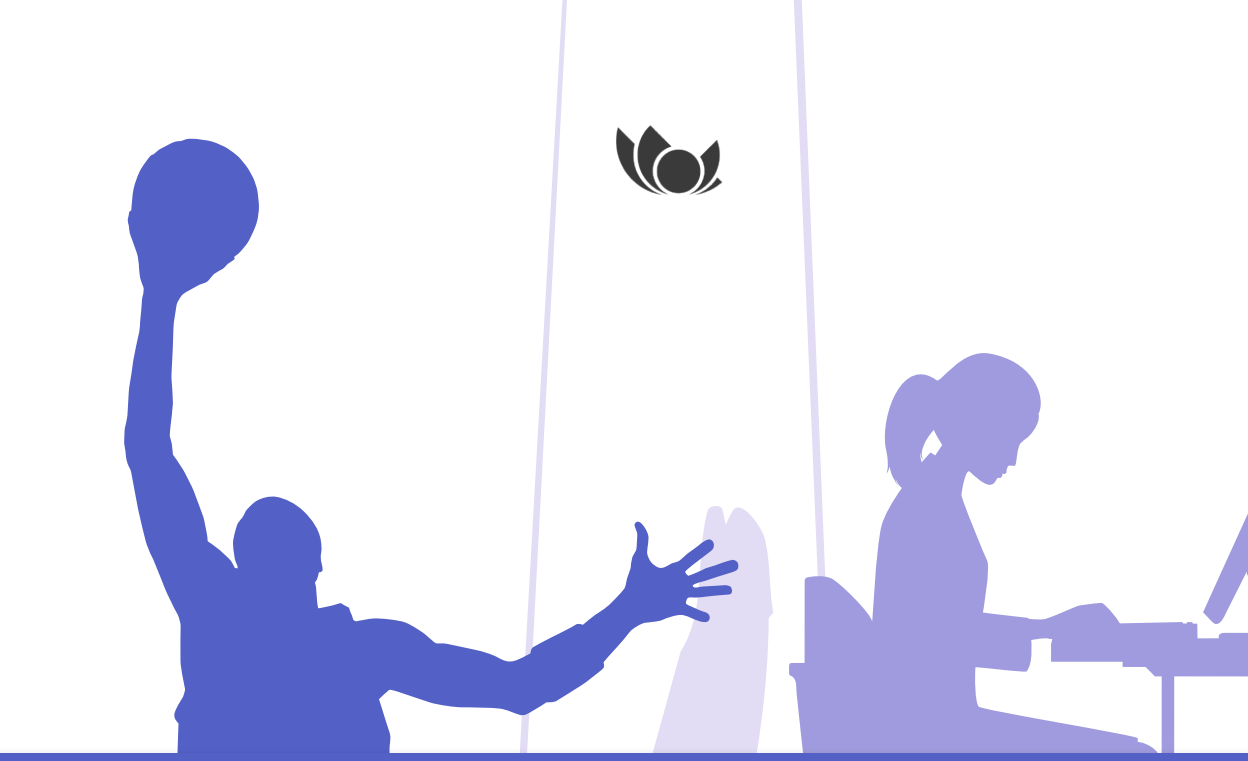

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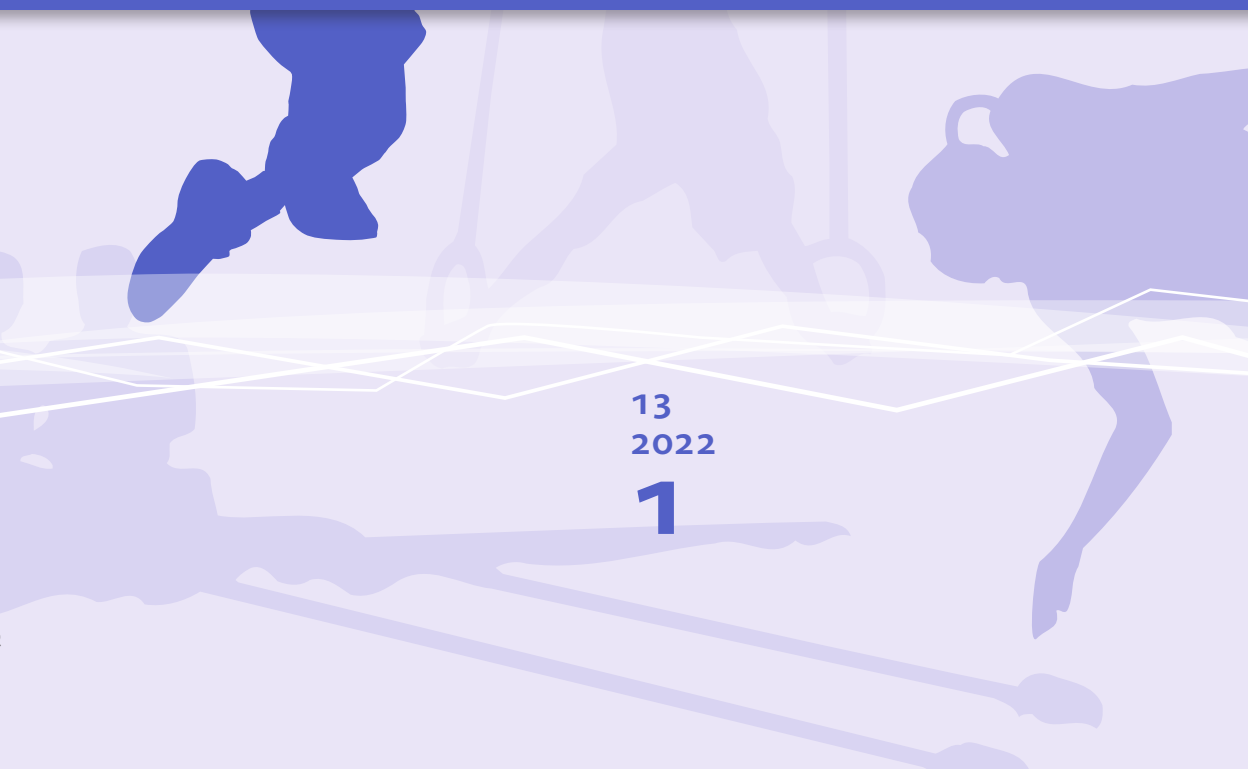

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EDITORIAL

Excess body fat is a serious health risk leading to problems such as hypertension, elevated blood lipids (fats and cholesterol), diabetes mellitus type 2, cardiovascular disease, respiratory dysfunction and gallbladder disease. Individuals who accumulate a lot of visceral fat are at higher risk than those who are more likely to accumulate fat on their thighs and buttocks.

These days, people are more concerned than ever about how much they weigh. Similarly, scientists propose a range of classification strategies based on body mass or composition, as is also evident in several publications in this issue of Annales Kinesiologiae. However, pure body mass or the body mass index is not an appropriate measure of health. For example, being thin does not necessarily mean that you have a lower health risk. In fact, the obsession with becoming thin often leads to serious eating disorders such as anorexia and bulimia. Being thin simply means weighing less than the recommended levels. It is important to distinguish between healthy leanness and unwanted thinness. There are also several important reasons to monitor body composition:

- To develop holistic physical fitness programs;
- To monitor body mass change = body fat loss with muscle growth;
- To provide a baseline for diet and the treatment of obesity;
- To follow changes due to growth, development, maturation and ageing;
- To individualise and optimise the performance of athletes.

The simplest 2-component body composition models divide it into a fat component and a fat-free component, and not all fat is considered unhealthy. This is an important advance over body mass indexing. Essential fat is found in the bone marrow, heart, lungs, liver, spleen, kidneys, intestines, muscles and fat-rich tissues, while storage fat accumulates in the adipose tissue. In addition, storage fat is found around the internal organs and under the skin. Fat-free mass is the weight of your muscles, bones, ligaments, tendons and internal organs, with essential fat subtracted.

The search for methods to determine body composition went through several phases (with the methods of each phase labelled): (1) precision without biology (anthropometry); (2) biology without precision (dilution methods); (3) in search of precision (bioimpedance); and (4) in search of accuracy (dual-energy X-ray absorptiometry). As bioimpedance is a very affordable method with a high potential for error of < 4%, one should consider multiple standards for a valid evaluation:

- Supine position with arms and legs abducted by 30 deg and 45 deg, respectively;
- No eating for 12 hours and no drinking for 4 hours before the test;
- No exercise within 12 hours of the test;
- Urinate within 30 minutes of the test:
- No alcohol consumption within 48 hours of the test
- No diuretics within 7 days of the test.

These standards for valid bioimpedance assessment are difficult to achieve, and many authors simply ignore them. Nevertheless, body composition is an integral component of overall health and physical fitness that leads to important decision-making strategies for our health.

On the other hand, dual-energy x-ray absorptiometry (DEXA or DXA) measures body fat, muscle and the total body bone mineral (TBBM) using two x-ray energies. DEXA is fast and has low radiation exposure. The analysis can be broken down into regional levels. While DEXA is the gold standard for measuring bone mineral density, it is also used to estimate total and regional body fat and lean mass.

Therefore, I would like to point out to scientists that they need to be aware of the measurement standards to be followed and to choose state-of-the-art methods for valid results in order to ensure high-quality result interpretation.

Boštjan Šimunič,
Editor

UVODNIK

Čezmerna telesna maščoba pomeni resno tveganje za zdravje, ki vodi v bolezni, kot so povišan krvni tlak, povišane vrednosti lipidov (maščob in holesterola) v krvi, sladkorna bolezen tipa 2, bolezni srca in ožilja, motnje v delovanju dihal in bolezni žolčnika. Posamezniki, ki si naberejo veliko visceralne maščobe, so bolj ogroženi kot tisti, ki si maščobo bolj nabirajo na stegnih in zadnjici.

Danes se ljudje bolj kot kdaj koli prej ukvarjajo s tem, koliko tehtajo. Podobno tudi znanstveniki predlagajo različne strategije razvrščanja glede na telesno maso ali sestavo, kar je razvidno tudi iz več objav v tej številki revije Annales Kinesiologiae. Vendar samo telesna masa ali indeks telesne mase ni ustrezno merilo našega zdravja. Na primer, če ste vitki, to še ne pomeni, da je vaše tveganje za zdravje manjše. Pravzaprav obsedenost z vitkostjo pogosto vodi v resne motnje hranjenja, kot sta anoreksija in bulimija. Biti vitek preprosto pomeni tehtati manj, kot je priporočeno. Pomembno je ločiti med zdravo vitkostjo in neželeno vitkostjo. Je tudi več pomembnih razlogov za spremljanje telesne sestave:

- za razvoj celostnih programov telesne pripravljenosti,
- za spremljanje sprememb telesne mase = izguba telesne maščobe z rastjo mišic,
- za zagotavljanje izhodišč za dieto in zdravljenje debelosti,
- za spremljanje sprememb zaradi rasti, razvoja, transformacijskih procesov in staranja,
- za individualizacijo in optimizacijo zmogljivosti športnikov.

Najpreprostejši dvokomponentni modeli telesne sestave se delijo na maščobno in pusto komponento, pri čemer vsa maščoba ne velja za nezdravo. To je pomemben korak naprej v primerjavi z indeksom telesne mase. Zdravju koristno maščobo najdemo v kostnem mozgu, srcu, pljučih, jetrih, vranici, ledvicah, črevesju, mišicah in tkivih, bogatih z maščobo, medtem ko se maščoba kopiči predvsem tudi v visceralnem in podkožnem maščevju. Pusta masa je masa mišic, kosti, vezi, kit in notranjih organov, od katere je odšteta tudi zdravju koristna oziroma potrebna maščobna masa.

Iskanje metod za določanje telesne sestave je potekalo v več fazah (s primeri najbolj razširjenih metod te faze): 1. natančnost brez biologije (antropometrija); 2. biologija brez natančnosti (metode presnavljanja snovi); 3. iskanje natančnosti (bioimpedanca) in 4. iskanje natančnosti (dvoenergijska rentgenska absorpciometrija). Ker je bioimpedanca cenovno zelo dostopna metoda s potencialno nizko napako merjenja < 4 %, je treba za veljaven rezultat merjenja upoštevati več standardov:

- ležeči položaj z abduciranimi rokami in nogami za 30 oziroma 45 stopinj,
- 12 ur ne jesti in 4 ure pred testom ne piti,
- brez vadbe 12 ur pred testom,
- urinirati 30 minut pred testom,
- ne uživati alkohola 48 ur pred testom,
- ne jemati diuretikov 7 dni pred testom.

Za veljavno oceno bioimpedance je namreč te standarde težko doseči, zato jih številni avtorji preprosto ne upoštevajo, čeprav je telesna sestava sestavni del splošnega zdravja in telesne pripravljenosti, ki vodi do pomembnih strategij odločanja o našem zdravju.

Po drugi strani pa dvoenergijska rentgenska absorpciometrija (DEXA ali DXA) z dvema energijama rentgenskih žarkov meri telesno maščobo, mišice in kostno mineralno gostoto celega telesa (TBBM). Metoda DEXA je hitra in pri njej je izpostavljenost sevanju majhna. Analizo je mogoče razdeliti na regionalna območja telesa. Čeprav je DEXA zlati standard za merjenje mineralne kostne gostote, se uporablja tudi za oceno skupne in regionalne telesne maščobe in puste mase.

Zato bi rad opozoril znanstvenike, da se morajo zavedati merilnih standardov, ki jih je treba upoštevati, in ustrezno izbrati merilne metode za veljavno merjenje, da bi zagotovili visoko kakovost interpretacije rezultatov.

Boštjan Šimunič,
urednik

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EFFECTS OF INSPIRATORY MUSCLE TRAINING ON PHYSICAL PERFORMANCE DURING BACKPACK CARRYING

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ABSTRACT

Purpose: *Restricting chest movement when carrying a loaded backpack reduces efficiency and increases the work of the respiratory muscles. The aim of the present study was to investigate the effects of six weeks of inspiratory muscle training (IMT) on respiratory muscle strength and endurance and on physical performance when carrying a load* ***Methods:*** *Twenty male (age: 32.2 ± 3.4 years) members of the Special Operations Unit of the Slovenian Army volunteered to participate. The experimental group (n=10) trained their respiratory muscles for six weeks against an incremental inspiratory resistance with a breathing apparatus. The placebo group (n=10) performed the same IMT protocol but with a sham inspiratory resistance. Assessment of the subjects before and after IMT included measurements of the maximal inspiratory and expiratory pressures, heart rate measurements, and ratings of perceived physical and respiratory exertion before and after a 60-min walk test with a 25-kg backpack* ***Results:*** *After six weeks of IMT, the maximum inspiratory pressure measured before and after the 60-minute walk test increased significantly ($p < 0.001$) in the experimental group by 47 ± 13% and 58 ± 20%, respectively. Inspiratory fatigue was also significantly lower in the experimental group. No changes were observed in the heart rate and the rating of perceived exertion during the walking test. In the placebo group, no significant changes were observed in the measured parameters after IMT.*

Conclusion: *Six weeks of IMT with progressive breathing resistance improves strength and reduces fatigue of the respiratory muscles. Individuals who perform tasks that require them to carry a heavy backpack for extended periods of time may benefit from IMT.*

Keywords: *load-carrying, respiratory muscle fatigue, respiratory muscle training, thoracic motion restriction.*

UČINKI VADBE INSPIRATORNIH MIŠIC NA TELESNO ZMOGLJIVOST MED NOŠENJEM NAHRBTNIKA

IZVLEČEK

Cilj: *Omejitev gibanja prsnega koša med nošnjo obteženega nahrbtnika zmanjša učinkovitost in poveča delo dihalnih mišic. Cilj pričujoče študije je bil raziskati učinke šesttedenske vadbe inspiratornih mišic (VIM) na jakost in vzdržljivost dihalnih mišic ter telesno zmogljivost med prenašanjem bremena.*

Metode: *Prostovoljno je sodelovalo 20 moških (starost: 32,2 ± 3,4 let) pripadnikov Enote za specialno delovanje Slovenske vojske. Eksperimentalna skupina (n=10) je šest tednov neprekinjeno vadila proti naraščajočemu uporu pri vdihu s posebno dihalno napravo. Placebo skupina (n=10) je izvedla enak protokol VIM z napravo, vendar le z navideznim inspiratornim uporom. Začetno in končno testiranje preiskovancev je vključevalo meritve največjih inspiratornih in ekspiratornih tlakov, meritve frekvence srčnega utripa in oceno občutenja telesnega in dihalnega napora pred in po 60-minutnem testu hoje s 25-kg nahrbtnikom.*

Rezultati: *Po šesttedenski VIM se je največji inspiratorni tlak izmerjen pred in po testu hoje pomembno ($P < 0,001$) povečal v eksperimentalni skupini, in sicer za 47 ± 13 % pred testom in za 58 ± 20 % po testu. Značilno se je zmanjšala tudi inspiratorna utrujenost v eksperimentalni skupini. Odziv frekvence srčnega utripa in ocena občutenja napora med testom hoje se po VIM ni spremenila. V placebo skupini po VIM nismo opazili pomembnih sprememb v nobenem izmerjenem parametru.*

Zaključek: *Šesttedenska VIM s progresivnim inspiratornim uporom izboljša jakost inspiratornih mišic in zmanjša njihovo utrudljivost. Tovrstna dihalna vadba ima lahko pozitivne učinke za ljudi med opravljanjem nalog, ki zahtevajo dolgotrajno nošenje težkega nahrbtnika.*

Ključne besede: *prenašanje bremen, utrujenost dihalnih mišic, vadba dihalnih mišic, omejitev gibanja prsnega koša.*

INTRODUCTION

Carrying a load with a backpack is defined as the movement of a person with an additional mass on the trunk supported by shoulder straps (Knapik, Harman, Steelman & Graham, 2012). It is a common form of occupational physical activity, especially for soldiers, firefighters and rescue workers, as well as for various forms of sports and recreational activities. The load carried in a backpack restricts the movement of the chest and the amount of air a person can inhale, increasing the work of breathing (Dominelli, Sheel & Foster, 2012; Faghy & Brown, 2014b). In this case, the respiratory muscles are working outside the optimal limits of their length-tension curve (Romer & Polkey, 2008). Altered respiratory mechanics lead to accelerated fatigue of the respiratory muscles (Faghy & Brown, 2014a; Faghy & Brown, 2014b), which can reduce physical performance by reducing the blood flow to other skeletal muscles and increasing the perception of physical and respiratory effort (Dempsey, Romer, Rodman, Miller, & Smith, 2006; Harms, et al., 1997).

The actual effect of carrying an extra load in a backpack on respiratory muscle function under different working conditions has not been studied in detail. Butcher, Jones, Eves and Petersen (2006) reported a significant reduction in the maximum airway pressure in professional firefighters wearing a heavy backpack and a respiratory mask during both long-duration low-intensity physical activities and short-duration high-intensity physical activities. However, it is difficult to assess the individual effects of wearing a backpack and using a breathing mask because the mask itself increases the work of breathing (Eves, Jones & Petersen, 2005). In subjects of varying fitness levels, wearing a 25 kg backpack without a breathing mask has been shown to reduce the maximum inspiratory pressure (MIP) by 11% during 60 min walking (58% $\dot{V}O_{2max}$) on a treadmill and by a further 5% during subsequent high-intensity running (Faghy & Brown, 2014a; Faghy & Brown, 2014b; Faghy, Blacker & Brown, 2016).

The physical training of members of military special forces includes both low-intensity activities (e.g. military patrols) and high-intensity activities (e.g. military interventions and combat operations) while wearing a backpack, so it might be useful to include respiratory muscle training in their training routine. By using special training aids and training programs, one can strengthen the inspiratory or expiratory respiratory muscles in isolation or both at the same time. Inspiratory muscle training (IMT) adds resistance to the inspiratory flow and primarily strengthens the inspiratory muscles, especially the abdominal diaphragm, which creates an intrathoracic negative pressure during inspiration. IMT is commonly used to reduce respiratory effort during physical activity in elite athletes (HajGhanbari et al., 2013) and healthy individuals (Illi, Held, Frank & Spengler, 2012; Sales et al., 2016) as it significantly increases the strength of the inspiratory intercostal muscles, as well as the diaphragm (Verges, Lenherr, Haner, Schulz, & Spengler, 2007; Romer & Polkey, 2008). This has been shown to improve athletic performance (HajGhanbari et al., 2013), e.g. cycling (Romer, McConnell & Jones, 2002; Johnson, Sharpe & Brown, 2007; McConnell,

2011), running (Tong et al., 2008), swimming (Yañez-Sepulveda et al., 2021) and rowing (Griffiths & McConnell, 2007).

Respiratory muscle performance can be improved with various training protocols, most of which result in increased respiratory muscle strength and, to a lesser extent, improved muscle endurance (Fernández-Lázaro et al., 2021). IMT protocols vary and depend on the respiratory device used, the characteristics of the exerciser and the desired effects. In general, a minimum of four weeks of regular IMT, usually performed twice daily for at least 5 days per week at 50-70% of the maximum inspiratory pressure (MIP), is required for improvement in respiratory muscle strength (McConnell, 2013). Moderate- to high-intensity IMT (~60% MIP) can increase maximal contraction velocity and inspiratory muscle strength. Faghy & Brown (2016) reported that six weeks of IMT performed twice daily increased the maximal inspiratory pressure at rest by 31% and significantly attenuated the cardiovascular and perceptual responses to 60 minutes of walking with a 25-kg backpack at a steady pace, while improving performance by 8% during high-intensity timed runs. Because the relative intensity of their IMT protocol was kept constant at 50% of the maximal inspiratory muscle pressure, we hypothesize that even higher training effects can be achieved with a more progressive inspiratory resistance protocol. The progressivity of inspiratory resistance is likely to be of critical importance for training individuals with high levels of physical fitness, such as members of military special forces.

The aim of our study was therefore to investigate the effects of six weeks of IMT with progressive breathing resistance in members of military special forces on respiratory muscle strength and endurance, heart rate response and the perception of effort when walking with a heavy backpack.

METHODS

We conducted a controlled prospective intervention study on a sample of members of the Special Unit of the Slovenian Army (SOU SA). The study was approved by the Medical Ethics Committee of the Republic of Slovenia (No. 0120-494/2017/7), the Ministry of Defence of the Republic of Slovenia and the General Staff of the Slovenian Army.

Study Sample

All the potential SOU SA candidates were first given important information regarding the purpose and procedure of the study. Twenty male (mean age: 32.2 ± 3.4 years, age range: 27-38 years) members of the SOU SA site completed a questionnaire on their general health and signed a declaration in which they volunteered to participate in the study. Exclusion criteria for the subjects were cardiovascular, respiratory or me-

tabolic diseases, a history of peripheral or central thromboembolism, radiculopathy or other peripheral neurological disorders of the lower limbs.

Assessment of General Fitness

The assessment of general physical fitness was based on regular military tests performed by the subjects in the three months prior to the start of the study. The tests included two minutes of push-ups, two minutes of abdominal crunches and a fast run of 3200 meters. The result achieved by the subject in each test task was converted into points using a motor test scoring system defined by gender and age categories (Ivšek & Pograjc, 2014).

Study Design

The twenty subjects were randomly divided by lot into two groups of equal size. The experimental group (EG) performed a six-week IMT program with a breathing device that provided a progressive increase in inspiratory resistance. The placebo group (PG) performed the same program with a device that did not add inspiratory resistance but had a virtual resistance regulator installed. Both groups were tested before and after the completion of the six-week IMT program, as described below.

Tests and Measurements

All the tests and measurements were carried out in the sports hall of Vojašnica Edvarda Peperka, Moste-Polje Ljubljana. On the day of the test, the subjects ate a small meal two to three hours before the exercise and abstained from coffee or alcoholic beverages for at least 24 hours before the exercise. The subjects were familiarised with all the tests and measurement protocols before the first data collection.

Heart Rate and Aerobic Capacity

The subjects were placed in a stationary, semi-recumbent position on the examination table for 10 minutes and their heart rate was measured using a monitor with a chest strap (Polar M430 POLAR Electro, Europe AG, Val-de-Travers, Switzerland). The Polar Fitness Test™, which assesses a person's maximum oxygen consumption ($\dot{V}O_{2max}$) based on resting heart rate variability, gender, age, height, body weight and self- assessed physical activity level, was used to assess aerobic capacity.

Respiratory Muscle Strength and Fatigue

Measurements were taken using an inspiratory and expiratory MicroRPM® pressure measurement device (VYAIRE Medical Inc., Illinois, USA). Respiratory muscle strength was measured using the maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) in cm H_2O (Faghy & Brown, 2016). The MIP measurement was derived from the residual volume (maximal expiration) and the MEP measurement of the total lung capacity (maximal inspiration). Each measurement was taken five times. The minimum and maximum values were excluded and the average of the remaining three measurements was calculated (McConnell, 2013). The respiratory muscle fatigue was determined from the difference (Δ) between the MIP and MEP values obtained before (pretest) and immediately after (posttest) the 60-minute walking test**.**

Walking Test with a Backpack

Before the 60-minute walking test, the subjects put on a military backpack (V2 Plus System, Tasmanian Tiger GmbH, Dasing, Germany) that was evenly filled with a 25-kg load. Each subject adjusted and fastened the straps of the backpack individually before performing the test. The subjects completed the 60-minute walking test on a leveled Technogym Skillrun™ treadmill (Technogym, Cesena, Italy). Before they started walking, subjective ratings of overall perceived exertion (RPE) were assessed using the 15-item RPE scale and respiratory effort was assessed using the CR10 RPE scale (Borg, 1982). The heart rate was measured and recorded continuously during the test. The test began with a three-minute warm-up period so that the subjects gradually reached a target speed of 6.5 km/h, which they then maintained for 60 minutes (Faghy et al., 2016). Every ten minutes, the subjects rated the overall physical effort and respiratory effort. After completing the test, the subjects removed their backpacks, cooled down by walking slowly on a treadmill for 5 minutes, and then rested under control for another 20 minutes.

Inspiratory Muscle Training Intervention

The experimental group (n=10; EG) exercised with the POWERbreathe® (medium resistance) inspiratory muscle strengthening device (Powerbreathe International Ltd., Southam, UK) with an initial resistance of 60% MIP. The placebo group (n=10; PG) performed the same IMT program using the same respirator with the internal inspiratory valve removed, minimizing the respiratory resistance. Every two weeks, the subjects' MIP was measured again and inspiratory resistance was adjusted accordingly with an additional 10% increase to reach the final training target of 80% MIP. The MIP was reassessed in PG at the same time points and the breathing resistance was adjusted

virtually. All subjects performed 30 consecutive maximal breaths twice daily. Each maximal inspiration was followed by an active forced expiration to expiratory residual volume (McConnell, 2011). Both groups kept an exercise diary that encouraged them to perform IMT regularly; compliance with the program was checked weekly by the investigators

The POWERbreathe® respirator works on the principle of suprathreshold inspiratory loading. This requires the subject to generate an inspiratory pressure that exceeds the pressure threshold set on the device in order to open the inspiratory valve. The inspiratory threshold is increased by tensioning the spring attached to the air valve of the device. The advantage of suprathreshold loading is that the increase in inspiratory resistance does not affect the actual airflow through the unit. Furthermore, the load resistance can be assessed objectively (McConnell 2011; McConnell, 2013).

Statistical Analysis and Data Processing

The normality of the data distribution was analyzed using the Shapiro-Wilk test, which showed the adequacy of the parametric tests. The effect of training was assessed by comparing the mean values of heart rate and maximum respiratory pressures measured at rest prior to the 60-minute walk test (pretest), before and after the six-week IMT period. The effect of IMT on fatigue during walking was assessed by comparing the heart rate and RPE at the end of the walking (posttest) and Δ MIP and Δ MEP. The means were compared using the independent samples t-test and the two-way factorial ANOVA (group × time) with repeated measures for the time factor. If the factor interaction was statistically significant, a pairwise comparison was performed using Tukey's HSD post-hoc test. The threshold for statistical significance was set at $p < 0.05$ for all analyses. Results are presented as means ± standard deviations unless otherwise stated.

RESULTS

Subjects from EG and PG did not differ significantly in age, anthropometric characteristics, general physical fitness, and aerobic capacity. The detailed analysis of group characteristics is shown in Table 1.

Table 1: Comparison of the basic subjects' characteristics across groups.

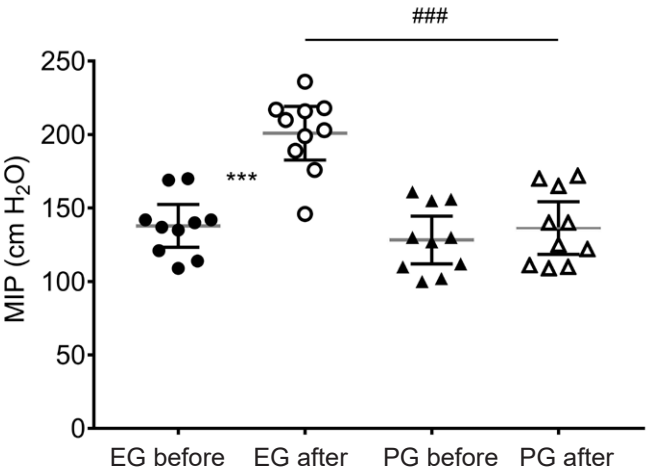
	EG	PG	p-value
Age (years)	33.3 ± 4.1	31.2 ± 2.8	0.258
Body height (cm)	180.6 ± 7.4	179.3 ± 4.5	0.641
Body weight (kg)	85.7 ± 5.6	82.7 ± 5.6	0.246
BMI (kg/m^2)	26.4 ± 2.3	25.6 ± 2.8	0.396
3200 m run (min)	13.3 ± 1.1	13.2 ± 1.1	0.843
Abdominal crunches (no./2 min)	87.3 ± 9.3	86.4 ± 9.0	0.843
Push-ups (no./2 min)	81.5 ± 7.2	79.4 ± 8.1	0.547
$\dot{V}O_{2max}$ (ml/kg/min)	47.8 ± 3.08	49.3 ± 2. 79	0.485

EG – experimental group; PG – placebo group; BMI – body mass index; 2max – maximal pulmonary oxygen consumption

Respiratory Muscle Strength

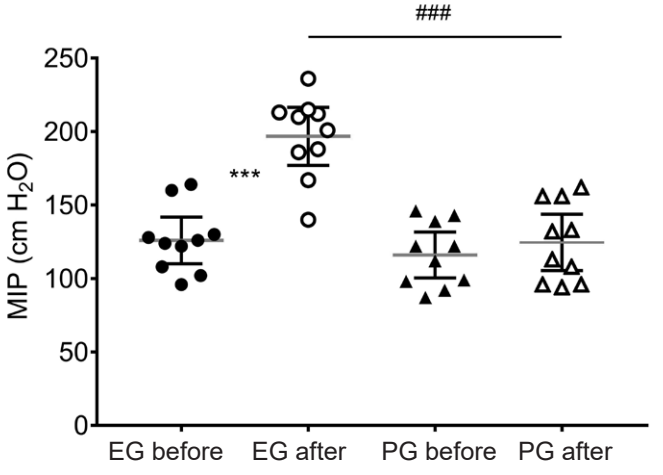
The interaction of factors during the six-week IMT was significant ($p < 0.001$) for the pretest MIP. The pretest MIP increased significantly ($p < 0.001$) in the EG by 63 ± 15 cm H_2O (47 ± 13%) after training. There was no significant change ($p = 0.162$) in the pretest MIP in the PG after training. The pretest MIP was significantly higher ($p < 0.001$) in the EG after training (Figure 1).

The interaction of factors during the six weeks of IMT was significant ($p < 0.001$) for the posttest MIP. The posttest MIP increased significantly ($p < 0.001$) in the EG by 71 ± 20 cm H_2O (58 ± 20%) after training. There was no significant change ($p = 0.306$) in the posttest MIP in the PG after training. The posttest MIP was significantly higher ($p < 0.001$) in the EG after training (Figure 2)



*** indicates the pretest to posttest difference in the EG at $p < 0.001$. ### indicates the difference between the groups at $p < 0.001$.

Figure 1: Comparison of the mean (standard deviation) maximum inspiratory pressure (MIP) measured before the 60-minute walk test between the experimental group (EG) and the placebo group (PG) before and after the inspiratory muscle training program.



*** indicates the pretest to posttest difference in the EG at $p < 0.001$. ### indicates the difference between the groups at $p < 0.001$.

Figure 2: Comparison of the mean values (standard deviation) of the maximum inspiratory pressure (MIP) measured after the 60-minute walk test between the experimental group (EG) and the placebo group (PG) before and after the inspiratory muscle training program.

The interaction of factors during six weeks of IMT was not significant for the pretest MIP ($p = 0.556$) and the posttest MIP ($p = 0.279$) (Figures 3 and 4).

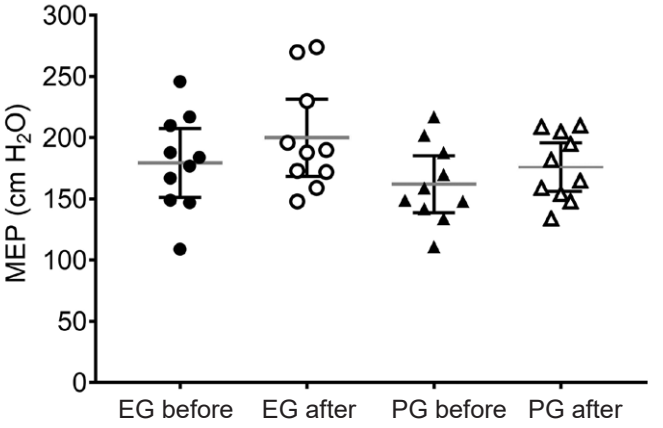


Figure 3: Comparison of the mean (standard deviation) maximum expiratory pressure (MEP) measured before the 60-minute walk test between the experimental group (EG) and the placebo group (PG) before and after the inspiratory respiratory muscle training program.

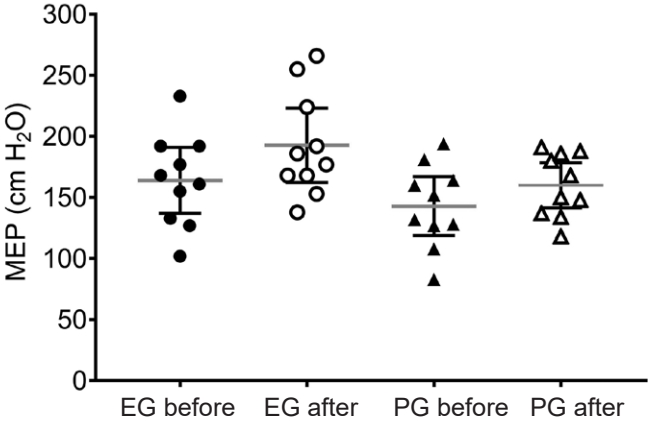


Figure 4: Comparison of the mean (standard deviation) maximum expiratory pressure (MEP) measured after the 60-minute walk test, between the experimental group (EG) and the placebo group (PG) before and after the inspiratory respiratory muscle training program.

Respiratory Muscle Fatigue

The interaction of factors during the six-week IMT was also significant ($p < 0.001$) for Δ MIP during the 60-minute walk test. The Δ MIP decreased ($p < 0.01$) from -12 ± 4 cmH_2O before the training to -4 ± 4 cmH_2O afterward. In contrast, the Δ MIP in PG before (-12 ± 3 cmH_2O) and after (-12 ± 4 cmH_2O) the training was no different ($p = 0.991$). The Δ MIP after IMT was significantly lower in EG ($p < 0.001$).

The interaction of the factors for Δ MEP during the 60-min walk test was also significant ($p < 0.01$). The Δ MEP decreased from -15 ± 5 cmH_2O before the training to -7 ± 5 cmH_2O afterward. In contrast, the Δ MIP in the PG before (-19 ± 7 cmH_2O) and after (-16 ± 4 cmH_2O) the training was no different ($p = 0.549$). The Δ MEP after IMT was significantly lower in EG ($p < 0.01$).

Heart Rate and Perceived Exertion

The interaction of the factors during the six-week IMT was not significant for the heart rate ($p = 0.215$), respiratory effort ($p = 0.327$), and overall body exertion ($p = 0.644$) (Figure 5).

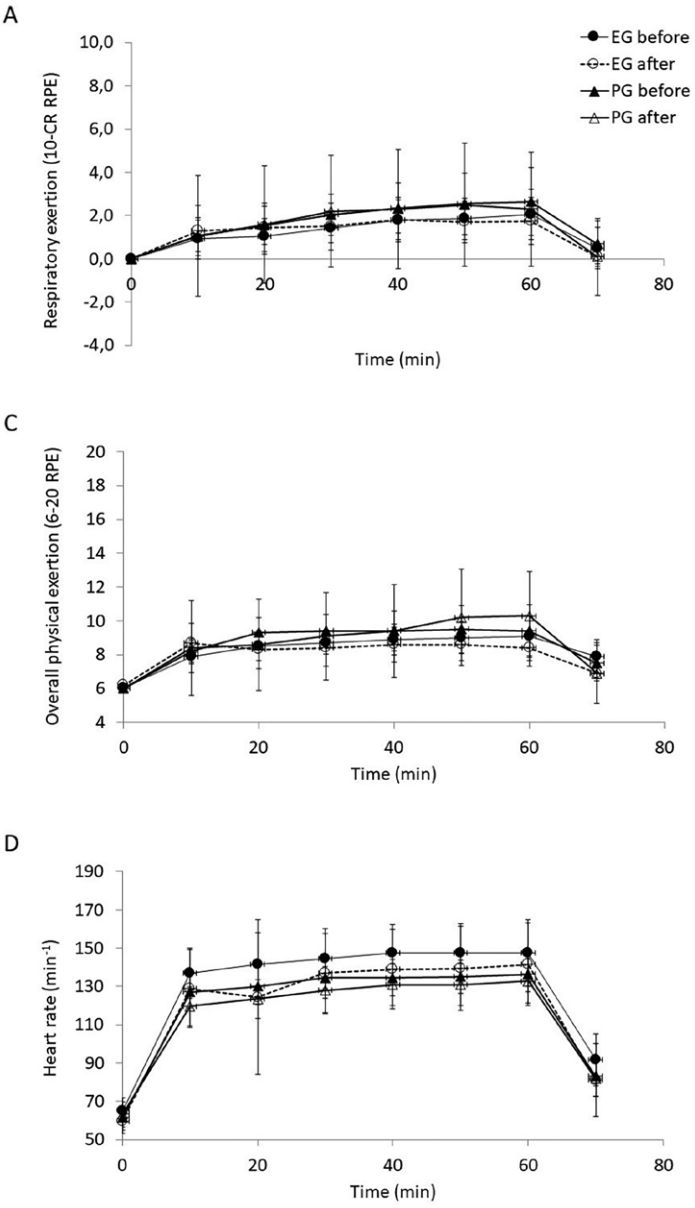


Figure 5. The mean (standard deviation) heart rate response (A) and ratings of overall body effort (B) and respiratory effort (C) during the 60-minute walk test before and after the six-week program of inspiratory muscle training for the experimental (EG) and placebo groups (PG).

DISCUSSION

The main objective of the present study was to evaluate the effects of six weeks of IMT with progressive inspiratory resistance in members of military special forces on respiratory muscle strength and endurance, heart rate response and the perception of exertion when walking with a heavy backpack. The results show that the experimental group increased inspiratory muscle strength (MIP) by 47% as a result of the training, while there was no effect on the expiratory muscle strength (MEP). In addition, a significant reduction in inspiratory and expiratory fatigue during the 60-minute walk test with a 25-kg backpack was found in the experimental group, but this was not reflected in the RPE or HR values during the test. In contrast, there was no significant improvement in any of the measured physiological parameters in the placebo group. Thus, our results fully confirm the findings of the meta-analysis on the effects of IMT in various types of athletes (Karsten, Ribeiro, Esquivel & Matte, 2018) and highlight the importance of the progressivity and specificity of breathing resistance for optimal training adaptation (McConnell, 2011).

A direct comparison with the results of the methodologically most similar study by Faghy and Brown (2016) confirms our initial assumption that progressive inspiratory resistance further enhances the effects of IMT. Indeed, Faghy and Brown (2016) achieved a 31% increase in MIP in the pretest and 19% in the posttest after six weeks of IMT in moderately physically fit healthy subjects, while our study achieved a 47% increase in MIP in the pretest and as much as 58% in the posttest in very physically fit subjects during the same training period. The training effect was substantially higher in our subjects despite their higher baseline level of physical fitness.

IMT also had a positive effect on the endurance of the respiratory muscles of the experimental group. The initial inspiratory and, interestingly, expiratory fatigue induced by the 60-minute walk test were reduced by 8 cmH_2O. However, these changes were too small to reduce the subjective ratings of whole-body exertion or respiratory effort. Considering that the weight of a backpack is critical to respiratory fatigue under given exercise conditions, the weight of the backpack in our study appears to have been too low to cause noticeable respiratory fatigue and impair physical performance. Indeed, Dominelli, Sheel and Foster (2012) have shown that a backpack weighing less than 35 kg has no effect on respiratory mechanics and thus on the demand for respiratory effort during short periods of walking. Consistent with this, Shei, Chapman, Gruber & Mickleborough (2017) reported that six weeks of flow-resistive IMT improved physical performance in recreational athletes but did not attenuate diaphragmatic fatigue during constant-load running to volitional exhaustion with a 10-kg backpack. Indeed, Faghy and Brown (2014a; 2014b) have shown that prolonged low-intensity physical activity with a backpack weighing less than 25 kg does not cause premature fatigue of the inspiratory respiratory muscles, although it does cause certain changes in the cardiovascular and metabolic responses and perceived physical exertion. They also highlight other factors that may mitigate premature inspiratory respiratory muscle fatigue, namely previous regular exercise, male gender, higher body mass, higher skeletal

muscle strength and higher aerobic capacity (Faghy & Brown, 2014a; Faghy & Brown, 2014b). All of these factors were present in our subjects, which most likely contributed to the low perceived respiratory muscle fatigue during the 60-minute walking test. Respiratory muscle fatigue due to the altered movement mechanics and excessive load on the chest when carrying a heavy backpack is clearly progressive (Butcher, et al., 2006; Faghy & Brown, 2014a; Faghy & Brown 2014b), so training-induced increases in respiratory muscle strength cannot completely prevent it. Wearing a backpack also requires a greater activity of the abdominal diaphragm to stabilize the thoracolumbar spine, which further accelerates diaphragm fatigue and worsens the mechanics and economy of breathing. It is therefore not surprising that IMT can also improve postural control when carrying loads and consequently reduce lower back pain (Janssens et al., 2015).

The main limitation of our study protocol was that it failed to produce detectable changes in the heart rate and ratings of perceived physical and respiratory exertion between the experimental and placebo groups. The most likely reason for this is that the intensity of the 60-minute walk test or the weight of the backpack was too low for the given population sample. To effectively stress the respiratory muscles, subjects must be exposed to a combination of prolonged moderate- to high-intensity physical activity while carrying a backpack weighing at least 25 kg. A two-stage testing protocol, such as that used by Faghy and Brown (2016), or a multi-stage protocol with progressive walking speeds and treadmill incline, such as that used by Armstrong, Ward, Lomax, Tipton, and House (2019), would most likely be more appropriate

The recommended intensity of IMT is between 50 and 70 per cent of the MIP, exercise duration is up to 30 breathing cycles and exercise frequency is twice daily, every day per week (McConnell, 2013). To optimize the training protocol for the needs of our study, we considered the basic principles of physical training: progressive overload and specificity. The progressivity of exercise overload is primarily achieved through incremental intensity (resistance), but increasing the time and frequency of exercise can have an additional effect. In our study, we only ensured the progressivity of the overload during the six-week training period by increasing intensity, i.e. by increasing the inspiratory resistance threshold on the respirator by 10% every two weeks. It could be that an additional modulation of the breathing exercise time, i.e. the number of breathing cycles, would further improve the training effect, especially the endurance of the inspiratory muscles. This should be tested in future studies. On the other hand, an additional increase in daily exercise frequency would not be feasible in our subjects, as performing IMT twice a day, seven days a week, was already at the upper limit of their busy daily schedule.

CONCLUSION

The aim of this study was to determine whether six weeks of IMT could increase the strength and endurance of the respiratory muscles, thereby delaying their fatigue when carrying a backpack during physical activity. The IMT protocol used in previ-

ous studies was improved on by progressively increasing the inspiratory resistance to ensure a more optimal overload of the respiratory muscles. Our results show that MIT significantly increases inspiratory strength and reduces muscle fatigue during a 60-minute walk with a 25-kg backpack. However, the positive changes in inspiratory pressure were not reflected in the perception of whole-body exertion and respiratory effort or in cardiovascular responses. Various groups of physically demanding occupations (e.g. military, firefighters, rescue workers, etc.), as well as people engaged in recreational activities that involve carrying heavy backpacks (hikers, alpinists, skiers, etc.), could benefit from MIT.

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BODY MASS INDEX CHANGES IN CHILDREN AND ADOLESCENTS WITH INTELECTUAL DISABILITY DURING THE COVID-19 PANDEMIC

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ABSTRACT

Introduction: *Intellectual disability (ID) is a generalized neurodevelopmental disorder characterized by significantly impaired intellectual and adaptive functioning. Body mass index (BMI) is a value derived from the mass (weight) and height of a person. Due to the COVID-19 pandemic, there was a lockdown of all schools and other daily sport activities.*

Methods: *We measured the height and weight of 100 children and adolescents with intellectual disabilities. The measurements were taken in September 2020 and then six months later, in March 2021. The calculated BMI was transformed into age- and sex-standardized values (zBMI). Mean BMI and zBMI were compared over time and between sexes using a paired t-test and two-way mixed analysis of variance (ANOVA). The effect size was estimated using Cohen's d.*

Results: *On average across all groups, BMI increased by 0.5kg/m^2 in the studied period. The increase in mean BMI was statistically significant for both groups of girls; the difference between girls and boys in BMI increase was marginally statistically significant. The analysis of zBMI confirmed that the observed changes were likely not simply a consequence of maturation.*

Discussion: *One effect of the COVID-19 pandemic and restrictions related to it was the increase in BMI values in children and youth. With our results, we can relate this data also to the population with ID. Although we have provided intervention programs and encouraged pupils and their parents to be more physically active during lockdown,*

the importance of school and after-school activities regarding physical fitness status is clearly evident.

Keywords: *body mass index, youth with intellectual disability, COVID-19 pandemic*

INDEKS TELESNE MASE PRI OTROCIH IN MLADOSTNIKIH Z MOTNJO V DUŠEVNEM RAZVOJU MED EPIDEMIJO COVIDA-19

IZVLEČEK

Uvod: *Motnja v duševnem razvoju je motnja, za katero je značilna pomembna omejitev tako intelektualnega delovanja kot prilagojenega vedenja, ki se kaže v pojmovnih, socialnih in praktičnih spretnostih prilagajanja. Indeks telesne mase (ITM) je antropološka mera, ki je definirana kot telesna masa v kilogramih, deljena s kvadratom telesne višine v metrih. V času pandemije COVID-19 je bilo uvedeno popolno zaprtje šol in ostalih dnevnih prostočasnih aktivnosti.*

Metode: *Septembra 2020 in ponovno marca 2021 smo izmerili maso in višino 100 mladostnikov z motnjo v duševnem razvoju,. Izračunane vrednosti ITM smo pretvorili v standardizirane (zITM) glede na starost in spol. Za primerjavo povprečja ITM in zITM med skupinami in skozi čas, smo uporabili test t in analizo variance, velikost učinka pa smo ocenili s Cohenovim d.*

Rezultati: *V povprečju se je ITM zvišal za 0,5 kg/m^2. Povečanje ITM je bilo statistično značilno pri obeh skupinah deklet; razlika med deklicami in dečki v povečanju povprečnega ITM je bila mejno statistično značilna. Analiza zITM je pokazala, da opažene spremembe po vsej verjetnosti niso bile zgolj posledica telesnega razvoja.*

Razprava: *Ena izmed posledic pandemije in restrikcij povezanih z njo, je tudi zvišanje ITM pri otrocih in mladostnikih. Z našimi rezultati lahko pokažemo, da se je ITM zvišal tudi pri osebah z motnjami v duševnem razvoju. Kljub interventnim programom med zaprtjem šol in spodbujanju učencev in staršev k večji aktivnosti, lahko vidimo kako pomembne so šolske in obšolske dejavnosti za razvoj in ohranjanje normalne telesne teže.*

Ključne besede: *indeks telesne mase, mladostniki z motnjo v duševnem razvoju, pandemija COVID-19*

INTRODUCTION

Intellectual disability affects about 1% of the population, and of those about 85% have mild intellectual disability (Schalock, Luckasson, & Tasse, 2021). Males are more likely to be diagnosed with intellectual disabilities than females. Intellectual disability is identified by problems in both intellectual and adaptive functioning (Schaepper, Hauser, & Kagadkar 2021). A full-scale IQ score of around 70 to 75 indicates a significant limitation in intellectual functioning. However, the IQ score must be interpreted in the context of the person's difficulties regarding general mental abilities. Three areas of adaptive functioning are considered: *Conceptual* – language, reading, writing, math, reasoning, knowledge, and memory; *Social* – empathy, social judgment, communication skills, the ability to follow rules and the ability to make and keep friendships; *Practical* – independence in areas such as personal care, job responsibilities, managing money, recreation, and organizing school and work tasks (Golubović, Maksimović, Golubović, & Glumbić, 2012). Adaptive functioning is assessed through standardized measures with the individual and interviews with others, such as family members, teachers, and caregivers. Intellectual disability is identified as mild (most people with intellectual disability are in this category), moderate or severe. The symptoms of intellectual disability begin during childhood; delays in language or motor skills may be seen by the age of two, but mild levels of intellectual disability may not be identified until school-going age. Intellectual disability can be associated with a genetic syndrome, such as Down syndrome or Fragile X syndrome; it may develop following an illness such as meningitis, whooping cough or measles; it may result from head trauma during childhood; or it may result from exposure to toxins such as lead or mercury. Other factors that may contribute to intellectual disability include brain malformation, maternal disease, environmental influences (alcohol, drugs, or other toxins), labor- and delivery-related events, infection during pregnancy, and problems at birth. Individuals with intellectual disabilities are at higher risk for health disparities including being overweight and obese; however, little is known at the population level about the BMI status of children and youth with intellectual disabilities (Lloyd, Foley, & Temple, 2014).

The *body mass index* (BMI) is defined as the body mass divided by the square of the body height (expressed in kg/m^2). It is a convenient rule-of-thumb to broadly categorize a person as underweight, normal weight, overweight, or obese based on tissue mass (muscle, fat, and bone) and height. Major adult BMI classifications are underweight (under $18.5kg/m^2$), normal weight (18.5 to 24.9), overweight (25 to 29.9), and obese (30 or more). When used to predict an individual's health, rather than as a statistical measurement for groups, the BMI has limitations that can make it less useful than some of the alternatives, especially when applied to individuals with abdominal obesity, short stature, or unusually high muscle mass (Temple, Foley, & Lloyd, 2014). People with BMIs under 20 and over 25 have been associated with higher all-cause mortality, with the risk increasing with distance from the 20–25 range. BMI is used differently for children. It is calculated in the same way as for adults but then compared to typical values for other children of the same age. Instead of comparison against fixed thresholds for

underweight and overweight, the BMI is compared against the percentiles for children of the same sex and age (Ptomey et al., 2020). A BMI that is less than the 5th percentile is considered underweight and above the 95th percentile is considered obese. Children with a BMI between the 85th and 95th percentile are considered overweight.

Obesity is a major health concern due to its increasing prevalence, particularly in people with intellectual disabilities. There has been a marked increase in the proportion of adults who were obese, from 13.2% in 1993 to 26.0% in 2013 for men, and from 16.4% to 23.8% for women (Health & Social Care Information Centre, March 2015). This is a cause of significant concern as obesity in turn increases the attributable risk for diabetes, cancer, and cardiovascular disease (Guh et al., 2009). Another cross-sectional study suggested a higher prevalence of obesity in people with intellectual disabilities when compared with the general population. The gender ratio showed that 39.3% of women and 27.8% of men with intellectual disability were obese compared to 25.1% of women and 22.7% of men in the general population (Melville et al., 2008).

The *coronavirus disease 2019 (COVID-19)* has an impact on physical activity (PA) behaviors worldwide. People around the world stayed at home and self-isolated, due to the lockdown policy. Although a lockdown is considered essential and the best recommendation for preventing the spread of the disease, it may create new challenges. Staying at home for a prolonged period can lead to disturbing consequences, such as weight gain, social isolation and may also cause a reduction in PA levels. The decrease in PA levels may be especially apparent among active individuals habitually practicing sports. Diminished PA resulting from home isolation may worsen a wide range of health conditions, including chronic ones, such as cardiac and metabolic diseases as well as infectious diseases, due to negative immune-modulation even without substantial weight gain. Therefore, maintaining an active lifestyle at home, including mainly PA, is extremely important for the general population's health, especially for people with additional risk factors, including older adults, during the quarantine (Dor-Haim, Katzburg, Revach, Levine, & Barak, 2021).

In relation to the facts outlined above, the aim of our observational study was to estimate the impact of COVID-19 and associated lockdown policy on the BMI of children and adolescents with intellectual disabilities in Slovenia.

METHODS

We measured the height and weight of 100 children and adolescents with moderate intellectual disability. They constituted a convenience sample of students of a special education center where the first author works. The sample consisted of 23 girls aged 6–14 years, 19 girls aged 15–26 years, 32 boys aged 6–14 years, and 28 boys aged 15–26 years.

The measurements were performed by the first author in September 2020 and then after six months, in March 2021, as part of regular physical education lessons. In the period between both measurements, the school was closed for 10 weeks due to the

COVID-19 pandemic. We calculated the BMI of all participants in both periods, and standardized the values based on age (in months) and sex, thus obtaining *z*BMI values according to WHO guidelines (World Health Organization, 2007). For the 17 participants aged 20 to 26 years, the standards for 19-year-olds were used (which are practically identical to those for adults).

The differences in mean BMI increase according to sex and age group were tested using a two-way analysis of variance (ANOVA). Mean BMI and *z*BMI were compared between the two measurements using a paired *t*-test within each group and the pooled sample. The effect size was estimated using Cohen's *d*. No a priori statistical power analysis or sample size estimation was performed.

The study was approved by the Committee for Ethical Issues in the Field of Sport of the Faculty of Sport, University of Ljubljana (no. 12/2022).

RESULTS

On average across all groups, BMI increased by 0.5 kg/m2 in the studied period. Descriptive statistics, results of paired *t*-tests and effect sizes for BMI and *z*BMI increase are reported in Table 1.

The increase in mean BMI was statistically significant for both groups of girls, marginally statistically significant for the younger boys and not statistically significant for older boys. ANOVA showed that the difference between girls and boys in BMI increase was marginally statistically significant (p=0.070 for the effect of gender); the effect of age group on mean BMI increase was not statistically significant (p=0.319), nor was there a statistically significant interaction (p=0.929). For the increase in *z*BMI, none of the effects was statistically significant (p=0.167 for gender, p=0.814 for age group, p=0.301 for interaction). These findings are illustrated in Figure 1.

Table 1: Descriptive statistics, results of paired t-tests, effect size estimates and estimates of relative BMI and zBMI increase in the studied period.

BMI		**September 2020**		**March 2021**				**relative change of mean**	**median relative change**
Group	**n**	**Mean**	**SD**	**Mean**	**SD**	**p (t-test)**	**d (95% CI)**		
Girls 6-14 y	21	20.4	6.2	21.3	7.1	0.007	0.65 (1.12, 0.17)	+4.4%	+3.4%
Girls 15-26 y	19	28.0	7.1	28.6	6.6	0.007	0.69 (1.19, 0.18)	+2.3%	+1.9%
Boys 6-14 y	32	20.6	5.1	21.0	4.8	0.056	0.35 (-0.01, 0.71)	+2.1%	+0.8%
Boys 15-26 y	28	23.7	5.2	23.9	4.9	0.415	0.16 (-0.22, 0.53)	+0.8%	+1.3%
zBMI		**September 2020**		**March 2021**				**relative change of mean**	**median relative change**
Group	**n**	**Mean**	**SD**	**Mean**	**SD**	**p (t-test)**	**d (95% CI)**		
Girls 6-14 y	21	0.72	1.64	0.80	1.75	0.369	0.20 (-0.23, 0.63)	+10.3%	+10,4%
Girls 15-26 y	19	1.46	1.54	1.62	1.37	0.006	0.71 (0.20, 1.21)	+11.2%	+11,0%
Boys 6-14 y	32	1.25	1.94	1.30	1.83	0.498	0.12 (-0.23, 0.47)	+4.0%	-8,5%
Boys 15-26 y	28	0.52	1.35	0.52	1.35	0.915	-0.02 (-0.39, 0.35)	-1.1%	+2,2%

Notes: *n* – sample size; SD – standard deviation; CI – confidence interval

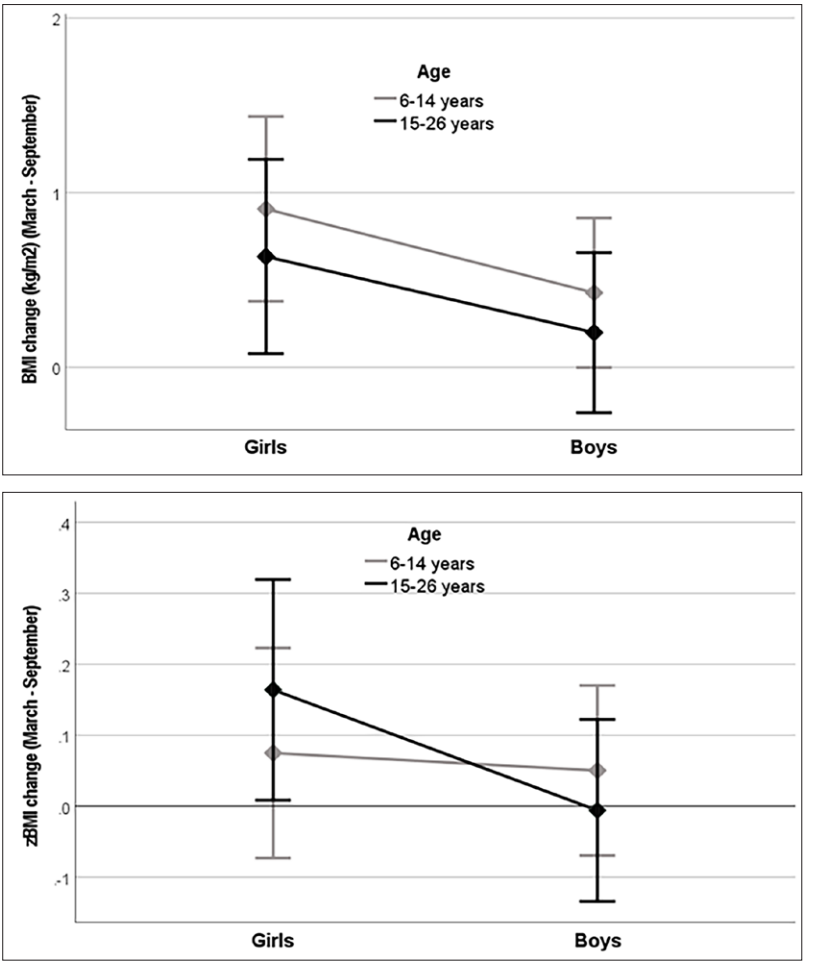

Figure 1: Mean BMI (top panel) and zBMI (bottom panel) change (with a 95% confidence interval, CI) from September to March according to sex and age group.

Because the groups did not differ statistically significantly in mean *z*BMI change, we analyzed the mean *z*BMI change between the two time points for the pooled sample. It was marginally statistically significant (p=0.075). Hence, the confidence interval for the estimated effect size contained zero, but very close to the lower limit (d=0.18, 95% CI -0.02 to 0.38), and the distribution of within-participant changes contained both positive and negative values, with the majority being positive (Figure 2). Overall, the mean within-participant increase in zBMI was 0.06.

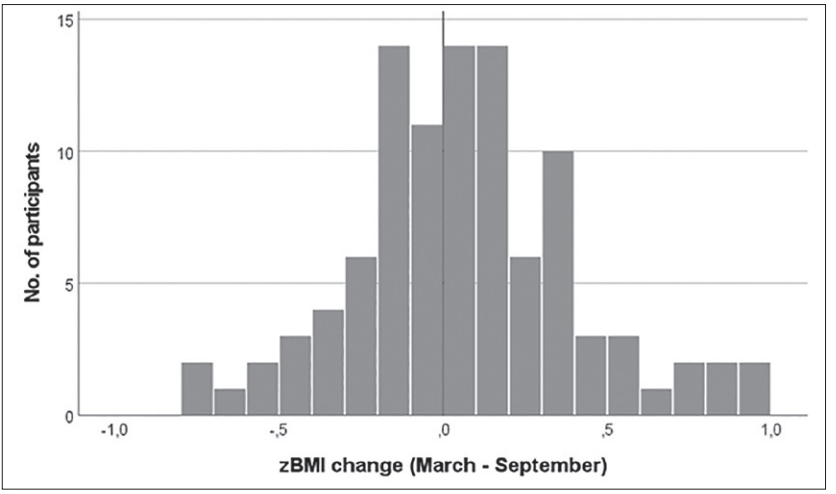

Figure 2: Mean BMI (top panel) and zBMI (bottom panel) change (with a 95% confidence interval, CI) from September to March according to sex and age group.

DISCUSSION AND CONCLUSION

Our data show that during the studied period, which included a 10-week lockdown, BMI in pupils with intellectual disabilities tended to increase on average more than what would be expected due to maturation alone. As expected, the average BMI of the pupils was higher than in their counterparts in the general population in the beginning (the starting mean *z*BMI values were positive), but this was more pronounced at the end of the studied period. In general, the effect seemed to be somewhat larger in girls than boys (and likely absent among the oldest boys).

Although we had online sports classes, supported and encouraged families to lead an active lifestyle and pupils returned to school much earlier than the majority population, there was still an increase in BMI in six months in all four groups. We assume that not only the school lockdown but also the general lockdown had an impact on increased BMI. There were a lot fewer possibilities for indoor and outdoor activities and there were no after-school activities, such as the Special Olympics program and training sessions, in which the population with intellectual disabilities is highly engaged (Lloyd, Temple, & Foley, 2012).

Studies related to the Slovenian SLOfit program suggest that the general fitness of the majority population dropped by 17% on average in almost all measurements of the SLOfit program. Part of those are also height and weight, and the BMI has increased in children and youth during the pandemic limitations on schools, sports programs and other social-life activities (Recek, 2020). Studies show that the intervention programs

provided during lockdown were excellent; we had online classes, professional recommendations, TV and online classes, etc., to encourage pupils to be as active as possible and maintain their physical fitness. Although all the programs were successful in terms of time spent outside and being active, there was a lack of moderate-to-vigorous physical activity (MVPA). Studies suggest that most of the MVPA is performed in the school environment (Morrison, Meh, Sember, Starc, & Jurak, 2021). BMI status is a significant indicator of health, and these findings suggest that being overweight and obesity are significant health concerns for children and youth with intellectual disabilities. It is critical that health professionals increase health promotion efforts, including physical activity and healthy eating behaviors for children and youth with intellectual disabilities. We assume that the lockdown resulted in a reduction in physical activity below the minimum recommendations of health organizations, which is in line with other studies that showed a decline in physical activity levels during closure times (Chen et al., 2020, Balanzá-Martinez, Atienza-Carbonell, Kapczinski, & De Boni, 2020). The study suggests that pandemics such as the current pandemic pose unique health issues caused by the requirements to stay at home, leading to a reduction in physical activity, among all people and especially among physically active individuals habitually practicing sports (Ravalli, & Musumeci 2020).

Although a lockdown may be required to mitigate a pandemic, it also generates new health challenges. Staying at home for a prolonged period of time may increase sedentary habits and decrease physical activity levels that may lead to disturbing consequences such as an increased risk of worsening health conditions (including chronic ones), weight gain, insufficient sunlight exposure, social isolation, and poor metabolic health. A US study found that the COVID-19 pandemic period was associated with an excess increase in BMI of 0.24kg/m^2 per year more than in the previous pre-pandemic period, even when controlling for socioeconomic status, race and ethnicity, baseline BMI category, and type of BMI ascertainment. Our findings validate the predictions of many scholars that weight increases among children because of the cumulative effects of anticipated decreases in physical activity and increases in sedentary behavior, screen time, and high-calorie diets among children during the pandemic (Knapp et al, 2022). Altogether, sedentary behavior and low levels of physical activity can have adverse effects on a person's overall well-being and quality of life (Laron, & Goldwag, 2020). Several authors followed children and youth and their development during the pandemic; most of the findings report an increased BMI (Woolford et al., 2021). After such devastating results of so many studies, the health program and school prevention programs should increase the level of physical activity, promote a healthy and active life style and try to rebalance the current situation of increased BMI of youth after all the restrictions. We must not forget to also include pupils with intellectual disabilities, as they are even more affected by staying at home with even less social life and opportunities to be active and lead a healthy lifestyle.

The main limitation of our study is that we do not have strictly comparable data on how the 10-week lockdown affected the majority population in this age group. In addition, we only measured height, weight, and BMI, but we did not compare other

potentially relevant indicators such as skinfold or general fitness level of the target population.

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FAT MASS TO FAT-FREE MASS RATIO AND BODY COMPOSITION IN PARTICIPANTS WITH CHRONIC LEG PROBLEMS

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ABSTRACT

Background & aim: *Low fat-free mass (FFM) or high fat mass (FM) in older adults are abnormal body composition phenotypes associated with morbidity. The dual burden of excessive FM and low FFM may lead to a higher risk of cardiovascular and other diseases and disability and lower physical performance compared with individuals with normal body composition or low FFM or high FM alone. Both conditions lead to poorer health and can be identified by a high FM/FFM ratio. Because few studies have examined the effects of abnormal body composition using the FM/FFM ratio, the aim of this study is to determine the FM/FFM values by gender in patients with knee and hip pathologies and compare them with body composition parameters. This condition is important when surgery is required because abnormal body composition leads to an increase in infections and other postoperative complications.*

Methods: *A total of 93 participants aged 64.71 ± 7.71 years in women and 65.9 ± 9.9 years in men with a body mass index (BMI) ≥25 kg/m^2 were recruited from the Valdoltra Orthopaedic Hospital (Ankaran, Slovenia). The waist circumference (WC) and anthropometric data (BMI), as well as body composition data (FM, FFM, % of body water, estimated by bioelectrical impedance - BIA) were measured. In addition, the body composition phenotypes (FM/FFM ratio) were calculated.*

Results: *The FM/FFM index was higher in females. The female group with FM/FFM (0.68) and those with a higher FM/FFM (0.92) correlated positively with WC. Male participants were excluded for further analysis because only two males had FM/FFM > 0.80. The FM/FFM of the remaining male participants was 0.53 ± 0.09.*

Conclusions: *FM/FFM provide information on patient body composition and identify individuals at risk of body composition abnormalities in women only.*

Keywords: *Fat-mass, fat-free mass, waist circumference, older adults, knee, hip.*

RAZMERJE MED MAŠČOBNO MASO IN PUSTO MIŠIČNO MASO TER SESTAVA TELESA PRI BOLNIKIH S KRONIČNIMI TEŽAVAMI SPODNJE OKONČINE

IZVLEČEK

Izhodišča: *Zmanjšan delež puste mišične mase (FFM) ali povečan delež maščevja (FM) vodi pri starejših odraslih do sprememb v telesni sestavi, ki odstopajo od mejnih vrednosti, kar je povezano z obolevnostjo. Sočasna prisotnost povečane FM in zmanjšane FFM lahko v primerjavi s posamezniki z normalno telesno sestavo ali samo z nizko FFM ali visoko FM poveča tveganje za razvoj srčno-žilnih in drugih bolezni, invalidnost in nižjo telesno zmogljivost. Oba dejavnika poslabšata zdravstveno stanje posameznika, ki ga lahko identificiramo s pomočjo povečanega razmerja FM/FFM. Zato je namen te raziskave določiti vrednosti FM/FFM pri preiskovancih s patologijo kolena in kolka ter jih primerjati s parametri telesne sestave. Poznavanje vrednosti FM/FFM je ključnega pomena v primerih, ko je potreben operativni poseg, saj telesna sestava, ki odstopa od mejnih vrednosti vodi do večjega tveganja za razvoj pooperativnih zapletov.*

Metode: *V raziskavo je bilo vključenih 93 preiskovancev iz Ortopedske bolnišnice Valdoltra (Ankaran, Slovenija), starih 64,71 ± 7,71 let (ženske) in 65,9 ± 9,9 let (moški) z indeksom telesne mase (ITM) ≥25 kg/m^2, napotenih na ortopedsko specialistično obravnavo. Izmerjeni so bili antropometrija (ITM), obseg pasu (WC) ter telesna sestava (FM, FFM, % telesne vode, ocenjeni z bioeletrično impedančno analizo-BIA). S pomočjo indeksa FM/FFM so bili določeni fenotipi telesne sestave.*

Rezultati: *Indeks FM/FFM je bil višji pri ženskah. Tako skupina žensk s FM/FFM (0,68), kot skupina z višjim FM/FFM (0,92) sta pozitivno korelirali z obsegom pasu. Ker sta imela samo dva moška FM/FFM >0,80 smo moške preiskovance iz nadaljnje analize izključili. FM/FFM preostalih moških preiskovancev je znašal 0,53 ± 0,09.*

Zaključek: *Razmerje FM/FFM nam poda pomembno informacijo o značilnostih pacientove telesne sestave ter pomaga identificirati bolnike, pri katerih obstaja tveganje za spremenjeno telesno sestavo. V naši študiji smo s pomočjo indeksa ugotovili, pomembne značilnosti v spremembi telesne sestave pri preiskovankah ženskega spola.*

Ključne besede: *maščobna masa, pusta mišična masa, obseg pasu, starejši odrasli, koleno, kolk.*

INTRODUCTION

The ageing of the population and the rise in obesity prevalence worldwide are the two major risk factors for non-communicable diseases, including degenerative diseases, sarcopenia, frailty, increased morbidity and mortality, with negative implications for the public health system (Merchant et al., 2021). Elevated body mass index (BMI), waist circumference (WC), and/or waist-to-hip ratio are commonly used to define obesity. BMI needs to be interpreted with caution in older adults as loss of physiological body height may lead to over-interpretation and lack of correlation with the percentage of body fat, the distribution of fat, or body composition (Batsis et al., 2016). Additionally, BMI has a limited ability to distinguish between muscle mass and fat accumulation and does not provide information on body composition (Prado et al., 2012). Therefore, a better understanding of body composition may require more specific measurements, such as fat mass (FM) and fat free mass (FFM), which can be obtained by bioelectrical impedance analysis (BIA) (Prado et al., 2012). The fat mass to fat-free mass ratio (FM/FFM) is an integrated metabolic index for assessing body composition, which evaluates the combined effect of the ratio between FM and FFM (Godziuk, Woodhouse, Prado, & Forhan, 2020; Rugila et al., 2022) In other words, FM/FFM indicates whether the amount of FM is adequate for the amount of FFM in an individual. Theoretically, higher values of the ratio indicate a less favorable balance between FM and FFM, and a high FM/FFM ratio already has negative effects on physical abilities and contributes to morbidity and mortality in many patients (Prado et al., 2012). Despite these clinical associations previously found with FM/FFM in chronic disease, this ratio has not been studied in patients with chronic knee or hip pain. The clinical impact of higher versus lower FM/FFM in these patients requires increased attention due to the accelerated loss of FFM associated with pain, mobility limitations and obesity-related inflammation (Godziuk et al., 2020). In addition, a loss of muscle mass is associated with prolonged hospital stays, infections, and other complications and disability (Prado et al., 2012). Thus, the aim of this study is to determine the FM/FFM values and compare the body composition of patients with higher and lower FM/FFM values by gender. Screening of this ratio may be important in order to identify patients with abnormal body composition, especially if surgery is indicated, to avoid complications after surgery. Our hypothesis is that higher FM/FFM values in these individuals are associated with abnormalities in body composition.

METHODS

Study Design

In this cross-sectional study, 93 participants (Caucasian origin), women with a mean age of 64.71 ± 7.71 years and men with a mean age of 65.90 ± 9.90 years with knee and hip problems, referred to an orthopedist for further diagnosis, were recruited at the Valdoltra Orthopaedic Hospital (Ankaran, Slovenia), excluding participants with cancer and acute illness, patients with pacemakers, and patients with a BMI ≤ 25 kg/m^2. Participants were examined in 2019 in the departments of the mentioned institution and underwent anthropometric measurement and body composition analysis.

The National Medical Ethics Committee of Slovenia (code 0120-557/2017/4) approved the study. All the participants were fully informed about the procedures before written informed consent was obtained.

Anthropometric Data

At the study site, body height, body mass and WC were measured according to a standardized protocol. All the measurements were taken between 7 and 8 am after fasting overnight. The body height (cm) of the subjects was measured to the nearest 0.1 cm while standing, without shoes, using a Leicester Height Measure (Invicta Plastics Limited, Oadby, England). The body mass (kg) of the participants wearing light clothing without shoes was measured with an accuracy of 0.1 kg. The WC (cm) was measured in the standing position halfway between the costal arch and the iliac crest with a non-stretchable tape measure. The BMI (kg/m$^{2)}$ was calculated using the formula body mass (kg) / body height (m^2).

Body Composition Measurements

FM (kg) and FFM (kg) were estimated by bioelectrical impedance analysis (BIA) using the Tanita BC 418MA (Tanita Corporation, Arlington Heights, IL) and the data was analyzed with the software provided by the manufacturer. The FM to FFM ratio (FM/FFM) was calculated as an index of obesity combined with sarcopenia and the following cut-off values were used (Biolo et al., 2015; Prado et al., 2012): FM/FFM ratio < 0.40 for metabolically healthy obese individuals in whom the increase in FM was minor compared to that in FFM; FM/FFM ratios between 0.40 and 0.80 for obese phenotypes in whom FM predominated FFM, but FFM is still adequately maintained; FM/FFM ratios > 0.80 for obese phenotypes with sarcopenia in whom FM was increased and FFM was reduced.

Statistics

Statistical analyses were performed using IBM SPSS ver. 26. Univariate data analysis was performed by calculating the frequencies and percentages for qualitative variables, mean and/or median, standard deviation (SD) were calculated for quantitative variables. To assess the normality of the distribution, Kolmogorov-Smironov and Shaphiro-Wilk tests were performed. Normality was additionally assessed by evaluating the histogram, skewness, and kurtosis.

The independent sample t-test was used to determine the statistically significant differences between the two groups because the variables in both groups followed the normal distribution. The Pearson's correlation coefficient was calculated to determine the association between normally distributed variables.

RESULTS

The participant characteristics are shown in Table 1. The female and male participants were comparable in age and BMI. Male participants had higher body mass, % body water, FFM and WC whereas FM and the FM/FFM ratio were higher in females. We excluded male participants from further analysis because only two men had FM/FFM > 0.80 (1.0 ± 0.13); the FM/FFM of the remaining male participants was 0.53 ± 0.09.

Table 1. General characteristics of the participants

Parameters	Men n=37 (45.8%)	Women n = 56 (54.2%)
Age [years]	64.71 ± 7.71	65.90 ± 9.90
Anthropometric measurements		
Body mass [kg]	93.2 ± 16.0	78.9 ± 12.9
Body height [cm]	172 ± 7	160 ±7
WC [cm]	109 ± 14	101 ± 11
BMI [kg/m²]	31.4 ± 4.8	30.8 ± 5.0
Body composition measurements		
FFM [kg]	59.7 ± 7.1	43.3 ± 4.6
Body water [%]	48.7 ± 3.2	41.1 ± 2.9
FM [kg]	30.4 ± 10.6	43.3 ±4.6
FM/FFM	0.50 ± 0.16	0.75 ± 0.15

Legend: All the values are mean ±SD, BMI - body mass index, WC - waist circumference, FM - fat mass, FFM - fat free mass, FM/FFM ratio - ratio between fat mass and fat free mass

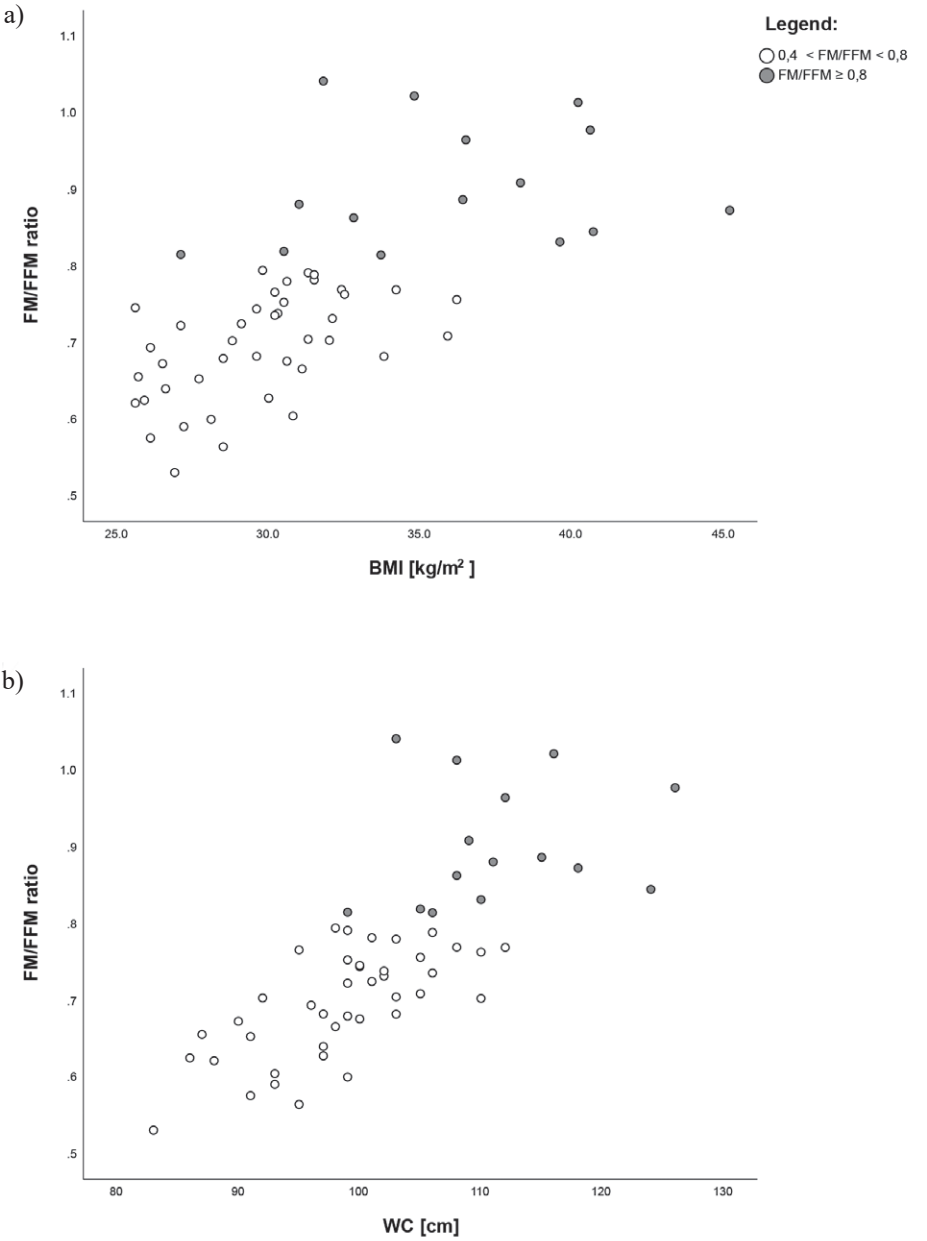
Therefore, we divided the females into two groups based on the cut-off values for the FM/FFM ratio: FM/FFM between 0.40 and 0.80 and FM/FFM ≥ 0.80 (Table 2).

Table 2. Body composition data in women with medium and higher FM/FFM (0.4 < FM/FFM < 0.8 and FM/FFM ≥ 0.8).

	FM/FFM			
	0.4 < FM/FFM < 0.8	FM/FFM ≥ 0.8	Independent sample t-test	
Parameters	(n=41)	(n=15)	(p)	Cohen d
Age [years]	66.62 ± 9.82	65.85 ± 9.55	.704	
Body mass [kg]	72.33 ± 8.11	91.31 ± 11.12	< .001	-2.112
Body height [cm]	159.05 ± 6.94	160.53 ± 7.58	.318	
WC [cm]	97.07 ± 7.93	110.18 ± 9.07	< .001	-1.581
BMI [kg/m²]	28.66 ± 3.32	35.56 ± 4.79	< .001	-1.837
Body water [%]	42.38 ± 2.18	38.13 ± 1.76	< .001	2.044
FM [%]	38.95 ± 3.34	46.28 ± 2.68	< .001	-2.304
FM [kg]	28.3 ± 4.9	42.4 ±7.0	< .001	-2.481
FFM [kg]	41.63 ± 3.61	46.31 ± 4.63	< .001	-1.200
FM/FFM ratio	.68 ± .09	.92 ± .11	< .001	-2.511

Legend: All values are mean ± SD, BMI - body mass index, WC - waist circumference, FM - fat mass, FFM - fat free mass, FM/FFM ratio - ratio between fat mass and fat free mass

Forty-one of the women were classified in the obesity phenotype group: FM/FFM ratio (0.68 ± 0.09), while fifteen women had an obesity phenotype combined with a low FFM: FM/FFM ratio (0.92 ± 0.11). In addition, women with a higher FM/FFM ratio (≥ 0.8) exhibited significantly greater body mass, BMI, WC, FFM and FM and a significantly lower % of body water when compared to the group with a lower FM/FFM. Pearson's correlation analysis revealed a significant, positive correlation in both groups between FM/FFM and BMI (overall: $r = 0.742$, $p < 0.01$; for $0.4 < FM/FFM < 0.8$: $r = 0.659$, $p < 0.01$; for $FM/FFM \geq 0.8$: $r = 0.676$, $p < 0.01$, Figure 1a) and WC (overall: $r = 0.768$, $p < 0.01$; for $0.4 < FM/FFM < 0.8$: $r = 0.741$, $p < 0.01$; $FM/FFM \geq 0.8$: $r = 0.542$, $p < 0.01$, Figure 1b). In addition, a significant, negative correlation was identified between FM/FFM and % of body water (overall: $r = -0.907$, $p < 0.01$; for $0.4 < FM/FFM < 0.8$: $r = -0.869$, $p < 0.01$; for $FM/FFM \geq 0.8$: $r = -0.874$, $p < 0.01$, Figure 1c).



Figures 1a, 1b: Scatter diagrams of the FM/FFM ratio and BMI (a) and WC (b).

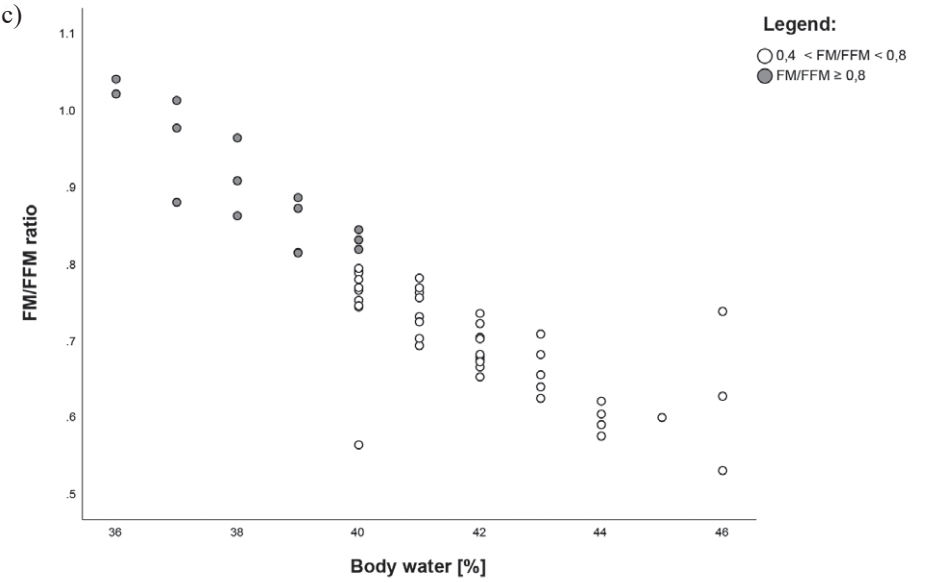


Figure 1c: Scatter diagrams of the % of body water.

DISCUSSION

In this cross-sectional study, the majority of the participants with hip or knee joint problems and associated leg pain were obese with normal FFM, while obesity associated with lower FFM was only found in women. A higher FM/FFM (> 0.8) is significantly associated with worse body composition parameters (body mass, BMI, WC, FM, FFM) in female patients.

The ageing process in the increasing population of older adults is associated with an increase in chronic health conditions and a high prevalence of functional limitations and disabilities associated with a decrease in muscle mass and strength (Delmonico & Beck, 2017). In addition, obese adults have greater skeletal muscle mass than normal body mass adults of the same age and sex, as we confirmed in this study. These differences are the result of muscle anabolism induced by the loading effect of the higher body mass in obesity (Biolo et al., 2015; Morse & Soeldner, 1964).

In our study, the FM/FFM ratio in both female groups correlated strongly and positively with WC. The WC is a surrogate marker for assessing the risk of visceral/abdominal fat accumulation (Ma et al., 2021). The association between abdominal fat and muscle mass loss is explained by several mechanisms. Abdominal obesity is characterized by systemic inflammation, oxidative stress and insulin resistance, which affect muscle proteolysis and inhibit protein synthesis (Biolo et al., 2015). Adipose tissue is actively involved in metabolic regulation and secretes pro-inflammatory cytokines such

as interleukin-6 (IL -6) and tumor necrosis factor-α (TNF-α), as well as the hormone leptin. The pro-inflammatory cytokines have effects on the brain, liver, and pancreas, which control appetite, carbohydrate and fat metabolism, and energy balance (Dhawan & Sharma, 2020; Roubenoff, 2000). The increase in FM and the accompanying release of pro-inflammatory cytokines lead to insulin resistance, which reduces the normal anabolic effect of insulin on amino acid transport in muscle (Kim et al., 2000). In addition, there is evidence that leptin reduces growth hormone secretion, suppressing another important anabolic stimulus (Obradovic et al., 2021).

In addition, there are a number of explanations for the association between body fat, muscle mass and musculoskeletal pain, including the upregulation of pro-inflammatory cytokines released by adipose tissue (Younger, Kapphahn, Brennan, Sullivan & Stefanick, 2016). Inflammation triggered by pro-inflammatory cytokines is known to be associated with physical pain, particularly in women (Walsh et al., 2018). In addition, a higher FM/FFM is a determinant factor of physical inactivity (Rugila et al., 2022). According to the FM/FFM ratio, obese women in this study had predominantly more fat mass and less muscle mass. This could be a result of the different distribution of body fat between the sexes (Prado et al., 2012). Physical activity became more difficult in this condition and their habitual level decreased further. The FM/FFM ratio may help reinforce the notion that body composition is a more informative measure of risk for musculoskeletal pain and immobility (Walsh et al., 2018). Taken together, these findings support the hypothesis that a higher FM/FFM ratio (> 0.8) may associate obesity with an additional decrease of FFM due to immobility and inflammation. This could be important information for sarcopenia screening in participants scheduled for surgery to avoid complications.

This study should be considered in light of certain limitations. First, the study included a relatively small sample size. Second, there is a lack of additional measurements of inflammatory markers and muscle function, which would certainly be of interest. Finally, this study is cross-sectional.

CONCLUSIONS

A higher value of the FM/FFM ratio, studied for the first time in participants with chronic knee or hip pain, was significantly associated with abdominal obesity and is useful for identifying individuals at risk of body composition abnormalities. The clinical implications of an FM/FFM > 0.8 in these participants require increased attention, as accelerated loss of FFM and complications may occur if surgery is indicated.

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THE DECISION-MAKING STYLE STRUCTURE OF SLOVENIAN SPORTS MANAGERS

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ABSTRACT

Purpose: *Decisions that we make are always burdened with consequences, which are the inevitable result of our decision-making. The decision-making style (DMS) is the way in which managers acquire, process and use information in decision-making processes. The goals of the present research are to define the factor structure of DMS for a sample of Slovenian sports managers and to determine the characteristics of their DMS structure.*

Methods: *80 managers of Slovenian sports organizations filled in an anonymous internet survey. The DMS was measured with the use of the General Decision-Making Style Inventory (GDMS), which was translated into the Slovenian language. The GDMS questionnaire measures five different decision-making styles: rational, intuitive, dependent, avoidant and spontaneous. The factor analysis (FA) method was used to test the assumption about the structure of the DMS. The internal consistency was measured using Cronbach's alpha coefficient. The Pearson correlation coefficient was used to study the relationship between the DMS.*

Results: *After three successive implementations of FA, we developed an optimized DMS model with 20 items confirming that when making decisions, sports managers use a combination of all five DMS. Slovenian sports managers mostly use the rational and dependent DMS, indicating that they are mostly rational decision-makers. We also recognized the correlation between the rational and the dependent style, but since the structure of the DMS in our sample is dominated by the rational DMS, we could conclude that this is a dependent-rational DMS, where mangers seek advice, opinions and knowledge from colleagues when making decisions to increasing their rationality.*

Conclusions: *We can conclude that the recognized average structure of the DMS is functional and healthy; furthermore, Slovenian sports managers are on average rational decision-makers who, due to the specific organizational characteristics of sports organizations, look for confirmation and opinions on future decisions in the broader environment of the organizations' stakeholders.*

Keywords: *Slovenian sports managers, decision-making styles, structure.*

STRUKTURA STILOV ODLOČANJA SLOVENSKIH ŠPORTNIH MENEDŽERJEV

IZVLEČEK

Namen: *Odločitve, ki jih sprejemamo, so vedno obremenjene s posledicami, ki so neizogiben rezultat našega odločanja. Stil odločanja (DMS) je način, na katerega menedžerji pridobivajo, obdelujejo in uporabljajo informacije v procesih odločanja. Cilja te raziskave sta opredelitev faktorske strukture DMS na vzorcu slovenskih športnih menedžerjev in opredelitev značilnosti strukture njihovih stilov.*

Metode: *80 menedžerjev slovenskih športnih organizacij je izpolnilo anonimno spletno anketo. DMS je bil merjen z uporabo splošnega vprašalnika stilov odločanja (GDMS), ki je bil preveden v slovenski jezik. Vprašalnik GDMS meri pet različnih stilov odločanja: racionalnega, intuitivnega, odvisnega, izogibajočega in spontanega. Za preverjanje predpostavke o strukturi DMS je bila uporabljena metoda faktorske analize (FA). Notranja konsistentnost je bila preverjena s Cronbachovim koeficientom. Pearsonov korelacijski koeficient je bil uporabljen za proučevanje povezanosti med stili odločanja.*

Rezultati: *Po treh zaporednih izvedbah FA smo razvili optimiziran model stilov odločanja z 20 postavkami vprašalnika, ki potrjuje, da športni menedžerji pri odločanju uporabljajo kombinacijo vseh petih stilov odločanja. Večinoma uporabljajo racionalni in odvisni stil, kar kaže, da so večinoma racionalni odločevalci. Ugotovljena je bila tudi korelacija med racionalnim in odvisnim stilom, ker pa v strukturi našega vzorca prevladuje racionalni stil, bi lahko sklepali, da gre za odvisno-racionalni stil odločanja, v okviru katerega menedžerji pri sprejemanju odločitev iščejo nasvete, mnenja in znanje pri sodelavcih zaradi povečanja racionalnosti svojih odločitev.*

Zaključek: *Ugotovili smo, da je ugotovljena povprečna struktura stilov odločanja funkcionalna in zdrava. Slovenski športni menedžerji so v povprečju racionalni odločevalci, ki zaradi posebnih organizacijskih značilnosti športnih organizacij iščejo potrditev in mnenja o prihodnjih odločitvah v širšem okolju deležnikov organizacije.*

Ključne besede: *slovenski športni menedžerji, stili odločanja, struktura.*

INTRODUCTION

Decision-making is a process resulting in a decision (Tomić, 2007). "*Decisions are an essential part of our lives, both in the work environment and outside of it. Decisions are made by those who are responsible for choosing between two or more options,*" (Heller & Hindle, 2001). A decision, as a result of a decision-making process, can be defined as "*a judgment or choice between two or more options that develops from an infinite number of situations, from solving a problem to taking action in a certain direction,*" (Heller & Hindle, 2001). Bohanec (2012) writes that a decision is a conscious and irreversible sharing of resources with the aim of achieving the desired goals. The decisions we make are always burdened with consequences, which are inevitable results of our decision-making. Therefore, it is particularly important how we decide on matters (or problems).

The decisions we make define our past and significantly design our future. Decisions made by managers about a company define the company's past performance, its current market, economic and social position and its future place in the industry, national economy and global environment. The essence of the managerial function is the *coordination* of technically divided work and the implementation of the joint work tasks of the association with the help of others; i.e., *delegating* and solving problems that arise, or making *decisions*. Thus, we could define the *content* of management work as coordination and delegation (responsibilities, duties and powers), while the *method* of managerial work is decision-making (Kolar & Jurak, 2014). Because of this, managers are often called decision-makers (Daft, 2010). The results of their decisions are reflected in the growth, prosperity or collapse of the organizations they deal with (Daft, 2008). Simon (1960) wrote that decision-making and management are synonymous terms. The general idea of the decision maker is an individual who evaluates and chooses between possible decisions. When solving problems, decision-makers are faced with situations representing a gap between the desired (the goal of the decision) and the actual state (initial state); in order to bridge this gap, they perform intellectual (cognitive) activities, while the future steps that need to be taken are unknown (Klein & Methlie, 1992). Every decision refers to an object, and the reason for its adoption is a certain purpose, which manifests itself as an intended change of that object in favour of the one who makes the decision (Rozman & Kovač, 2012). A fundamental condition for ensuring the success and efficiency of n organization is that the managers at all levels of management make valid decisions.

Simon (1987) claims that it is highly unlikely to find two types of managers (at least not good managers) who can be classified as making decisions solely based on intuition or making decisions solely based on rational/analytical techniques. It is more likely that we will find a range of combinations or the related use of intuition and rational-analytical techniques in decision-making processes. Rowe, Boulgarides and McGrath (1984) point out that the *decision-making style* reflects the way a person uses information to make decisions. Avsec (2012) accordingly stated that, despite the fact that the nature of the problem and situational factors play an important role in decision-

-making, we can assume that, regardless of the decision-making problem, individuals differ in the frequency of use of individual decision-making styles. Remenova and Jankelova (2019) state that the decision-making style can be understood as the result of a cognitive process that leads to the choice of solutions from among several alternatives. The authors also note that managers generally use a combination of at least two decision-making styles, varying based on the characteristics and weight of the decision problem. Driver (1979) defined decision-making styles as learned patterns of response that people use when making decisions. The decision-making style is therefore the way managers acquire, process and use information in decision-making processes. This is a set of qualitative indicators that manifest themselves within the decision-making process in the form of a decision-making style and represent a typical method of enforcing decisions. Managers' decision-making styles significantly contribute to their individual performance and thus to the performance of organizations (Abdelsalam, Daeoud & ElKadi, 2013); therefore, as pointed out by Rowe and Boulgarides (1992), they need to be measured, because decision-making styles should form the backbone of effective decision-making. Knowledge of decision-making styles and their use in the management structure directly contributes to increasing the competitive advantage of organizations (Remenova & Jankelova, 2019) and can also represent one of the main sources of risk for the successful operation of organizations.

Several authors have worked on defining decision-making styles. It is typical of research in the field of decision-making styles that in addition to defining the styles, authors often build different models and constructs, including a varying number of decision-making styles, as well as different inventories for determining the dominant styles of individual subjects (Harren, 1979; Rowe & Mason, 1987; Hunt, Krzystofiak, Meindl, & Yousry, 1989; Scott & Bruce 1995; Nygren, 2000). Berisha, Pula and Krasniqi (2018), based on a review of a large number of studies, concluded that one of the most frequently used and validated questionnaires for discovering decision-making styles is the General Decision-Making Style Inventory (GDMS) developed by Scott and Bruce (1995). Scott and Bruce (1995) defined decision-making styles as a learned response or behavioural pattern of an individual who is faced with a decision-making situation. They claimed that it is not a personality trait, but rather a tendency to react in a specific way in a decision-making situation, whereby the characteristics of the situation itself can have a significant influence. The authors also stated that individual styles are not mutually exclusive and that individuals do not rely exclusively on one decision-making style. The results of their study showed that individuals use a combination of decision-making styles when making important decisions. Based on the questionnaire, which contained 37 items and was used on the initial sample of subjects (military officers), with the use of factor analysis, the authors discovered a structure based on five factors (decision-making styles) and then reduced the questionnaire to 25 items. In the subsequent steps of the analysis, the questionnaire was tested with the use of the factor analysis method (the principal axes method with varimax factor rotation) on the remaining three different samples. The results of the study showed that the structure of the decision-making styles consists of five styles and that the questionnaire can be used

regardless of the decision-making context or situation (Scott & Bruce, 1995). The five decision-making styles included in the GDMS inventory are defined as (Thunholm, 2004; Faletič & Avsec, 2013):

- *rational style:* characteristic of people who search for information in detail and comprehensively and logically evaluate all the alternatives. They mainly focus on logic, order and the systematic analysis of information;
- *intuitive style:* characteristic of those who pay a lot of attention to details in the information flow and, instead of systematically searching and processing information, mainly consider their feelings about whether a certain decision is correct or not;
- *dependent style*: characteristic of people who seek advice, support and confirmation from others before making an important decision;
- *spontaneous style:* characteristic of those who have a sense of urgency and thus a desire to complete the decision-making process as soon as possible and make a decision;
- *avoidant style;* characteristic of people who want to avoid making a decision whenever possible.

In various studies on samples from different countries, numerous authors (Loo, 2000; Thunholm, 2004; Spicer & Sadler-Smith, 2005; Gambetti, Fabbri, Bensi & Tonetti, 2008; Curşeu & Schruijer; 2012; Erenda, Meško & Bukovec; 2014; Bavoľár & Orosová, 2015; Alacreu-Crespo et al., 2019) have confirmed the validity (using factor analysis) and reliability (using Cronbach's alpha coefficient) of the GDMS inventory as suggested by Scott and Bruce (1995).

In the aforementioned preliminary research, the authors tested the validity of the five-factor structure of decision-making styles on samples of managers, various profiles of students, the general population, military officers and others. In the present study, we will determine the factor structure of decision-making styles using a sample of Slovenian sports managers. Sports managers usually work in the specific environment of non-profit sports organizations, which in terms of legal, structural and procedural characteristics, are significantly different to for-profit organizations (companies). One of the important characteristics of sports organizations is that they are interest-type associations, in which the interests of different stakeholders are in constant conflict (Tavčar & Trunk Širca, 2002). Participants in sports organizations are individuals (officials, coaches and athletes), groups (professional and other) and associations (societies and clubs), all with their own interests and with the possibility of significantly acting and influencing the operation of the organization. Furthermore, in non-profit sports organizations, it is necessary to deal with a large number of volunteers (Santos, Batista & Carvalho, 2022) and to generate and obtain financial resources from a large number of different sources (sponsorships, donations, national and local budgets, sales of products and services, etc.). Finally, a "unique" governmental-managerial process is established in non-profit sports organizations; they are led by a committee of elected volunteers (governmental organizational function) who form very sensitive relations with professional (management) staff (Young, 1998; Kolar & Jurak, 2014).

All of the aforementioned specifics of the structure and operation of non-profit sports organizations have a significant impact on the management and decision-making processes in these types of organizations and thus probably on the structure of the decision-making styles of the sports managers. The goals of the present research are to define the factor structure of decision-making styles using a sample of Slovenian sports managers and to determine the characteristics of their structure of decision-making styles. According to the described structural and operational differences in the functioning of non-profit sports organizations, we can define the hypothesis that in the structure of decision-making styles of the sample of managers in our research, the dependent decision-making style will be more emphasized than the intuitive and spontaneous style, which enables faster and quick decisions. We assume that sports managers have to coordinate decisions with much more diverse stakeholder interests than is typical for for-profit organizations (companies).

METHODS

Participants

The sample consisted of 80 managers of Slovenian sports organizations, which is more than the minimum requirement for executing the factor analysis (de Winter, Dodou & Wieringa, 2009, Andrew, Pedersen & McEvoy, 2010). The average age of the subjects was 47.5±10.6 years and the average work experience as a manager was 15.61±9.7 years. The upper age limit was 68 years, whereas the lower age limit was 28 years. The most experienced manager had 40 years and the least experienced 1 year of work experience. The sample consisted of 56 men (70%) and 24 women (30%). The sample is comparable to samples of sports managers by other authors (Barros & Lucas, 2001; Case & Branch, 2003; Retar, Plevnik & Kolar, 2013). The Slovenian Olympic Committee sent the managers of Slovenian sports organizations an invitation to participate in the study and to fill in an anonymous internet survey. The invitation was sent three times at one-month intervals. All the subjects participated in the study voluntarily and without any compensation.

Instrument

The decision-making style was measured with the use of the General Decision--Making Style Inventory – GDMS (Scott & Bruce, 1995), which was translated into the Slovenian language. The GDMS questionnaire measures five different decision--making styles: rational, intuitive, dependent, avoidant and spontaneous. The questionnaire consists of 25 items (5 for each decision-making style) ranging on a five-point Likert scale from strongly disagree (1) to strongly agree (5). The total score of all five decision-making styles was obtained by adding the item score of the decision-making

style and the score ranges from 5 to 25. GDMS scales have previously shown good psychometric characteristics (Scott & Bruce, 1995; Loo, 2000; Thunholm, 2004; Spicer & Sadler-Smith, 2005; Gambetti, et. al, 2008; Curşeu & Schruijer; 2012; Avsec, 2012; Erenda, et al.; 2014; Bavoľár & Orosová, 2015; Alacreu-Crespo, et. al, 2019). In this study, the alpha coefficients of the scales ranged between 0.572 (spontaneous) and 0.814 (avoidant). The Cronbach's alpha for the whole GDMS is 0.69, which is a good indicator of internal consistency. The Slovenian version of the GDSM inventory has already been used and validated in several research projects and using different samples in Slovenia (Avsec, 2012; Faletič & Avsec, 2013; Erenda, et al.; 2014); in the present study, general information questions about gender, age, experiences in management, level of education and field of education were added.

Statistical Analysis

Statistical data processing was carried out using the Statistical Package for the Social Sciences 29 (IBM SPSS Inc., Armonk, NY, USA). The factor analysis method – Principal Component Factoring (PCF) and varimax rotation of factors – was used to test the assumption about the structure of decision-making styles (Scott & Bruce, 1995). Factor extraction was carried out with the use of Kaiser-Guttman's criterion (Eigenvalue > 1). Before applying the factor analysis (FA), the data adequacy was tested with the Keiser--Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of sphericity. Values of the KMO test above 0.6 indicate that the analyzed data is suitable for the use of FA (Tabachnick & Fidell, 2007). Bartlett's test must show significant differences at a risk level of less than 5% ($p < 0.05$), showing that the correlation matrix is not uniform and that the observed variables are related to a certain extent. The internal consistency of the overall scale and subscales was measured using Cronbach's alpha coefficient. Pearson correlation coefficient was used to study the relationship between the GDMS' styles.

RESULTS

Table 1 shows descriptive statistics for five decision-making styles. The average values of the individual decision-making style use (Mean/Value) were calculated from the original model of items assigned to an individual decision-making style (Scott & Bruce, 1995). The average share of the individual decision-making style use (Mean/% of maximum) in relation to the maximum possible total value of the sum of items originally dedicated to the individual decision-making style (maximum = 25) was calculated for each decision-making style.

Table 1: Descriptive statistics and internal consistency of decision-making styles.

Variable	Possible rang	Actual range	Mean		Standard Deviation	Skewness	Kurtosis	Cronbach α
			Value	% of maximum				
DMS Rational	5–25	15–25	21.35	85.40%	2.081	-0.283	0.885	0.777
DMS Intuitive	5–25	7–21	15.30	61.20%	3.235	-0.537	0.024	0.667
DMS Dependent	5–25	10–23	17.53	70.10%	3.027	-0.211	-0.365	0.694
DMS Avoidant	5–25	5–18	9.21	36.85%	3.129	0.439	-0.508	0.814
DMS Spontaneous	5–25	6–20	12.80	51.20%	2.558	0.122	-0.044	0.572

Key: DMS Rational = rational style; DMS Intuitive = intuitive style; DMS Dependent = dependent style; DMS Avoidant = avoidant style; DMS Spontaneous = spontaneous style.

The structure of the decision-making styles (Table 1) revealed that Slovenian sports managers on average most often use the rational and dependent decision-making styles. These are followed by the intuitive and spontaneous decision-making styles whereas sports managers in Slovenia are least likely to use the avoidant decision-making style. Similar results on the structure of decision-making styles in different samples (middle managers, teachers, students, military officers and engineers) were also found by other authors (Scott & Bruce, 1995; Hariri, Monypenny & Prideaux, 2014; Ghazi & Hu, 2016; Berisha, et al., 2018; Krasniqi, Berisha & Pula, 2019). The internal consistency, calculated using Cronbach's alpha coefficient, was 0.686 for the overall scale and between 0.572 (DMS Spontaneous) and 0.814 (DSM Avoidant) for the five subscales. The reliability coefficient of the questionnaire items for the spontaneous style can be assessed as sufficient, while the other coefficients indicate moderate to robust internal consistency (Taber, 2018).

Before applying FA, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity (Table 2) were carried out to evaluate the factorability. The KMO measure of sampling adequacy was 0.689 (the required minimum is above 0.6) and the significance of Bartlett's test of sphericity was 0.000 ($p < 0.01$). The results of both tests show that the studied sample is suitable for performing FA.

Table 2: The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity.

KMO and Bartlett's Test				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0,689	**Bartlett's Test of Sphericity**	**Approx. Chi-Square**	824.326
			df	300
			Sig.	0.000

The structure of the decision-making styles of Slovenian sports managers was verified by FA using the method of principal components with varimax rotation (Table 3). The FA procedure based on Kaiser-Guttman's criterion extracted seven (7) factors, which cumulatively explain 66.65% of the total variance. Table 3 shows a scree plot diagram with the factor eigenvalue curve bend at the fifth factor, meaning that a five--factor solution corresponds to the basic GDMS model and could also be considered a valid result of the FA (Scott & Bruce, 1995; Spicer & Sadler-Smith, 2005). Thus, the rotated solution with five factors explains 54.57% of the total variance of the observed variables.

Table 4 shows the factor structure and factor loadings of the items included in the GDMS inventory, which were obtained by the orthogonal rotation of the factors using the varimax method. It can be observed that all the items measuring a rational decision--making style (DMSRAT1 to DMSRAT5) from the original model are related to the first factor (factor loadings from 0.637 to 0.725). The first factor explains 13.91% of the total variance of the rotated solution (Table 3) and can be named the "*rational style*". The second factor is associated with four items measuring the avoidant style (DMSAVO2, 3, 4 and 5) and one of the spontaneous decision-making style items (DMSSPO2). The projections of avoidant style items on the second factor are high (factor loadings from 0.663 to 0.876), while the projection of the DMSSPO2 on the same factor is very low (0.382). Therefore, the second factor can be named the "*avoidant style*", explaining 13.61% of the total space of the rotated solution (Table 3). The third factor (Table 4) is explained with three items measuring the intuitive decision-making style (DMSINT1, 2 and 5). Projections of items on this factor are very high for all three items (factor loadings from 0.797 to 0.871). The third factor explains 10.61% of the total variance of the rotated solution (Table 3) and can be named the "*intuitive style*". The fourth factor is explained with four dependent decision-making style variables (DMSDEP1, 2, 3 and 4) with relatively high projections on the factor (factor loadings from 0.636 to 0.788). The fourth factor explains 8.90% of the total variance (Table 3) and can be named the "*dependent style*". The fifth factor is explained with only two items, both belonging to the spontaneous decision-making style (DMSSPO1 and 3). Their projections on the factor are high (factor loadings 0.735 and 0.801). The fifth factor explains 7.54% of the total variance of the rotated solution (Table 3) and can be named the "*spontaneous style*". The sixth factor of the rotated solution is explained with four variables, which, in

Table 3: FA of the original GDMS inventory with 25 items.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.022	20.087	20.087	5.022	20.087	20.087	3.479	13.917	13.917
2	3.451	13.803	33.890	3.451	13.803	33.890	3.403	13.612	27.529
3	2.943	11.774	45.664	2.943	11.774	45.664	2.654	10.615	38.144
4	1.704	6.816	52.480	1.704	6.816	52.480	2.226	8.903	47.048
5	1.347	5.389	57.869	1.347	5.389	57.869	1.884	7.538	54.586
6	1.155	4.621	62.490	1.155	4.621	62.490	1.628	6.511	61.097
7	1.039	4.155	66.645	1.039	4.155	66.645	1.387	5.549	66.645
8	0.915	3.662	70.307						
9	0.860	3.441	73.748						
10	0.813	3.253	77.001						
11	0.700	2.799	79.800						
12	0.634	2.537	82.336						
13	0.620	2.481	84.817						
14	0.572	2.287	87.104						
15	0.471	1.886	88.990						
16	0.429	1.716	90.705						
17	0.398	1.594	92.299						
18	0.367	1.467	93.765						
19	0.329	1.318	95.083						
20	0.300	1.200	96.283						
21	0.267	1.068	97.351						
22	0.215	0.859	98.211						
23	0.171	0.683	98.894						
24	0.164	0.656	99.550						
25	0.112	0.450	100.000						

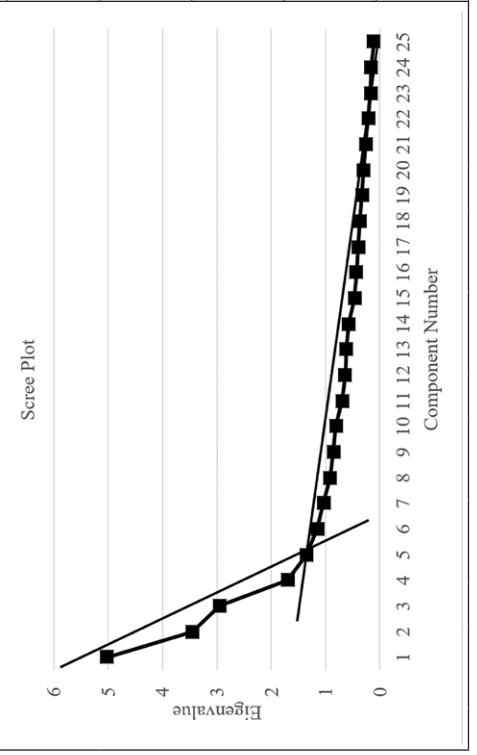

Table 4: Factor structure and factor loadings of the 25 items of the GDMS inventory.

Rotated Component Matrix[a]							
	Component						
	1	2	3	4	5	6	7
DMSRAT3	0.725						
DMSRAT5	0,716						
DMSRAT4	0.714						
DMSRAT1	0.670						
DMSRAT2	0.637						
DMSAVO3		0.876					
DMSAVO2		0.769					
DMSAVO5		0.760					
DMSAVO4		0.663					
DMSSPO2		0.382					
DMSINT2			0.871				
DMSINT5			0.821				
DMSINT1			0.797				
DMSDEP1				0.788			
DMSDEP4				0.679			
DMSDEP3				0.671			
DMSDEP2				0.636			
DMSSPO3					0.801		
DMSSPO1					0.735		
DMSDEP5						0.613	
DMSINT4						0.563	
DMSAVO1						0.479	
DMSSPO4						0.373	
DMSINT3							0.746
DMSSPO5							0.662

Notes: DMSRAT1-5 = rational style items 1 to 5; DMSINT1 – 5 = intuitive style items 1 to 5; DMSDEP1 – 5 = dependent style item 1 to 5; DMSAVO1-5 = avoidant style items 1 to 5; DMSSPO1 – 5 = spontaneous style items 1 to 5.

the original GDMS inventory model, are classified as different decision-making styles. With the exception of the rational style variables, all the other decision-making styles are related to this sixth factor. Projections of individual items in the sixth factor are lower than for the first five factors (factor loadings from 0.373 to 0.613). The sixth factor explains 6.51% of the total variance of the rotated solution (Table 3) and can be named the "*non-rational style*" or "*descriptive style*", as the variables associated with this factor measure all the decision-making styles from the original model with the exception of the rational style. Items explaining this decision-making style deviate from the rational or normative model of decision-making, assuming that the decision-maker is entirely rational and fully follows the decision-making process. Observing this aspect, these items primarily belong to the descriptive rather than rational decision-making styles (Bohanec, 2001). The seventh factor is explained with two variables belonging to the intuitive and spontaneous decision-making styles. The projection of both variables in the seventh factor is relatively high (DMSINT3 = 0.746 and DMSSPO = 0.662) with the factor explaining 5.55% of the total variance (Table 3). The association of these two variables in the same factor is not surprising, as different authors have found statistically significant correlations between the intuitive and spontaneous decision-making styles (Scott & Bruce, 1995; Thunholm, 2004; Spicer & Sadler-Smith, 2005; Wood, 2012; Verma, Rangnekar & Barua, 2012; Curşeu & Schruijer, 2012; Faletič & Avsec, 2013; Reyna, Ortiz & Revilla, 2014; Hariri, et al., 2014; Bavoľár & Orosová 2015; Berisha, et al., 2018; Geisler & Allwood, 2018). Based on this, it can be concluded that both styles have the same cognitive structure in the background, which could be named the intuitive-experiential cognitive style (Sagiv, Amit, Ein-Gar & Arieli, 2013; Alacreu-Crespo, et. al, 2019). As Thunholm (2004) states, the spontaneous decision-making style could also be named the high-speed intuitive style due to the urgency of the decision-making process. As a result, we have named the seventh factor the "*high-speed*" decision-making style. Since the scree plot diagram analysis revealed that it is possible to interpret the factor structure with only five factors (Table 3) and as the sixth and seventh factors are unclear, we further checked how the variables are projected within the five-factor structure of the decision-making styles of sports managers.

Table 5 shows the five-factor structure of the decision-making styles of Slovenian sports managers. The factor structure with a limited number of extracted factors (five) explains 57.87% of the total variance – 8.78% less than the full seven-factor model. This structure is also characterized by higher eigenvalues of all five extracted factors; also, a larger part of the total variance is explained than for the five factors within the seven-factor model (+ 3.30%). Eight items are projected onto the first factor, which explains 15.67% of the total variance. All the items measuring the avoidant decision-making style in the original GDMS inventory are related to this factor (factor loadings 0.489 and 0.832). Furthermore, two variables measuring the spontaneous decision-making style (DMSSPO4 = 0.541 and DMSSPO2 = 0.489) and a single variable measuring the dependent decision-making style (DMSDEP5 = 0.658) are also related to the first factor. In contrast, within the seven-factor solution, the variables DMSDEP5 and DMSSPO4 were connected to the sixth factor (non-rational style) and the variable

Table 5: Factor structure and factor loadings with a limited number of extracted factors.

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
DMSAVO5	0.832				
DMSAVO3	0.808				
DMSAVO2	0.752				
DMSDEP5	0.658				
DMSAVO1	0.619				
DMSSPO4	0.541				
DMSAVO4	0.495				
DMSSPO2	0.489				
DMSRAT3		0.742			
DMSRAT5		0.693			
DMSRAT4		0.678			
DMSRAT1		0.664			
DMSRAT2		0.659			
DMSINT2			0.858		
DMSINT1			0.817		
DMSINT5			0.788		
DMSINT4			0.566		
DMSDEP1				0.793	
DMSDEP2				0.627	
DMSDEP3				0.564	
DMSDEP4			0.503	0.556	
DMSSPO3					0.774
DMSSPO1					0.687
DMSINT3					0.686
DMSSPO5					0.435
Eigenvalues	3.918	3.436	2.762	2.335	2.017
% of Variance	15.672	13.744	11.048	9.339	8.066

DMSSPO2 was connected with the lowest projection to the second factor (avoidant style).

As the first factor includes all five variables measuring the avoidant style (DMSAVO1 - 5), as well as a variable from a seven-factor model structure with a projection on the avoidant style factor (Table 4) and two variables with a projection on the sixth factor (non-rational style), it can be named the "*avoidant style*". The second factor is explained with five items measuring the rational decision-making style (DMSRAT1 - 5). The projections of items on this factor are high for all five items (factor loadings from 0.659 to 0.742). The second factor explains 13.74% of the total variance and can be named the "*rational style*". The third factor is explained with four items measuring the intuitive decision-making style (DMSINT1, 2, 4 and 5). The projections of items on this factor are moderate to very high (factor loadings from 0.566 to 0.858). The third factor explains 11.05% of the total variance and can be named the "*intuitive style*". The fourth factor is, as in the seven-factor model, explained with four dependent decision--making style variables (DMSDEP1, 2, 3 and 4). Projections of items on this factor are moderate to high (factor loadings from 0.556 to 0.793); the fourth factor explains 9.34% of the total variance and can be named the "*dependent style*". The fifth factor is a combination of the fifth (spontaneous style) and seventh (high-speed style) factors from the seven-factor model structure. This factor is explained with three variables measuring the spontaneous decision-making style in the original model (DMSSPO1, 3 and 5) and a variable measuring intuitive style (DMSINT3), together explaining 8.07% of the total variance of the studied space. With the exception of the variable DMSSPO5, which has a slightly lower projection on the fifth factor (0.435), other variables have high projections (factor loadings from 0.686 to 0.774). The fifth factor is named the "*spontaneous style*".

In this way, the developed five-factor decision-making styles structure model forms individual factors or decision-making styles more clearly and, at the same time, establishes the same structure as the original GDMS inventory (Scott & Bruce, 1995), which was confirmed by other authors (Loo, 2000; Thunholm, 2004; Spicer & Sadler-Smith, 2005; Gambetti, et al., 2008; Curşeu & Schruijer; 2012; Avsec, 2012; Erenda, Meško & Bukovec; 2014; Bavoľár & Orosová, 2015; Alacreu-Crespo, et. al, 2019). Regardless of the increased clarity of the five-factor structure model, some variables are nevertheless distributed outside the predicted decision-making styles. Some other authors have also faced a similar problem with different samples; they named the variables that were not distributed among the factors in accordance with the intended model as "problematic items". One such item, which in the resulting five-factor structure (Table 5), was not projected onto the factors in accordance with the original model, is DMSDEP5 (*I like to have someone to steer me in the right direction when I am faced with important decisions*) (Baiocco, Laghi, D´alesio, Gurrieri & Di Chiacchio, 2007; Fischer, Soyez & Gurtner, 2015; del Campo, Pauser, Steiner & Vetschera, 2016). This particular item did not project onto a dependent style factor in either seven-factor or five-factor structure models. Two further variables were also not projected onto a spontaneous style factor in either of the two models; namely, DMSSPO4 (*I often make impulsive decisions*)

and DMSSPO2 (*I often make decisions on the spur of the moment*) (Fischer, et al., 2015). In the continuation of the present study, we designed the "*optimized structure model*" by removing the mentioned variables from the structure of the decision-making styles of Slovenian sports managers. In order to balance the number of items for each decision-making style (four items per style), we also removed the variables that, in the five-factor structure model (Table 5), had the smallest projections on the avoidant style factor (DMSAVO4 - *I generally make important decisions at the last minute*) and the rational style factor (DMSRAT2 - *I make decisions in a logical and systematic way*). Both of these variables have also been characterized as problematic by other authors (Baiocco, et. al, 2007; Fischer, et al., 2015). Based on previous projections of the variable DMSINT3 *(I generally make decisions that feel right to me*) onto the high-speed (Table 4) and spontaneous (Table 5) styles, we assumed that in the continuation of the research, this variable would also have a high projection on the spontaneous decision--making style.

Table 6: Descriptive statistics and internal consistency of the optimized structure model of decision-making styles.

Variable	Possible rang	Actual range	Mean		Standard Deviation	Skewness	Kurtosis	Cronbach α
			Value	% of maximum				
DMS Rational	5–20	12–20	17.03	85.13%	1.736	-0.203	0.630	0.740
DMS Intuitive	5–20	4–18	12.43	62.13%	2.997	-0.591	0.258	0.775
DMS Dependent	5–20	9–20	15.28	76.38%	2.648	-0.087	-0.520	0.705
DMS Avoidant	5–20	4–14	7.18	35.88%	2.540	0.403	-0.706	0.814
DMS Spontaneous	5–20	5–17	12.56	62.81%	2.609	-0.575	0.051	0.609

Table 6 reveals no changes in the order of the average use of individual decision--making styles, between the optimized structural model of the decision-making styles of Slovenian sports managers (20 items; 4 items per decision-making style) and the original GDMS inventory model (25 items, 5 items per decision-making style). The internal consistency, calculated using Cronbach's alpha coefficient, was 0.637 for

the overall scale and between 0.609 (DMS Spontaneous) and 0.814 (DSM Avoidant) for the five subscales. The reliability coefficients for the intuitive (DMS Intuitive α = 0.775), dependent (DMS Dependent α = 0.705) and spontaneous (DMS Spontaneous α = 0.609) subscales were higher in comparison to the original model, whilst the reliability coefficient was slightly lower for the rational style subscale (DMS Rational α = 0.740) and equal for the avoidant decision-making style subscale. The KMO measure of sampling adequacy was 0.646 (the required minimum is above 0.6) and the significance of Bartlett's test of sphericity was 0.000 ($p < 0.01$) (Table 7). The results of both tests show that the studied sample is suitable for performing FA.

Table 7: The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity for the optimized model.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.646
Bartlett's Test of Sphericity	**Approx. Chi-Square**	592.612
	df	190
	Sig.	0.000

The optimized structure with 20 items of the decision-making styles of Slovenian sports managers was verified by FA using the method of principal components with varimax rotation (Table 8). The FA procedure, based on Kaiser-Guttman's criterion, extracted five (5) factors that cumulatively explained 61.60% of the total variance, which is 3.73% more than in the five-factor structure of the original GDMS Inventory with 25 items (Table 5).

Table 9 shows the factor structure and factor loadings of the 20 items included in the optimized model inventory, obtained by the orthogonal rotation of the factors using the varimax method. Four avoidant style variables (DMSAVO1, 2, 3 and 5) are associated with the first factor (factor loadings from 0.618 to 0.859), together explaining 14.39% of the total variance (Table 8). This first factor can be named the "*avoidant style*". The second factor is explained with four items measuring the intuitive decision-making style (DMSINT1, 2, 4 and 5). The projections of items on this factor are very high for three items (factor loadings from 0.803 to 0.856) and moderate for DMSINT4 (0.569). The second factor explains 13.45% of the total variance and can be named the "*intuitive style*". The third factor is explained with four items measuring the rational decision-making style (DMSRAT1, 3, 4 and 5). The projections of items on this factor are high for all four items (factor loadings from 0.661 to 0.754). The third factor explains 13.29% of the total variance and can be named the "*rational style*". Four variables measuring

Table 8: FA of the optimized structure model inventory with 20 items.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.547	17.735	17.735	3.547	17.735	17.735	2.878	14.388	14.388
2	3.129	15.646	33.380	3.129	15.646	33.380	2.689	13.446	27.834
3	2.785	13.925	47.305	2.785	13.925	47.305	2.658	13.288	41.121
4	1.577	7.887	55.192	1.577	7.887	55.192	2.188	10.942	52.063
5	1.282	6.408	61.600	1.282	6.408	61.600	1.907	9.536	61.600
6	0.984	4.920	66.519						
7	0.882	4.409	70.928						
8	0.809	4.044	74.972						
9	0.798	3.988	78.961						
10	0.658	3.289	82.250						
11	0.624	3.119	85.369						
12	0.580	2.901	88.271						
13	0.509	2.543	90.813						
14	0.374	1.871	92.684						
15	0.326	1.632	94.317						
16	0.307	1.536	95.852						
17	0.261	1.306	97.158						
18	0.238	1.190	98.348						
19	0.208	1.040	99.388						
20	0.122	0.612	100.000						

Table 9: Factor structure and factor loadings of the optimized model inventory with 20 items.

Rotated Component Matrix[a]					
	Component				
	1	2	3	4	5
DMSAVO3	0.859				
DMSAVO5	0.833				
DMSAVO2	0.828				
DMSAVO1	0.618				
DMSINT2		0.856			
DMSINT1		0.811			
DMSINT5		0.803			
DMSINT4		0.569			
DMSRAT3			0.754		
DMSRAT5			0.732		
DMSRAT4			0.716		
DMSRAT1			0.661		
DMSDEP1				0.812	
DMSDEP3				0.635	
DMSDEP2				0.594	
DMSDEP4				0.581	
DMSSPO3					0.790
DMSINT3					0.705
DMSSPO1					0.677
DMSSPO5					0.433

the dependent decision-making style have a projection on the fourth factor. The projections of the variables on this factor range from moderate for the variables DMSDEP4 (0.581), DMSDEP2 (0.594) and DMSDEP3 (0.635) to very high for the variable DMSDEP1 (0.812). The fourth factor explains 10.94% of the total variance and can be named the "*dependent style*". The fifth factor combines three variables measuring the spontaneous decision-making style (DMSSPO1, 3 and 5) and a variable measuring the intuitive style (DMSINT3); this factor is identical to the fifth factor extracted in a five-factor structure with 25 items (Table 5). With the exception of the variable DMSSPO5, which has a low but still satisfactory projection onto this factor (0.433), the other variables have high projections (factor loadings from 0.677 to 0.790). The fifth factor explains 9.54% of the total variance.

Table 10: Correlations between the decision-making styles in the optimized structure model inventory with 20 items.

Correlations					
	DMS Rational	**DMS Intuitive**	**DMS Dependent**	**DMS Avoidant**	**DMS Spontaneous**
DMS Rational	1				
DMS Intuitive	-0.143	1			
DMS Dependent	.348**	0.012	1		
DMS Avoidant	-0.211	0.020	0.175	1	
DMS Spontaneous	-0.087	.278*	-0.036	-0.025	1

Notes: * $p < 0.05$; ** $p < 0.01$.

Table 10 shows the correlations between the extracted factors within the optimized model of the decision-making styles of Slovenian sports managers. Correlation analysis showed that the rational and dependent decision-making styles are statistically significantly related at a 1% risk level. A statistically significant association at a 5% risk level was also found between the intuitive and spontaneous decision-making styles. Similar conclusions were also reached by other authors (Scott & Bruce, 1995; Thunholm, 2004; Spicer & Sadler-Smith, 2005; Baiocco, Laghi & Alessio, 2009; Wood, 2012; Verma, et al., 2012; Curşeu & Schruijer, 2012; Faletič & Avsec, 2013; Reyna, et. al., 2014; Hariri, et al., 2014; Bavoľár & Orosová 2015; Berisha, et al., 2018; Geisler & Allwood, 2018). These findings are consistent with the expectations; namely, both types of connections are characterized by the same cognitive style in the background, defining the manifestation of the aforementioned styles. Thus, the rational and dependent decision-making styles have a background in the rational-analytical cognitive style, while the intuitive

and spontaneous decision-making styles have a background in the intuitive-experiential cognitive style (Sagiv et. al, 2013; Alacreu-Crespo et al., 2019).

DISCUSSION

The decision-making style focuses attention on how an individual obtains, uses and interprets information. Thunholm (2004) defined a decision-making style as a response pattern that an individual shows when faced with a decision problem. This response pattern depends on the decision situation, the decision problem and the decision maker. Faletič and Avsec (2013) stated that although the nature of the problem and the situational factors play an important role in decision-making, we can assume that individuals differ in the frequency of using individual decision-making styles regardless of the decision-making problem. Managers' decision-making styles contribute significantly to their individual performance and thus to the performance of organizations (Abdelsalam, Dawoud & ElKadi, 2013); therefore, as pointed out by Rowe and Boulgarides (1992), they need to be measured, because decision-making styles should form the backbone of effective decision-making.

The present study deals with determining the structure of the decision-making styles of Slovenian sports managers. The GDMS Inventory (Scott & Bruce, 1995) with a five--factor structure was used to measure decision-making styles. After three successive implementations of FA using the method of principal components with the orthogonal rotation of factors using the varimax method, we developed a five-factor model of decision-making styles with 20 items. The results and a comparison of the individual obtained models are presented in Table 11.

Table 11 shows the basic characteristics of all three studied factor models. In all three models, the first five extracted factors form the original structure of the model developed by Scott and Bruce (1995), which was confirmed by the authors earlier mentioned. The developed optimized structure model inventory includes 20 items measuring the avoidant, intuitive, rational, dependent and spontaneous decision-making styles. This model has relatively good internal consistency, both at the level of the entire model and at the level of the individual decision-making styles. Individual factors also explain the variance of the space of decision-making styles in a more balanced way compared to the other two models with 25 items. Another advantage of the developed optimized model is the balanced number of items measuring the individual decision--making styles, allowing us to determine a clearer structure of decision-making styles, both at the level of the individual decision-maker and at the level of the entire sample. In all three factor models, the rational, avoidant and dependent styles showed the greatest stability of the structure of the included items. The stability of the intuitive style was relatively good, while the spontaneous style scale proved to be very unstable and problematic (Fischer et. al, 2015).

Based on the optimized structure model inventory, we calculated the structure of the decision-making styles of Slovenian sports managers (Table 6), confirming that when

Table 11: Basic characteristics of all three factor models of the decision-making style structure of Slovenian sports managers.

Solution	**7-factors solution**				**5-faktor solution**				**Optimized structure model inventory**			
	(25 items)				**(25 items)**				**(20 items)**			
% of variance	66.645%				57.869%				61.600%			
Extracted factors (decion-making styles)	**Factor name**	**No of items**	**% of variance**	**α**	**Factor name**	**No of items**	**% of variance**	**α**	**Factor name**	**No of items**	**% of variance**	**α**
	Rational style	5	13.92%	0.777	Avoidant style	8	15.67%	0.828	Avoidant style	4	14.39%	0.814
	Avoidant style	5	13.61%	0.810	Rational style	5	13.74%	0.777	Intuitive style	4	13.45%	0.775
	Intuitive style	3	10.61%	0.824	Intuitive style	4	11.05%	0.775	Rational style	4	13.29%	0.740
	Dependent style	4	8.90%	0.705	Dependent style	4	9.34%	0.705	Dependent style	4	10.94%	0.705
	Spontaneous style	2	7.54%	0.697	Spontaneous style	4	8.07%	0.609	Spontaneous style	4	9.54%	0.609
	Non-rational style	4	6.51%	0.602								
	High speed style	2	5.55%	0.413								

making decisions, sports managers use a combination of all five decision-making styles (Scott & Bruce, 1995; Thunholm, 2004; Avsec, 2012; Faletič & Avsec, 2013). Slovenian sports managers mostly use the rational (Atilgan & Kaplan, 2022) and dependent decision-making styles, indicating that they are mostly rational decision-makers. Rational decision-makers characteristically follow a decision-making process involving the critical evaluation of evidence and a structured process that requires time and conscious effort before making and implementing decisions (Fitzgerald, Mohammed & Kremer, 2017). Rational and intuitive decision-making styles are defined as functional decision--making styles, the use of which leads to various positive outcomes (Faletič & Avsec, 2013; Alacreu-Crespo, et. al, 2019). In contrast to a number of other studies, in our sample, the dependent decision-making style emerged as the second most used style (Spicer & Sadler-Smith, 2005; Curşeu & Schruijer, 2012; Erenda, Meško & Bukovec, 2014; Alacreu-Crespo et al., 2019; El Othman et. al, 2020). The dependent decision--making style has a statistically significant positive correlation with emotional (seeking moral support) and instrumental social support (seeking advice, help and information from others). Connection with both aspects of support indicates that individuals who predominantly use the dependent decision-making style, seek support within their environment for the decision-making processes (Alacreu-Crespo et al., 2019). However, it has to be emphasized that the dependent style is not necessarily dysfunctional, as it also correlates with positive outcomes when it is defined on the basis of behaviour, such as seeking advice and support and not shifting responsibility to others (Faletič & Avsec, 2013; Fischer et. al, 2015). Frequent use of the dependent decision-making style in Slovenian sports managers is probably related to specific characteristics for this type of organization (Young, 1998; Kolar & Jurak, 2014). Sports managers mostly work in interest-type associations, where the interests of various participants and stakeholders (athletes, volunteers, employees, associations, the state, local communities, sponsors, etc.) overlap or are even in conflict. Managers need to constantly coordinate and consider all these interests in the decision-making processes in order to achieve the organization's strategic and operational goals (Parent, 2010). In these organizations, there is also a "unique" governmental-managerial process, led by a committee of elected volunteers (governmental organizational function) who form very sensitive relations with the professional (management) staff (Young, 1998; Kikulis, Slack & Hinings, 1995). When regulating this process, the managers are in a subordinate position, as they are appointed by the governmental function and therefore need to act in accordance with the interests of the government. In order to avoid a conflict between the managerial and governmental structures, the managers depend on the opinions, directions and decisions of the government, otherwise the negative consequences would mostly be reflected on the managers. The structure of decision-making styles also shows that sports managers use an intuitive and spontaneous decision-making style to a lesser extent, which means that they are less likely to make decisions quickly, unconsciously and based on experience (Simon, 1987; Epstein, 1994; Kahneman, 2003; Dane & Pratt, 2007). This is probably also related to the aforementioned specifics of this type of organization. Sports managers use an avoidant decision-making style least often or to a negligible extent, which

is good, because this decision-making style is defined as pathological and dysfunctional and, as such, does not lead to decisions (Mitchell, Shepherd & Sharfman, 2011; Faletič & Avsec, 2013).

Finally, it is necessary to mention the recognized connection between the rational and the dependent styles, which are together also classified as a non-functional decision-making style. Since the structure of the decision-making styles in our sample is dominated by the rational decision-making style, we could conclude that this forms a dependent-rational decision-making style, which can be characterized as functional (Faletič & Avsec, 2013; Fischer et. al, 2015). It is typical for such decision-makers to seek advice, opinions and knowledge from colleagues when making decisions, thus using the dependent style and increasing the rationality of their decisions (Vroom, 2003; Khasawneh, Alomari & Abu-tineh, 2011). Such an understanding is in accordance with the theory of extended rationality (Secchi, 2010), where a decision-maker reduces the influence of the limitations of rationality, which arise from an individual's abilities to acquire and process information (Simon, 1976).

CONCLUSION

The decision-making process of managers has an important impact on the development and growth of sports organizations; therefore, the knowledge of the way managers make decisions is very important. In the present study, we found that the structure of the decision-making styles of Slovenian sports managers is formed as a combination of five decision-making styles, with the rational and dependent decision-making styles being predominant. We can conclude that the recognized average structure of decision-making styles is functional and healthy; furthermore, Slovenian sports managers are, on average, rational decision-makers who, due to the specific organizational characteristics of sports organizations, look for confirmation and opinions on future decisions in the broader environment of the organizations' stakeholders. This study also developed an instrument for measuring the decision-making styles of sports managers, which assumes a five-factor structure of decision-making styles and is consistent with the GDSM Inventory developed and proposed by Scott and Bruce (1995). By using the questionnaire, it is possible to predict the behaviour of individual decision-makers in decision-making situations, which can be an important tool when choosing a manager for an individual sports organization or placing them in the overall organizational structure of a sports organization.

Limitations of the Study

There are some limitations that should be considered for a more valid understanding of the results obtained. The participants completed the questionnaire online and this may have influenced the results. The study could be improved with a larger sample,

which means that we need to be careful when generalizing the results to the entire population of sports managers.

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REPORT OF 4th INTERNATIONAL SPE BALKAN SKI CONFERENCE

Pamporovo ski resort, Bulgaria, 13–17 March 2022

After two successful conferences – one in Kopaonik, Serbia, and the other in Jahorina, Bosnia and Herzegovina – the third international SPE Balkan Ski Conference in Rogla, Slovenia, was cancelled because of the pandemic. The fourth international conference was organised in Bulgaria, at the Pamporovo ski resort. The conference was hosted by the Association of Bulgarian Ski Instructors – the Bulgarian Ski School, in cooperation with the Science and Research Centre Koper (ZRS Koper), Slovenia, the Faculty of Sport and Physical Education of the University of Niš, Serbia, and the Ski Instructors Association (SITAS) of Slovenia.

The high level of the scientific conference was set by renowned experts in the field of alpine skiing and snowboarding, which was then reinforced by the members of the demo groups on the snow. In the afternoon, we heard renowned speakers such as Dieter Bubeck, PhD (Germany), Prof. Erich Muller (Austria), Prof. Lana Ružić (Croatia), Prof. Matej Supej (Slovenia), Ron Kipp, PhD (USA), Asa Tugetam, PhD (Sweden) and many others. In more than thirty scientific papers, the participants presented the main idea of the conference, "Science, Practice and Education", and the main theme "Fun and safety in contemporary skiing − the new role of ski instructors/trainers in winter sports and society". The abstracts published on this occasion present the latest perspectives on the sensitive areas of safety and injuries, preparation, and the development of ski technique, as well as modern possibilities and approaches in the methodology and didactics of teaching skiing.

The morning workshops on the snow enriched the theory and were led by members of the demo teams from the participating Balkan countries (from Bosnia and Herzegovina, Bulgaria, Romania, Serbia and Slovenia). The morning workshops gave the participants the opportunity to deepen their theoretical knowledge through practical work. Another important event in the conference was the "Demo Team Show", where the audience could admire the perfected skiing techniques of the demo teams of the national ski schools. The honorary members such as the Slovenian ski legend Bojan Križaj and Bulgarian Olympic gold medallist Ekaterina Dafovska added to the value of the event.

Despite the spring-like days in March, the sunny conditions did not affect the conditions on the slopes. The beautiful weather and perfectly groomed slopes further contributed to the excellent conference.

The next big event will take place in the upcoming winter season of 2023, with the INTERSKI Congress in the Levi Ski Resort, Finland, where the 5th SPE Balkan Ski Conference, which will be held at the Predeal Ski Resort in Romania, will also be announced and promoted to the biggest snow sports society in the world.

Kaja Teraž and Rado Pišot

REPORTS AND REVIEWS/POROČILA IN OCENE, 77–84

POROČILO S 4. MEDNARODNE KONFERENCE SPE BALKAN SKI

Smučarski center Pamporovo, Bolgarija, 13.–17. marec 2022

Po dveh uspešnih konferencah na Kopaoniku v Srbiji ter Jahorini v Bosni in Hercegovini je bila tretja mednarodna balkanska smučarska konferenca SPE na Rogli v Sloveniji zaradi pandemije odpovedana. Četrta mednarodna konferenca je bila organizirana v Bolgariji, v smučarskem središču Pamporovo. Konferenco je gostilo Združenje bolgarskih učiteljev smučanja – Bolgarska šola smučanja – v soorganizaciji z Znanstveno-raziskovalnim središčem Koper (ZRS Koper), Slovenija, Fakulteto za šport in telesno vzgojo Univerze v Nišu, Srbija, in Združenjem učiteljev smučanja (ZUTS) Slovenije.

Visoko raven znanstvene konference so postavili priznani strokovnjaki s področja alpskega smučanja in deskanja na snegu, ki so jo nato podkrepili člani demo skupin na snegu. V popoldanskih urah smo prisluhnili priznanim predavateljem, kot so dr. Dieter Bubeck (Nemčija), prof. dr. Erich Muller (Avstrija), prof. dr. Lana Ružić (Hrvaška), prof. Matej Supej (Slovenija), dr. Ron Kipp (ZDA), dr. Asa Tugetam (Švedska) in številni drugi. V več kot tridesetih znanstvenih prispevkih so udeleženci predstavili glavno idejo konference Znanost, praksa in izobraževanje in glavno temo konference Zabava in varnost v sodobnem smučanju – nova vloga smučarskih učiteljev/trenerjev v zimskih športih in družbi. Ob tej priložnosti objavljeni povzetki predstavljajo najnovejše poglede na občutljiva področja varnosti in poškodb, priprave in razvoja smučarske tehnike ter sodobne možnosti in pristope v metodologiji in didaktiki poučevanja smučanja.

Dopoldanske delavnice na snegu so obogatile predstavljeno teorijo, vodili pa so jih člani demo ekip iz sodelujočih balkanskih držav (demo ekipe iz Bosne in Hercegovine, Bolgarije, Romunije, Srbije in Slovenije). Dopoldanske delavnice so udeležencem omogočile, da so teoretično znanje poglobili s praktičnim delom na snegu. Pomemben dogodek konference je bil tudi „Demo Team Show“, na katerem je občinstvo lahko občudovalo dovršeno tehniko smučanja demo ekip nacionalnih smučarskih šol. Častna člana, kot sta slovenska smučarska legenda Bojan Križaj in bolgarska olimpijska prvakinja Ekaterina Dafovska, sta še povečala pomembnost dogodka.

Kljub spomladanskim marčevskim dnevom sončno vreme ni vplivalo na razmere na smučiščih. Lepo vreme in odlično urejene proge so še dodatno prispevali k odlični konferenci.

Naslednji veliki dogodek bo potekal v prihajajoči zimski sezoni 2023, in sicer kongres INTERSKI v smučarskem središču Levi na Finskem, kjer bo najavljena tudi 5. balkanska smučarska konferenca SPE, ki bo potekala v smučarskem središču Predeal v Romuniji, in promovirana v največjem društvu za snežne športe na svetu.

Kaja Teraž in Rado Pišot

REPORTS AND REVIEWS/POROČILA IN OCENE, 77–84

HAVING FUN WHILE LEARNING - SKI EASY SNOW DAY

1st SKI EASY Multiplier SPORT EVENT,
Pamporovo, Bulgaria, 14–16 March 2022

Despite the difficult situation caused by Covid- 19 measures, the project ERASMUS + Sport - cooperation *"SKI EASY - EASY (Educational, Accessible, Simple, Youthful) Approach to Skills Acquisition in Skiing"* has successfully pursued the implementation of its objectives. One of the important outcomes is the implementation of multiplier sport events known as the SKI EASY SNOW DAY.

The main idea of the SKI EASY SNOW DAY is to promote the SKI EASY teaching module and to enable children – ski beginners from 6–9 years old, especially those coming from deprived social and economic environments – to experience an exciting snow day and try to take their first steps on ski. For that purpose, the Elan ski manufacturer prepared and adapted special skis (using U-Flex technology) and ski boots for children that enable easier turns on slopes and more fun when learning how to ski.

In short, the SKI EASY SNOW DAY enables deprived children from lower socio-economic environments who do not have the opportunity to experience skiing to get a

taste of this beautiful experience with professional ski instructors with the help of the SKI EASY MOBAPP application.

The 2022 SKI EASY Snow Day Pamporovo was the first of three planned multiplier sport events and was organized by a Bulgarian ski school. It took place at the Pamporovo ski resort which offers suitable conditions for the event and was divided in two parts. On the first day, a workshop was held by SKI EASY project partners with Bulgarian ski school instructors to get acquainted with the SKI EASY teaching model. The following two days were devoted to ski lessons for beginners. Despite the problems of viral illnesses and the COVID-19 pandemic, we managed to have two very nice and unforgettable days with the children. There was a very good response from the ski instructors, coaches and other snow sport experts, participants of the 3rd SPE Balkan Ski Conference, who were invited to observe the implementation of the SKI EASY teaching model.

The SKI EASY project also addresses the aspect of sustainability, as the 300 pairs of skis will remain with the eight project partners in order to be able to organize further ski days and ski teaching courses after the end of the project according to the developed unified SKI EASY teaching model. In 2023 another two SKI EASY SNOW DAYS will be held in Kopaonik, Serbia and Innsbruck, Austria.

Saša Pišot,
Project coordinator

REPORTS AND REVIEWS/POROČILA IN OCENE, 77–84

ZABAVNO UČENJE SMUČANJA – DNEVI NA SNEGU SKI EASY

1. interaktivni športni dogodek SKI EASY,
Pamporovo, Bolgarija, 14.–16. marec 2022

Projekt ERASMUS + šport „*EASY (izobraževalen, dostopen, preprost, mladosten) pristop k usvajanju veščin pri učenju smučanja«)*“ je kljub težkim razmeram zaradi ukrepov covida-19 uspešno uresničil zastavljene cilje. Eden od pomembnih rezultatov je izvedba interaktivnih športnih dogodkov, imenovanih dan na snegu SKI EASY.

Glavni zamisli dneva na snegu SKI EASY sta promocija učnega modula SKI EASY in omogočanje otrokom začetnikom, starim od 6 do 9 let, zlasti tistim, ki prihajajo iz socialno in ekonomsko šibkih družin, da doživijo razburljiv dan na snegu in poskusijo

narediti prve korake na smučeh. V ta namen je proizvajalec smuči Elan pripravil posebne smuči s tehnologijo U-Flex in smučarske čevlje, ki omogočajo lažje zavoje in več zabave pri učenju smučanja.

Dan na snegu SKI EASY omogoča otrokom, ki nimajo priložnosti, da s pomočjo dostopne opreme, profesionalnih učiteljev in zabavne mobilne aplikacije SKI EASY doživijo čudovito izkušnjo usvajanja smučarskega znanja.

Dan na snegu SKI EASY, ki ga je organizirala bolgarska šola smučanja, je bil prvi od treh načrtovanih interaktivnih športnih dogodkov, saj smučarsko središče Pamporovo ponuja primerne pogoje za dogodek, ki je bil razdeljen na dva dela. Prvi dan so partnerji projekta SKI EASY organizirali delavnico za učitelje bolgarske nacionalne smučarske šole, na kateri so se ti seznanili z modelom SKI EASY. Preostala dneva sta bila namenjena učenju smučanja otrok začetnikov. Kljub težavam z virusnimi obolenji in epidemijo covida-19 nam je uspelo pripraviti lepa in nepozabna dneva za otroke iz bližnjega mesta. Lahko se pohvalimo tudi z dobrim odzivom učiteljev smučanja – udeležencev 3. SPE konference Balkan SKI, ki so bili povabljeni, da si ogledajo izvajanje modela poučevanja SKI EASY.

S projektom SKI EASY zagotavljamo tudi trajnost, saj bo 300 parov smučarske opreme pri osmih projektnih partnerjih namenjenih za organizacijo smučarskih dni in tečajev smučanja po enotnem učnem modelu SKI EASY tudi po končanem projektu.

Leta 2023 bosta izvedena še dva smučarska dogodka – dneva na snegu SKI EASY na Kopaoniku v Srbiji in v Innsbrucku v Avstriji.

Saša Pišot,
koordinatorica projekta

REPORTS AND REVIEWS/POROČILA IN OCENE, 77–84

REPORT ON THE EASS & ISSA 2022 WORLD CONGRESS OF SPORT SOCIOLOGY

Tübingen, Germany, 7–10 June 2022

After two years of online conferences and uncertain times, the EASS (European Association of Sociology of Sports) and ISSA (International Sociology of Sport Association) have joined forces to organise a joint World Congress of Sociology of Sport with the working title: Why Sociology Matters? The Role of Sociology of Sport in Interdisciplinary Research.

Scholars from around the world pondered the question of why sociology and its very special relationship to society is hardly noticed. Sociology seems to have a reputation problem, not only in the public and political contexts, but also in scientific research networks. The aim of this congress was therefore to provide a clearer insight into the complex descriptions of reality and to reveal the contradictions and inconsistencies in the common sense and everyday constructions that target the field of sport.

The organiser of the congress was the University of Tübingen, together with the Institute of Sports Science of the University of Tübingen. At the three-day event, 230 papers were presented by over 350 authors in 10 sessions. Among the papers, the topics of depression and the deviant behaviour of elite athletes and coaches, and the impact of COVID-19 measures on sport participation and sport policy issues were the main topics of interest.

The main key lectures:

1. Addressed the novelties in European football and its organisation in lectures presented by prof. Mark Turner, PhD (*Against the European Super League*: *Reading this critical juncture for English and European football)* and prof. David Webber PhD (*Rewriting the future: Alternatives to 'the present' (and presence of) capitalist realism in elite European football*)
2. Opened up new questions in the field of sport impact on the local community with the lectures: *(Re)configuring for sport, volunteerism and the civil society landscape*: *Toward sustainable communities and capacity building in a post--Olympic metropolis* by prof. Niki Koutrou and prof. Geoffrey Kohe, *Reciprocation and Responsibility – "Giving Back" to Children and Youth in Community Organizations* by prof. Christine Dallaire and Steph MacKay.

The conference gave the expected impetus for further cooperation between researchers and their institutions, so we are looking forward to the next, 19th EASS Conference in 2023 with the working title: Transitioning Sport, Transitioning European Societies to be held in Budapest, Hungary on 30 May—2 June 2023.

Saša Pišot

REPORTS AND REVIEWS/POROČILA IN OCENE, 77–84

POROČILO S SVETOVNEGA KONGRESA SOCIOLOGIJE ŠPORTA EASS IN ISSA 2022

Tübingen, Nemčija, 7.–10. junij 2022

Po dveh letih spletnih konferenc in negotovih razmerah v času covida-19 sta EASS (Evropsko združenje za sociologijo športa) in ISSA (Mednarodno združenje za sociologijo športa) združila moči in organizirala skupni svetovni kongres sociologije športa z delovnim naslovom Zakaj je sociologija pomembna? Vloga sociologije športa v interdisciplinarnem raziskovanju.

Udeleženci z vsega sveta so razmišljali, zakaj sta sociologija in njen posebni odnos do družbe premalo opazna, saj se zdi, da ima sociologija težave z ugledom, ne le v javnem in političnem kontekstu, temveč tudi v znanstveno-raziskovalnih mrežah. Glavni namen tega kongresa je bil zato spodbuditi jasnejši vpogled v opise resničnosti, protislovij in morebitnih nedoslednosti, ki se kažejo v »zdravo razumskih« in vsakdanjih konstrukcijah na področju športa.

Organizator kongresa je bila univerza v Tübingenu skupaj z inštitutom za znanosti o športu univerze v Tübingenu. Na tridnevnem dogodku je več kot 350 avtorjev v desetih sekcijah predstavilo več kot 230 prispevkov. Med referati so bile v ospredju predvsem teme depresije, deviantnega vedenja vrhunskih športnikov in trenerjev in vpliv ukrepov za zajezitev covida-19 na participacijo v športu in pereča politična vprašanja s področja športa.

Glavna vabljena predavanja so:

1. obravnavala novosti v evropskem nogometu in njegovi organizaciji, ki sta jih predstavila prof. dr. Mark Turner – *Proti evropski superligi: (Kritičen trenutek za angleški in evropski nogomet)* – in prof. David Webber – *Rewriting the future: alternativa »sedanjosti« (in prisotnosti) kapitalističnega realizma v elitnem evropskem nogometu;*
2. odpirala nova vprašanja na področju vpliva športa in politik na lokalno skupnost s predavanji prof. Niki Koutroua in prof. Geoffreya Koheja – (Re)configuring for sport, volunteerism and the civil society landscape: *Na poti k trajnostnim skupnostim in krepitvi zmogljivosti v post-olimpijski metropoli* – ter predavanjem *Reciprocation and Responsibility – »Giving Back« to Children and Youth in Community Organizations*, ki sta ga pripravila prof. Christine Dallaire in Steph MacKay.

Konferenca je pričakovano spodbudila nadaljnje sodelovanje med raziskovalci in njihovimi institucijami, zato se že veselimo naslednje, 19. konference EASS 2023 z delovnim naslovom *Transitioning Sport, transitioning European societies*, ki bo od 30. maja do 2. junija 2023 potekala v Budimpešti.

Saša Pišot

GUIDELINES FOR AUTHORS

1. Aim and scope of the journal:

Annales Kinesiologiae is an international interdisciplinary journal covering kinesiology and its related areas. It combines fields and topics directed towards the study and research of human movement, physical activity, exercise and sport in the context of human life style and influences of specific environments. The journal publishes original scientific articles, review articles, technical notes and reports.

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d) The **title page** should include the title of the article (no more than 85 characters, including spaces), full names of the author(s) and affiliations (institution name and address) of each author; linked to each author using superscript numbers, as well as the corresponding author's full name, telephone, and e-mail address.

e) The authors are obliged to prepare two **abstracts** – one short abstract in English and one (translated) in Slovene language. For foreign authors translation of the abstract into Slovene will be provided. The content of the abstract should be structured into the following sections: purpose, methods, results, and conclusions. It should only contain the information that appears in the main text, and should not contain reference to figures, tables and citations published in the main text. The abstract is limited to 250 words.

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g) The **main text** should include the following sections: Introduction, Methods, Results, Discussion, Conclusions, Acknowledgement (optional), and References. Individual parts of the text can form sub-sections.

h) Each **table** should be submitted on a separate page in a Word document after the Reference section. Tables should be double-spaced. Each table shall have a brief caption; explanatory matter should be in the footnotes below the table. Abbreviations used in the tables must be consistent with those used in the main text and figures. Definitions of symbols should be listed in the order of appearance, determined by reading horizontally across the table and should be identified by standard symbols. All tables should be numbered consecutively Table 1, etc. The preferred location of the table in the main text should be indicated preferably in a style as follows: *** Table 1 somewhere here ***.

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j) References

The journal uses the Harvard reference system (Publication Manual of the American Psychological Association, 6th ed., 2010), see also: https://www.apastyle.org). The list of references should only include work cited in the main text and being published or accepted for publication. Personal communications and unpublished works should only be mentioned in the text. References should be complete and contain up to seven authors. If the author is unknown, start with the title of the work. If you are citing work that is in print but has not yet been published, state all the data and instead of the publication year write „in print".

Reference list entries should be alphabetized by the last name of the first author of each work. Titles of references written in languages other than English should be additionally translated into English and enclosed within square brackets. Full titles of journals are required (no abbreviations).

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Examples of reference citation in the text

One author: This research spans many disciplines (Enoka, 1994) or Enoka (1994) had concluded...

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Three to six authors:
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Seven or more authors:
Only the first author is cited: Di Prampero et al. (2008) or (Di Prampero et al., 2008).
Several authors for the same statement with separation by using a semicolon: (Biolo et al., 2008; Plazar & Pišot, 2009)

Examples of reference list*:*
The style of referencing should follow the examples below:

Books
Latash, M. L. (2008). Neurophysiologic basis of movement. Campaign (USA): Human Kinetic.

Journal articles
Marušič, U., Meeusen, R., Pišot, R., & Kavcic, V. (2014). The brain in micro- and hypergravity : the effects of changing gravity on the brain electrocortical activity. European journal of sport science, 14(8), 813–822. https://doi.org/10.1080/17461391.2014.908959

Šimunič, B., Koren, K., Rittweger, J., Lazzer, S., Reggiani, C., Rejc, E., … Degens, H. (2019). Tensiomyography detects early hallmarks of bed-rest-induced atrophy before changes in muscle architecture. Journal of applied physiology, 126(4), 815–822. https://doi.org/10.1152/japplphysiol.00880.2018

Book chapters

Šimunič, B., Pišot, R., Mekjavić, I. B., Kounalakis, S. N. & Eiken, O. (2008). Orthostatic intolerance after microgravity exposures. In R. Pišot, I. B. Mekjavić, & B. Šimunič (Eds.), The effects of simulated weightlessness on the human organism (pp. 71–78). Koper: University of Primorska, Scientific and research centre of Koper, Publishing house Annales.

Rossi, T., & Cassidy, T. (in press). Teachers' knowledge and knowledgeable teachers in physical education. In C. Hardy, & M. Mawer (Eds.), Learning and teaching in physical education. London (UK): Falmer Press.

Conference proceeding contributions

Volmut, T., Dolenc, P., Šetina, T., Pišot, R. & Šimunič, B. (2008). Objectively measures physical activity in girls and boys before and after long summer vacations. In V. Štemberger, R. Pišot, & K. Rupret (Eds.) Proceedings of 5th International Symposium A Child in Motion "The physical education related to the qualitative education" (pp. 496–501). Koper: University of Primorska, Faculty of Education Koper, Science and research centre of Koper; Ljubljana: University of Ljubljana, Faculty of Education.

Škof, B., Cecić Erpić, S., Zabukovec, V., & Boben, D. (2002). Pupils' attitudes toward endurance sports activities. In D. Prot, & F. Prot (Eds.), Kinesiology – new perspectives, 3rd International scientific conference (pp. 137–140), Opatija: University of Zagreb, Faculty of Kinesiology.

4. Manuscript submission

The article should be submitted via online Open Journal Systems application, which is open source journal management and publishing software at http://ojs.zrs-kp.si/index.php/AK/about/submissions. All the communication process with authors proceeds via Open Journal System and e-mail.

5. For additional information regarding article publication, please do not hesitate to contact the secretary of Annales Kinesiologiae.


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