b>Opinion about the importance of a warm-up on the 1-5 scale (1-not important, 5-very important)?</b>	
<b>Scale</b>	<b>The number of participants</b>
1	0
2	2
3	12
4	20
5	105
<b>Doing a warm-up in a dancing association? (YES/NO)</b>	
<b>Warm-up</b>	<b>The number of folklore associations</b>
DA	36
NE	5
<b>The duration of warm-up activities in minutes?</b>	
5'	5
10'	17
15'	14
<b>Other physical activities besides dancing in the association? (YES/NO)</b>	
<b>Activity</b>	<b>The number of participants</b>
YES	81
NO	58
<b>Injuries caused by folklore dancing? (YES/NO)</b>	
YES	29
NO	110

As evident in table 2, 27 dancing societies (65.9%) have two dancing sessions a week, 24 of which (58.5%) have 120-minute dancing sessions; 105 (75.5%) out of 139 participants consider warming up to be very important; 36 societies (87.8%) do warm-up activities, 14 of which (38.9%) do them for 15 minutes. The responses to other questions showed that none of the folklore societies practice individual warm-up activities. The last group of questions referred to physical activities outside the folklore society, and the injuries that resulted during practicing folk dance. 81 (58.3%) participants engage in other physical activities, and 29 (20.9%) of them suffered some form of injury, predominantly of the lower extremities.

## DISCUSSION

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In the work of amateur folklore societies, as a heterogeneous group of dancers, the recommendation is, in the case that the society conducts a large number of rehearsals per week, that the rehearsals should be less intense regardless of their duration, optimally planned and organized with a necessary inclusion of introductory warm-up activities, which 105 (75,5%) participants consider very important.

The fact that as many as 17 groups (47.2%) do 10-minute warm-up activities is positive, because according to Bishop (2003), 10 minutes is the optimal time in which, exercising at 60-80% of your maximum oxygen intake, your ability level is increased without causing fatigue or significantly depleting energy stores. 58 participants (41.7%) do not practice any other physical activities but folkdance, which makes the programming of optimal warm-ups even more important.

## CONCLUSION

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The aim of this research was to determine the warm-up habits of amateur folklore societies through an online questionnaire, and to raise awareness amongst the leaders and members of these societies on the importance and effects of warm-up activities. Further analysis of the results indicates that, although 86.8% of the societies warm-up regularly, there is still a lot of room for improvement, primarily when it comes to ensuring the safety of dancers and preventing the possibility of injury.

Amateur folklore societies, as the cornerstone of Croatian folk culture preservation, are held in extremely high regard across the Republic of Croatia, and as such should work on improving the quality of their work. As it is the case with any physical activity, implementing the basic principles of kinesiology is the best way to improve the quality of work and to reach a society's highest possible potential.

Besides raising awareness on the importance of warm-up activities, it is also necessary to improve the education of the leaders and members of amateur folklore societies. The School of Croatian Folklore, which is the most prominent educator of the folklore society directors, should regard folklore activity as a sport-recreational activity to a greater extent, and greatly improve their courses covering this subject. In this way, the heads of societies would gain necessary knowledge, not only about the importance of the warm-up and its regular practice, but also about the importance and ways to improve functional and motor abilities. Some larger and more dedicated folklore societies, ones that during a dance season plan concerts lasting up to two hours, could significantly improve the quality of their performances as well as take better care of their member's physical welfare and prevent injuries by hiring a kinesiologist as a fitness training specialist or a general physical activity professional. The main issue is that such investment demand significant financial support which is not always available to societies of this kind. Raising awareness on this subject is a step towards ensuring the bodies responsible for preserving amateur folklore societies, organizationally and financially, recognize the importance of this aspect in the preservation and progress of these societies in the Republic of Croatia (Hrbud, 2022).

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