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Original scientific paper

Understanding Factors of Exercise Motivation: Simplification of the Exercise Motivation Inventory-2 (EMI-2)

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Abstract

Introduction. Physical inactivity represents a major public health concern, contributing to the development of numerous chronic diseases.

Aim. The aim of this study was to simplify the Exercise Motivation Inventory-2 (EMI-2) using exploratory and confirmatory factor analysis in order to identify a new, meaningful factor structure that effectively explains the underlying motives for physical activity among university students.

Methods. The study was conducted on 1,304 students of the University of Zagreb (65.7% female). The Croatian version of the EMI-2 questionnaire was employed, comprising 54 items designed to assess various intrinsic and extrinsic motives for exercise, which in the original English version are grouped into 14 factors. Data were analyzed using exploratory factor analysis (EFA) to identify latent factors, followed by confirmatory factor analysis (CFA) to verify the factor structure. Reliability was assessed using Cronbach's alpha coefficient.

Results. The exploratory factor analysis initially identified eight factors; however, the scree plot suggested a three-factor solution encompassing psychological, social, and health-related motives for exercise. The simplified model demonstrated high internal consistency (Cronbach's alpha: psychological motives = 0.934; social motives = 0.919; health motives = 0.922). The confirmatory factor analysis confirmed the validity of the model with acceptable fit indices (CFI = 0.92; NFI = 0.91; IFI = 0.92), while regression analysis indicated that these factors significantly predicted students' leisure-time physical activity.

Conclusions. The simplified version of the EMI-2 provides a reliable and valid tool for assessing motives for physical activity, particularly within the student population. Simplifying the factor structure facilitates its use in both research and practical settings, supporting the development of targeted intervention programs aimed at promoting physical activity. The findings highlight the importance of psychological, social, and health-related motives in understanding and improving physical activity behaviors. Future research should examine the applicability of this model across different populations to confirm its universal relevance.

Introduction

Physical inactivity is a major public health issue, with substantial evidence demonstrating its contribution to the development of numerous chronic diseases and conditions. Recognition of the health and functional risks associated with a sedentary lifestyle has led to a wide range of recommendations in favor of regular physical activity. Current World Health Organization (WHO) public health guidelines (1) for adults aged 18–64 years recommend at least 150 minutes of moderate-intensity physical activity per week, or 75 minutes of vigorous activity. Moreover, aerobic activities should be performed in bouts of at least 10 minutes. For additional health benefits, WHO advises adults within this age range to increase moderate-intensity physical activity to 300 minutes per week, or vigorous activity to 150 minutes per week. Strength exercises involving major muscle groups should be performed at least twice per week. Individuals who engage in physical activity more frequently obtain additional benefits, and alongside aerobic exercise they are advised to include strength and flexibility training at least twice weekly. Such activity further assists in maintaining normal body weight, improving muscular strength and endurance, and preserving physical function, thereby increasing the likelihood of long-term adherence to regular physical activity (2).

Research findings indicate that physical inactivity represents a serious threat to health, functional ability, and quality of life, ranking among the three leading causes of morbidity, mortality, and disability worldwide—alongside smoking and inadequate diet (3, 4). According to recent WHO data (5), nearly one-third (31%) of adults worldwide, approximately 1.8 billion individuals, failed to meet recommended physical activity levels in 2022. These findings point to a concerning upward trend, with physical inactivity increasing by approximately 5% between 2010 and 2022. The situation in Croatia is particularly alarming: as Bartoluci and Škorić (6) report, only around 17% of people are sufficiently active, while Greblo and colleagues found that 59% of Croatian adults do not engage in physical activity at all (7).

Although it might be expected that young adults, particularly university students, are the most physically active population, studies consistently show that students worldwide often fail to meet minimum daily activity recommendations, and that activity levels decline during the transition from secondary school to university (8, 9). A study from Portugal revealed that students walked more and spent less time sitting during the workweek, whereas weekend activity decreased, especially among female students (10). Croatian students also exhibit low activity levels, with participation varying by sociodemographic factors (11, 12, 13). Students recognize the importance of exercise but often do not practice it sufficiently (14, 15). Thus, targeted interventions to increase physical activity are needed, particularly among female students (12, 16).

Given the importance of physical activity and its positive effects on psychophysical health, it is essential to identify the factors that predict engagement in physical activity. The decision to initiate, and even more so to maintain, regular exercise is strongly influenced by psychological factors, with motivation being among the most important (17).

Self-Determination Theory (SDT) is a comprehensive theory of human motivation and personality, developed through traditional empirical research, that emphasizes the importance of intrinsic resources for personality growth and behavioral self-regulation (18). Due to functional and experiential differences between self-motivation and external regulation of behavior, much of SDT research has focused on distinguishing and understanding different types of motivation that drive behavior at any given moment.

According to SDT principles, physical activity may be driven by both intrinsic and extrinsic factors. Intrinsic motivation refers to behavior performed for the inherent enjoyment and satisfaction derived from the activity itself. In contrast, extrinsic motivation characterizes behavior undertaken to achieve external outcomes, such as tangible rewards, avoidance of punishment, or the pursuit of recognition, status, or praise. From the SDT perspective, intrinsic motivation reflects a deeply rooted desire to apply and develop one's skills and capacities (18). Such motivation is connected to the increasing demands of the environment and the individual's ability to cope with those challenges. However, in the context of physical activity, intrinsic motivation alone may not be sufficient to initiate action; rather, the activity must also be enjoyable, offering a sense of pleasure and fun—features that fundamentally characterize intrinsically motivated activities. Indeed, one of the primary reasons people cite for engaging in exercise is that it is interesting, challenging, and enjoyable (Frederick & Ryan, 1995; as cited in 19).

At the same time, many sports and physical activities are predominantly influenced by extrinsic motivators. In such cases, individuals participate not because they inherently enjoy the activity, but because they derive some external benefit—whether in the form of athletic achievement, improved health, enhanced appearance, or maintenance of physical fitness. For most individuals, participation in physical activity reflects a combination of intrinsic and extrinsic motives, underscoring the importance of acknowledging extrinsic motivation when designing strategies to promote engagement in exercise (19).

Teixeira et al. (20) conducted a systematic review of 66 empirical studies and concluded that autonomy support, competence, and relatedness significantly contribute to motivation for physical activity. For example, when individuals feel they have control over their exercise (autonomy) and experience a sense of achievement (competence), they are more likely to sustain participation. Furthermore, social support and a sense of belonging enhance motivation to engage in exercise.

Interventions based on SDT that are designed to foster autonomy, competence, and relatedness have proven effective in increasing physical activity levels. Such interventions often include personalized exercise programs that allow individuals to select preferred activities, set their own goals, and receive continuous support from trainers or peer groups (20, 21).

Research has also shown that students motivated by intrinsic reasons, such as health concerns, are more likely to engage regularly in physical activity (22). In comparison, women more frequently report extrinsic motives, while men more often emphasize health-related benefits (22). Additionally, cultural contexts and educational policies may significantly influence student motivation, as illustrated by studies conducted in China (23).

Measuring motivation for exercise and physical activity is therefore a crucial step toward the ultimate goal of developing effective intervention programs to increase physical activity. One of the most widely used instruments for assessing exercise motivation is the Exercise Motivations Inventory-2 (EMI-2), developed by David Markland and David K. Ingledew in 1997 (24). The EMI-2 was designed to capture a broad spectrum of motives for physical activity participation, comprising 51 items across 14 scales that assess intrinsic and extrinsic motives, including social recognition, health pressures, and body-related motives. The EMI-2 has been widely applied in research on psychological aspects of exercise and has proven to be a reliable and valid tool for understanding why individuals engage in physical activity (24).

Aim

Given the complexity of the motivational structure reflected in the original EMI-2, the aim of this study was to employ exploratory and confirmatory factor analyses to derive a meaningful factor structure that reduces the number of factors while effectively capturing the underlying motives for exercise. This approach follows Markland's (25) suggestion that, due to practical limitations of analyses involving large numbers of motivational factors, grouping variables into a smaller set of latent constructs can provide both practical and theoretical clarity.

Methods

The study was approved by the Research and Ethics Committee of the Faculty of Kinesiology, University of Zagreb. Following the approval, authorization for data collection was obtained from each of the 10 faculties where the research was conducted in 2018. At each faculty, a designated contact person (most often the Vice-Dean for Research) proposed one or more course instructors, depending on the required number of students and the year of study, within whose classes the research could be carried out. After receiving consent from the respective instructors, data collection was conducted at the beginning of the agreed class session. Students present at that time were invited to participate, and completion of the questionnaire lasted approximately 20–30 minutes.

Participation was voluntary. Before completing the questionnaire, students were informed that refusal to participate would have no negative consequences for their studies or their relationship with the instructors, and conversely, that participation would not be financially compensated. They were also informed that by completing the questionnaire they consented

to take part in the study and that their participation is completely anonymous.

The study sample consisted of 1,304 students enrolled at the University of Zagreb, originating from ten faculties that cover five scientific fields. Of the total sample, 857 participants were female students (65.7%), and 447 were male students (34.3%). The mean age of participants was 20.72 years, with the largest subgroup comprising students aged 19 years.

The sampling was quota-based with regard to the scientific fields represented at the University of Zagreb. All scientific fields were included, with the exception of the humanities and the arts. The distribution of participants across fields closely corresponded to that reported by the Croatian Bureau of Statistics (26).

Instrument

Croatian Version of the EMI-2 Questionnaire (24, 27)

The questionnaire consists of 54 items that represent fourteen potential motives for exercise. These are: weight control, illness avoidance, revitalization, appearance, social pressure, stress management, health, strength, enjoyment of exercise, affiliation, medical prescription, competition, agility, and challenge. Items are formulated to address the question of why a person exercises or would exercise, with responses provided on a five-point Likert scale (1 = not at all true for me; 5 = very true for me). According to Vlašić et al. (27), Cronbach's alpha coefficients demonstrated satisfactory internal consistency across all 14 motivational dimensions ($0.61 < \alpha < 0.83$). Markland and Ingledew (24) developed the original Exercise Motivation Inventory from the perspective of Self-Determination Theory, initially attempting to categorize motives as either intrinsic or extrinsic. However, it was later shown that certain motives may be considered intrinsic or extrinsic depending on the individual's perspective. Consequently, a strict dichotomy was not established, although some groups of motives are clearly predominantly intrinsic (e.g., enjoyment of exercise, affiliation), while others are predominantly extrinsic (e.g., social pressure).

Statistics

For data processing and analysis in this study, the statistical programs IBM SPSS Statistics 23 and Amos Graphics were employed. The method of analysis used in Amos was maximum likelihood estimation, which is considered the most appropriate approach in most cases, particularly when the normality of the distribution of analyzed variables is violated (28).

Results

The common-factor analysis aimed to establish a meaningful factor structure that would group exercise motives in a more parsimonious manner. Initially, eight factors with eigenvalues greater than 1 were extracted, but the rotated factor solution could not be meaningfully interpreted. Therefore, the scree test was used as the criterion for factor retention, a graphical method that clearly demonstrated that three factors accounted for substantially more variance than the remaining factors (see Figure 1).

Subsequently, a new factor analysis was conducted with three predefined factors. The analysis of loadings for individual exercise motives on the three factors revealed that all three items belonging to the agility-related motives, as well as all three items from the health enhancement group, did not clearly load on any of the factors and were therefore excluded from further analysis. Consequently, a new factor analysis was performed on the remaining 48 manifest variables (i.e., motives). After rotation of the factor axes, the following factor structure was obtained (Table 1).

When analyzing the item content in relation to their loadings on individual factors, it becomes evident that the first factor is saturated with exercise motives related to enjoyment, revitalization, stress prevention, challenge, and strength enhancement. These can be classified as psychological motives, and accordingly, this factor was labeled "psychological motives for exercise." Strength enhancement somewhat diverges conceptually; however, it still represents a positive motive in which an individual seeks self-improvement and greater strength—an aspect that may be interpreted not only in a physical but also in a psychological sense. Thus, the first factor is designated as *psychological motives for exercise*.

The second factor is saturated with motives related to social recognition, competition, social pressure,

and affiliation, and was therefore labeled *social motives for exercise*. The third factor is saturated with motives related to appearance enhancement, weight control, and the prevention of health problems, and was labeled *health motives for exercise*.

Markland (25) notes that, due to the practical limitations of analyzing a large number of motivational factors, it is reasonable to group variables into a smaller number of latent constructs, especially when high internal consistency coefficients are obtained. Nevertheless, this approach inevitably reduces the level of detail and limits the precision of information on participants' exercise motivation.

Cronbach's alpha reliability coefficients for the three newly created scales (latent variables) were satisfactory: 0.75 for social motives, 0.78 for health motives, and 0.886 for psychological motives.

To verify the factor structure obtained through exploratory factor analysis, a confirmatory factor analysis was performed in AMOS, separately for each higher-order factor. For clarity, factor loadings for each factor are presented individually in the following figures; however, the analysis was carried out as a single integrated model including all manifest and latent variables of exercise motives.

Figure 2 presents the loadings of the manifest and latent variables underlying the construct *psychological motives for exercise*. It can be observed that, among the manifest variables, the lowest loadings were obtained for "Because I enjoy exercising" (0.61), belonging to the *enjoyment* factor, and "Because it gives me space to think" (0.59), belonging to the *stress prevention* factor. At the higher-order level, the lowest loading within the *psychological motives for exercise* factor was observed for the *strength* factor (0.59).

With regard to the factor loadings of the manifest and latent variables underlying the *social motives for exercise* (Figure 3), it can be observed that the lowest loadings were obtained for the manifest variables "To fit in with society" (0.50) and "Because others encourage me to do so" (0.63). Both belong to the *social pressure* factor, whose overall factor loading was low (0.35), indicating a weak association with the higher-order *social motives for exercise* factor.

In the part of the confirmatory model related to the *health motives for exercise* (Figure 4), the lowest loadings were found for the manifest variables "To maintain my figure" (0.74) and "To avoid heart disease" (0.76), which belong to the factors *weight control* and *prevention of health problems*, respectively. The latter showed the weakest association (0.43) with the higher-order factor.

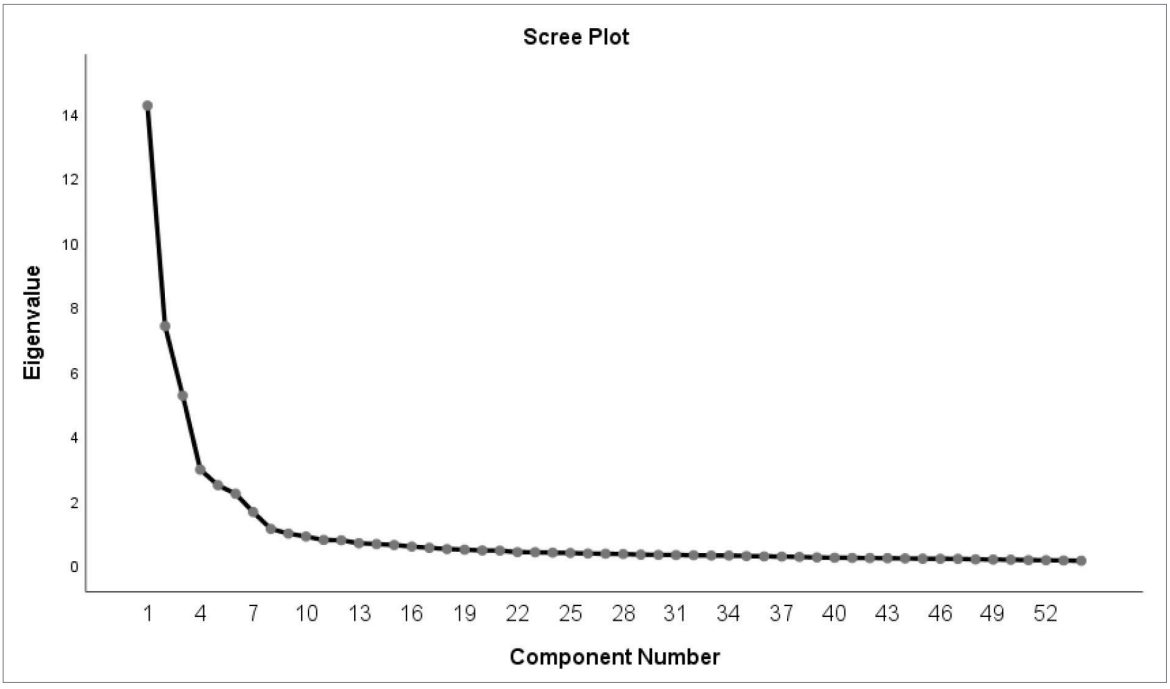

Figure 1. **Scree plot of eigenvalues of the factors extracted from the EMI-2 questionnaire**

Table 1. **Rotated factor matrix of the modified Croatian version of the EMI-2 questionnaire and reliability of the retained components**

	Factors		
Items	**1**	**2**	**3**
Because I enjoy exercising. (enjoyment)	0.790		
Because exercising itself makes me feel happy. (enjoyment)	0.787		
Because I consider exercise refreshing. (revitalization)	0.779		
To relieve tension. (stress prevention)	0.775		
Because I feel best when I exercise. (enjoyment)	0.771		
Because it helps me reduce tension. (stress prevention)	0.750		
Because it helps me cope with stress. (stress prevention)	0.735		
To 'recharge my batteries.' (revitalization)	0.724		
Because I feel good afterwards. (revitalization)	0.704		
To develop my skills. (challenge)	0.662		
Because it gives me goals to achieve progress. (challenge)	0.659		
To improve my own standards. (challenge)	0.643		
To face personal challenges. (challenge)	0.625		
To develop my muscles. (strength)	0.571		
Because it gives me space to think. (stress prevention)	0.567		
Because I enjoy the effort. (enjoyment)	0.556		
To increase endurance. (strength)	0.549		
To become stronger. (strength)	0.530		
To increase my strength. (strength)	0.528		
To compare my abilities to others. (social recognition)		0.709	
Because I enjoy competing in physical abilities. (competition)		0.707	
To receive recognition for my achievements. (social recognition)		0.694	
Because I enjoy competing. (competition)		0.687	
Because I like trying to win in physical activities. (competition)		0.684	
To please other people. (social pressure)		0.658	
To achieve what others cannot. (social recognition)		0.655	
To fit into society. (social pressure)		0.652	
Because others expect it from me. (social pressure)		0.624	
Because I find physical activity fun, especially when it involves competition. (competition)		0.597	
Because others demand it from me. (social pressure)		0.590	
Because people don't leave me another choice (i.e., they push me to do it). (social pressure)		0.573	
To prove myself to others. (social recognition)		0.567	
To make new friends. (socializing)		0.520	
Because others encourage me to do it. (social pressure)		0.471	
To have fun in activities with others. (socializing)		0.457	
To enjoy the social aspects of exercising. (socializing)		0.441	
To spend time with friends. (socializing)		0.421	
To have a good figure. (appearance)			0.834
To improve my appearance. (appearance)			0.834

Table 1. **Rotated factor matrix of the modified Croatian version of the EMI-2 questionnaire and reliability of the retained components**

	Factors		
Items	**1**	**2**	**3**
To maintain my figure. (weight control)			0.818
Because it helps me look better. (appearance)			0.768
To look more attractive. (appearance)			0.754
Because it helps me control my body weight. (weight control)			0.735
Because exercise helps me burn calories. (weight control)			0.724
To lose weight. (weight control)			0.670
To avoid health problems. (prevention of health issues)			0.418
To avoid heart diseases. (prevention of health issues)			0.396
To avoid diseases. (prevention of health issues)			0.393
Eigenvalue	**12.873**	**6.396**	**5.246**
% of Variance Explained	**26.820**	**13.325**	**10.230**
Cronbach α Coefficient	**0.886**	**0.751**	**0.781**

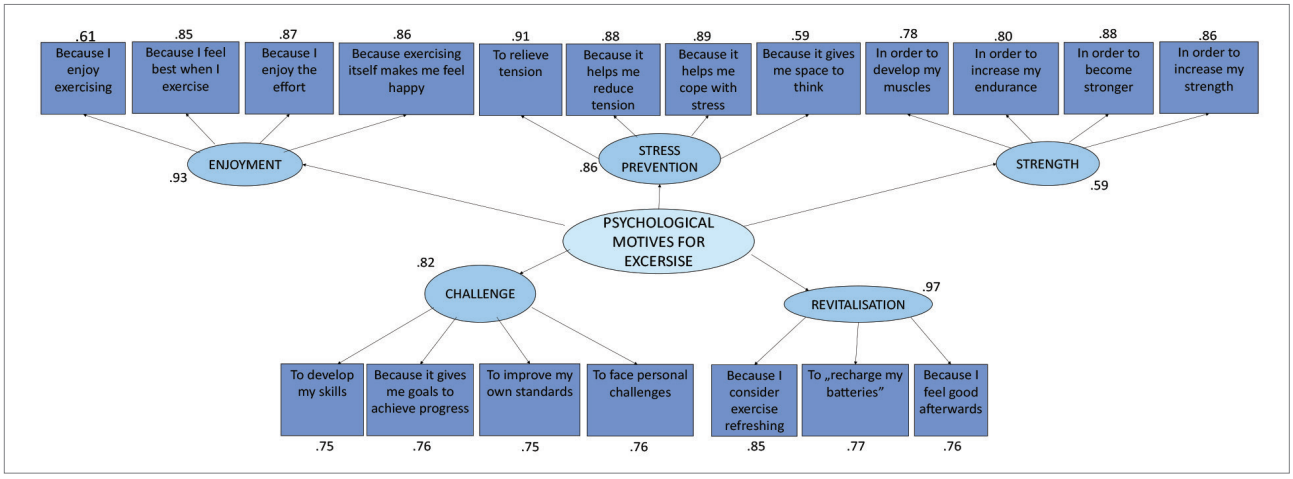

Figure 2. **Confirmatory factor analysis of psychological exercise motivation variables**

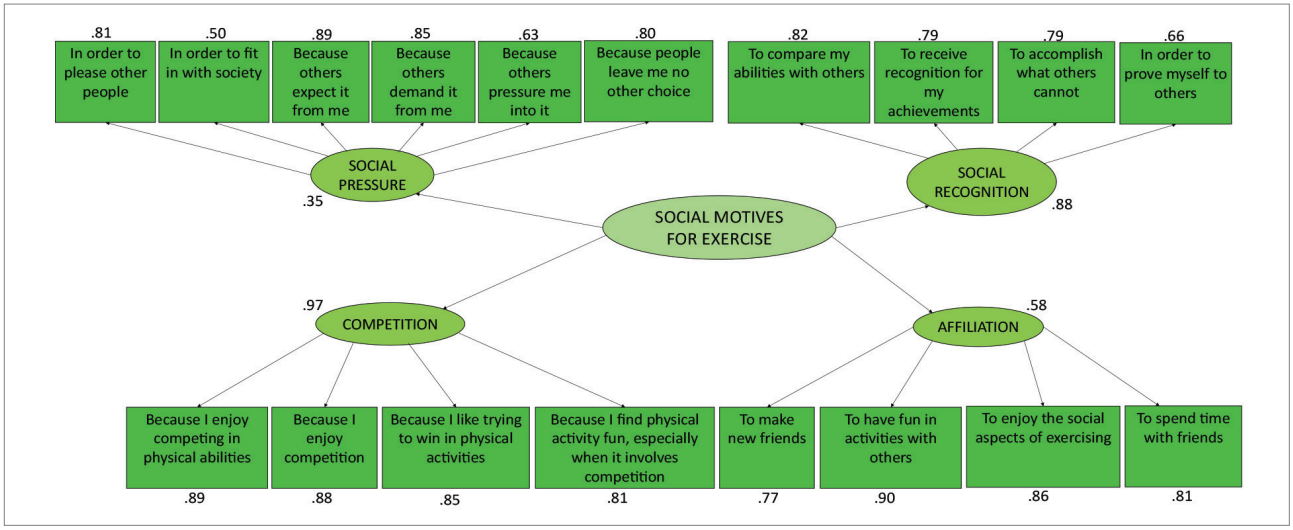

Figure 3. **Confirmatory factor analysis of social exercise motivation variables**

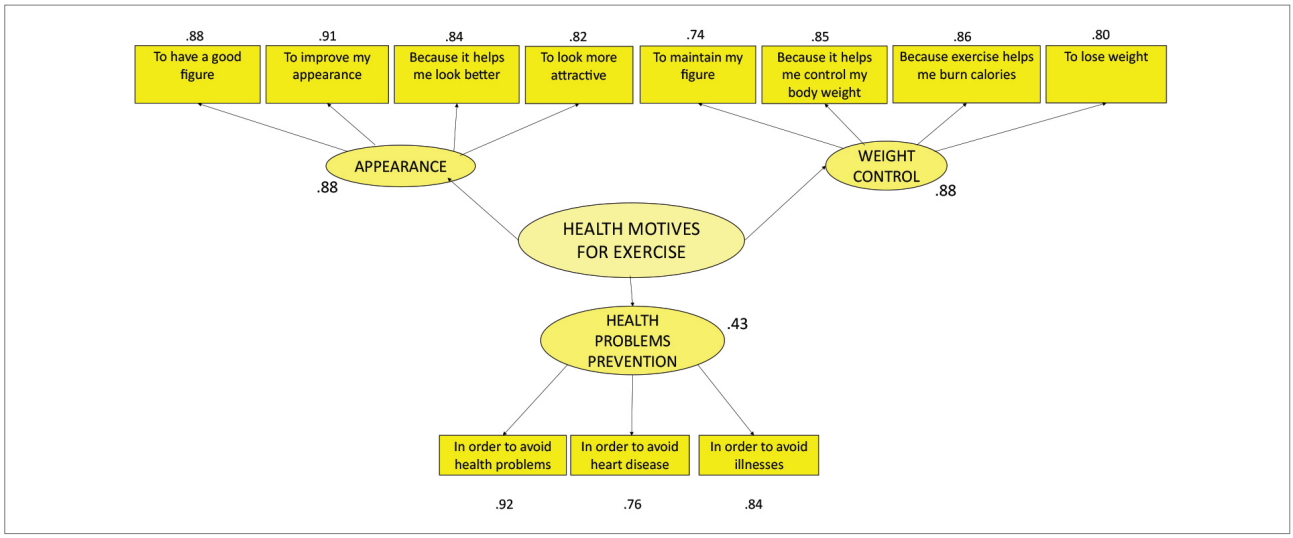

Figure 4. **Confirmatory factor analysis of health exercise motivation variables**

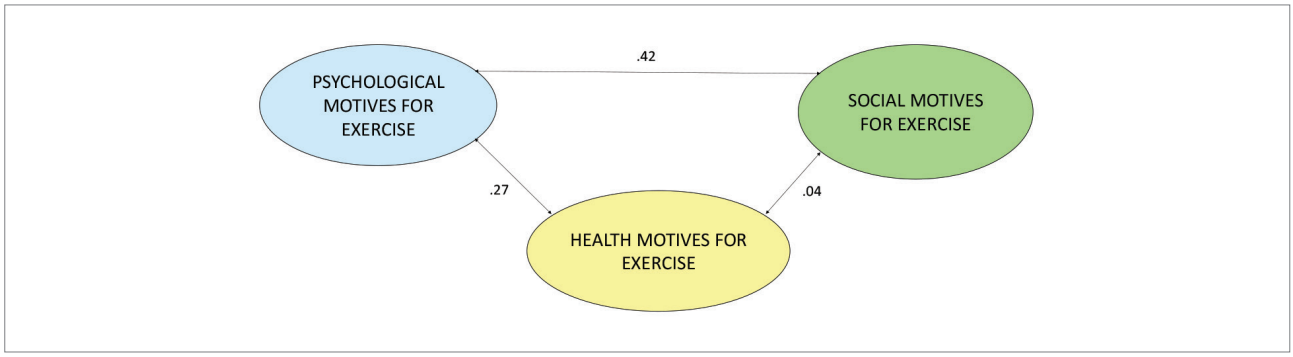

Figure 5. **Correlations between psychological, social, and health exercise motivation factors**

Table 2. **Fit indices of the higher-order exercise motivation model**

χ^2	df	p	χ^2/df	CFI	NFI	IFI	RMSEA	90% confidence interval	PClose
5814.650	1065	0.000	5.46	0.898	0.878	0.898	0.059	0.057-0.060	0.000

Regarding the correlations between higher-order factors (Figure 5), the strongest positive correlation was observed between psychological and social motives for exercise (r = 0.42, $p < 0.01$), followed by the correlation between psychological and health motives (r = 0.27, $p < 0.01$). Finally, the weakest and almost negligible correlation was recorded between social and health motives for exercise (r = 0.04, $p > 0.05$).

Lastly, the model fit indices for the higher-order confirmatory model of exercise motives (Table 2) indicated the need for model refinement. While a significant chi-square value is expected with such a large sample size and therefore provides limited information about model fit, the relative χ^2 (chi-square/df ratio) should ideally be below 5, and the CFI, NFI, and IFI indices should exceed 0.90. Additionally, the RMSEA value indicative of a good model fit should be below 0.05.

Although all values were borderline, in the next step we excluded the variables that showed the lowest loadings with the higher-order factors, in order to ex-

amine whether this would improve the quality of the model. After their exclusion, total number of manifest variables kept in the model was 32.

Regarding the part of the model related to *psychological motives for exercise* (Figure 6), the manifest variables "Because I enjoy exercising" (0.61), which belonged to the *enjoyment* factor, and "Because it gives me space to think," which belonged to the *stress prevention* factor, were removed. In addition, the *strength* factor was excluded, as it not only showed the lowest loading but also had the weakest conceptual connection to the group of psychological motives for exercise. After these exclusions, all factor loadings exceeded 0.75.

In the part of the model concerning *social motives* (Figure 7), the manifest variable "To prove myself to others," belonging to the *social recognition* factor, and the latent variable *social pressure* were removed. The resulting loadings of manifest variables were all above 0.73, with the lowest loading observed for the *affiliation* factor.

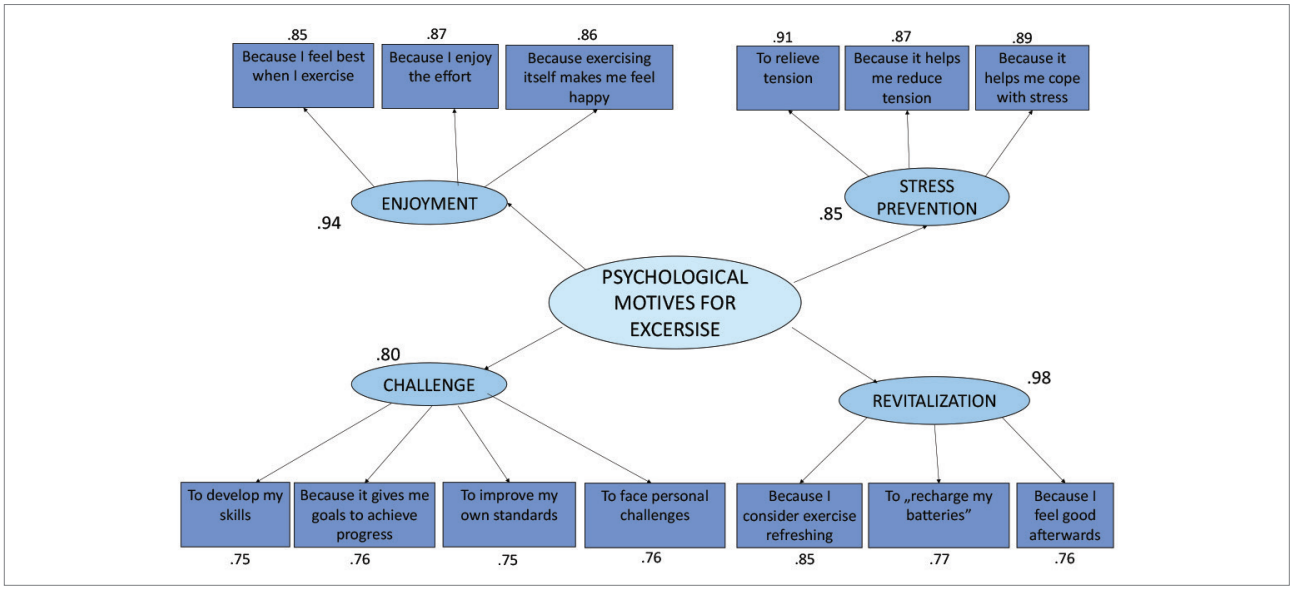

Figure 6. **Confirmatory factor analysis of modified psychological exercise motivation variables**

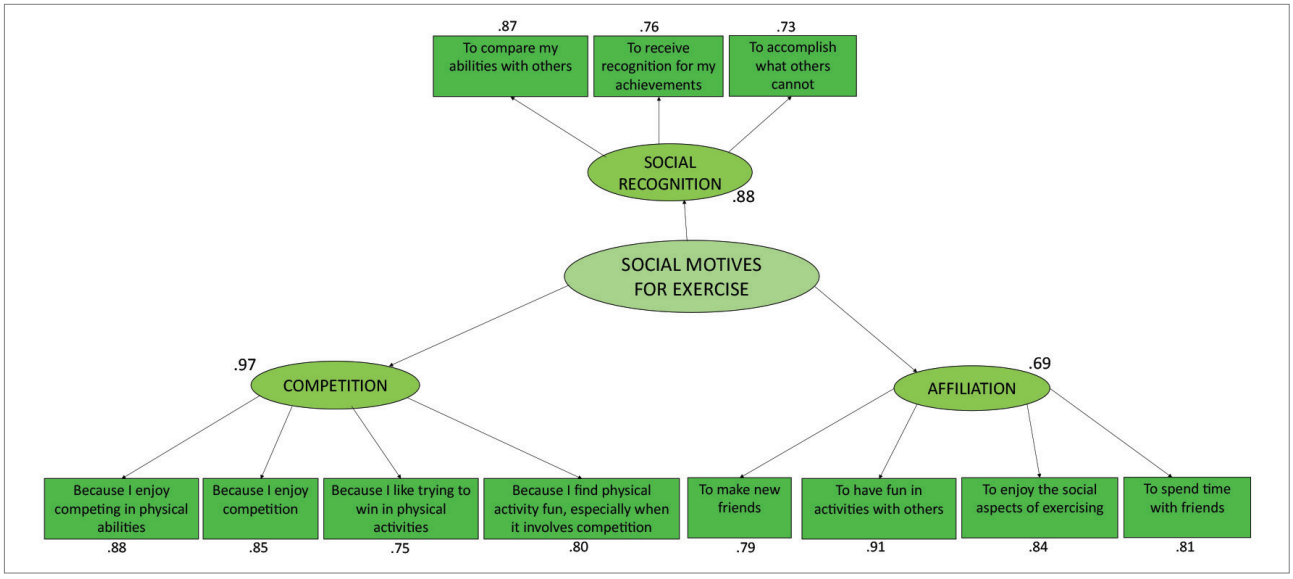

Figure 7. **Confirmatory factor analysis of modified social exercise motivation variables**

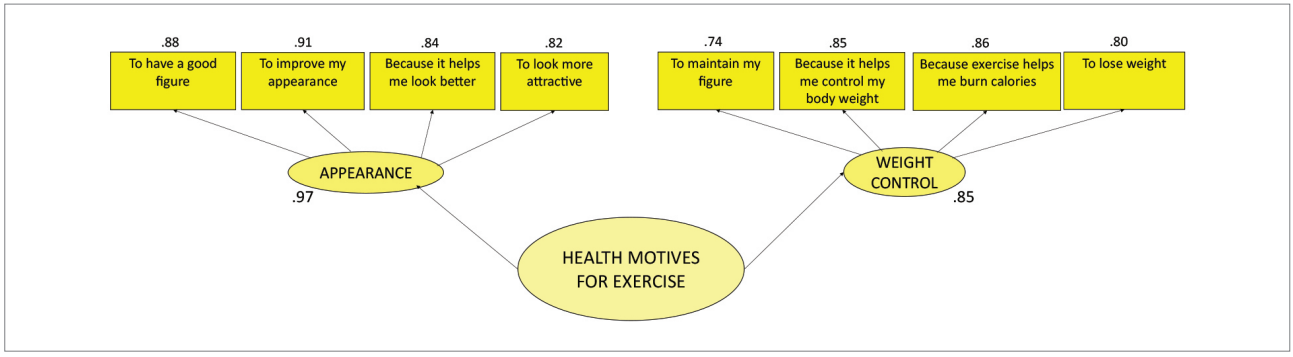

Figure 8. **Confirmatory factor analysis of modified health exercise motivation variables**

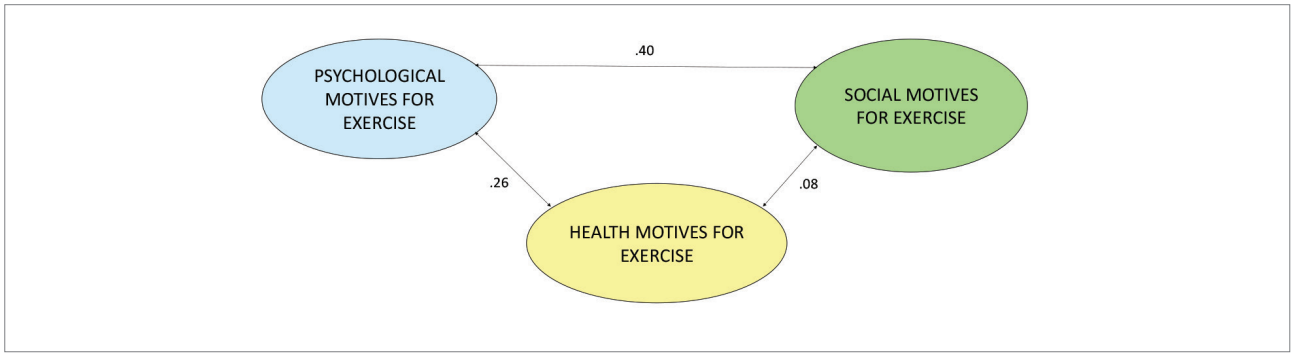

Figure 9. **Correlations between psychological, social, and health exercise motivation factors after model modification**

From the part of the model related to *health motives* (Figure 8), the factor *prevention of health problems* was excluded, as it showed the weakest association with the higher-order factor. This step further simplified and strengthened the higher-order model of exercise motives.

Simplifying the model did not substantially affect the correlations between higher-order factors (Figure 9). The strongest correlation remained between the factor representing psychological motives and that representing social motives ($r = 0.40$, $p < 0.01$), while the weakest correlation was between social and health motives ($r = 0.08$, $p > 0.05$).

What was of primary interest was the change in model fit indices after simplification. As shown in Table 3, the simplified model demonstrated better fit.

Although the χ^2 statistic, relative χ^2 (χ^2/df), and RMSEA (> 0.05) remained slightly above traditionally stricter thresholds, these indices are sensitive to sample size and model complexity. In most real-world applications, SEM models often exceed these cut-offs without undermining overall validity. On the other hand, relative fit indices such as CFI, NFI, and IFI measure the improvement of the model compared to the "null" or independent model. The obtained values (CFI = 0.92, NFI = 0.91, IFI = 0.92) surpass the conventional cut-off (≥ 0.90), indicating a good level of fit with the expected data pattern.

Table 3. **Fit indices of the modified higher-order exercise motivation model**

χ^2	df	*p*	χ^2/df	CFI	NFI	IFI	RMSEA	90% confidence interval	PClose
2807.660	456	0.000	6.15	0.927	0.914	0.927	0.063	0.061-0.065	0.000

Finally, the reliability of the higher-order factors created in this way was tested (Table 4). Despite the reduced number of manifest variables, the reliability of all three higher-order factors proved to be very high and satisfactory.

Table 4. **Reliability of the modified higher-order exercise motivation variables**

Variable	Psychological motives for exercise	Social motives for exercise	Health motives for exercise
Cronbach α	0.934	0.919	0.922

Discussion

The finding of a moderate positive correlation between psychological and social motives suggests that these two categories of motivation tend to support one another. Students who exercise because they enjoy it, feel better afterward, or use it to manage stress are also more likely to value social elements such as recognition, shared activity, or affiliation. This pattern aligns well with Self-Determination Theory, which emphasizes that motivation is strengthened when needs for competence, autonomy, and relatedness are jointly satisfied. In this case, the internal satisfaction associated with exercise seems to complement the social dimension, creating a mutually reinforcing motivational framework. Such interplay helps explain why students who are psychologically motivated often remain engaged in social contexts of physical activity as well.

Based on the conducted analysis, it is evident that the 54 manifest variables from which the authors of the EMI-2 questionnaire initially extracted 14 latent variables can validly be reduced, through factor analysis, to three latent variables representing groups of social, psychological, and health-related motives. The three obtained latent factors (social, psychological, and health motives), derived from 32 kept manifest variables, demonstrated high internal consistency, indicating the stability and reliability of this model.

In research focusing on motivation and other psychological variables in sport, the importance of simplified questionnaires with fewer manifest variables has become increasingly apparent. Such questionnaires reduce respondents' cognitive load, resulting in more accurate and reliable data. Overly complex questionnaires, on the other hand, may confuse participants and create ambiguities during responding, which can ultimately lead to less precise results (29).

Studies also show that reducing the number of variables allows for more accurate measurement of current motivational states rather than only stable traits, thereby making these instruments more useful across diverse contexts (30). This approach encourages more intuitive and quicker responses, which increases the precision of the results. Measuring motivation is of great importance, as it enables coaches, psychologists, and researchers to understand the key drivers of physical activity. Based on such assessments, personalized programs can be developed to encourage long-term participation, particularly through interventions that support autonomy, competence, and relatedness (20).

Moreover, the simplified structure facilitates data analysis and interpretation, which is particularly beneficial for applied research and for working with populations outside academic settings. In practical terms, shorter and clearer questionnaires can be more easily integrated into routine evaluations in sports clubs, healthcare institutions, or educational settings, thereby enhancing their utility for coaches, teachers, and other professionals.

Although research exclusively on students represents a certain limitation of the study, as motives may change throughout the lifespan, the results of this study may serve as a foundation for future research aimed at exploring specific intervention strategies based on dominant motivational factors.

Conclusion

The simplified version of the EMI-2 questionnaire provides a reliable and valid tool for measuring motives for physical activity, particularly within the context of the student population. This version facilitates easier application in both research and practical

settings and supports the development of more effective programs aimed at promoting physical activity. Future research could further examine the applicability of this structure across different populations and contexts, thereby confirming its universality and practical value.

Author contributions

Conceptualization and methodology (JB, RB); data curation and formal analysis (JB, IT); investigation and project administration (JB, RB); and writing – original draft and review & editing (JB, RB, IT). All authors have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest

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References

1. World Health Organization. Global recommendations on physical activity for health. Geneva: WHO; 2010. Available at: https://www.ncbi.nlm.nih.gov/books/NBK305057/
2. Blair SN, LaMonte MJ, Nichaman MZ. The evolution of physical activity recommendations: how much is enough? Am J Clin Nutr. 2004;79(5):913S-20S. https://doi.org/10.1093/ajcn/79.5.913S
3. Matković A, Nedić A, Meštrov M, Ivković J. Uobičajena tjelesna aktivnost studenata Medicinskog fakulteta Sveučilišta u Zagrebu. Hrvatski športskomedicinski vjesnik. 2010;25(2),87-91. Available at: https://hrcak.srce.hr/64526 [Croatian]
4. Danaei G, Ding EL, Mozaffarian D, Taylor B, Rehm J, Murray CJL, et al. The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. PLoS Med. 2009;6(4):e1000058. https://doi.org/10.1371/journal.pmed.1000058
5. World Health Organization. Nearly 1.8 billion adults at risk of disease from not doing enough physical activity. WHO; 2024. Available at: https://www.who.int/news/item/26-06-2024-nearly-1.8-billion-adults-at-risk-of-disease-from-not-doing-enough-physical-activity
6. Bartoluci M, Škorić S. Uloga menadžmenta u sportskoj rekreaciji. In: Neljak B, editor. 17. ljetna škola kineziologa Republike Hrvatske: zbornik radova. Zagreb: Hrvatski kineziološki savez; 2008. Available at: http://hrks.hr/skole/17_ljetna_skola/464-469.pdf [Croatian]
7. Greblo Jurakić Z, Pedišić Ž, Jurakić D. Relationship between exercise frequency and self-perceived mental health. In: Proceedings Book of 5th International Scientific Conference. Zagreb; 2008.
8. Huang TTK, Harris KJ, Lee RE, Nazir N, Born W, Kaur H. Assessing overweight, obesity, diet, and physical activity in college students. J Am Coll Health. 2003;52(2):83-6. https://doi.org/10.1080/07448480309595728
9. Butler SM, Black D, Blue CL, Gretebeck RJ. Change in diet, physical activity, and body weight in female college freshman. Am J Health Behav. 2004;28(1):24-32. https://doi.org/10.5993/AJHB.28.1.3
10. Clemente FM, Nikolaidis PT, Martins FML, Mendes RS. Physical activity patterns in university students: Do they follow the public health guidelines? PLoS One. 2016;11(3):e0152516. https://doi.org/10.1371/journal.pone.0152516
11. Jurakić D, Pedišić Ž, Andrijašević M. Physical activity of Croatian population: cross-sectional study using International Physical Activity Questionnaire. Croat Med J. 2009;50(2):165-73. https://doi.org/10.3325/cmj.2009.50.165

12. Pedišić Ž, Rakovac M, Titze S, Jurakić D, Oja P. Domain-specific physical activity and health-related quality of life in university students. Eur J Sport Sci. 2014;14(5):492-9. https://doi.org/10.1080/17461391.2013.844861
13. Alić J. Povezanost tjelesne aktivnosti studentica, samoprocjene zdravlja i zadovoljstva tjelesnim izgledom [Doktorska disertacija]. Kineziološki fakultet Sveučilišta u Zagrebu; 2015. Available at: https://dr.nsk.hr/islandora/object/kif:379/datastream/PDF/download [Croatian]
14. Andrijašević M, Ciliga D, Jurakić D. Is Sports Recreation Important to University Students? Collegium antropologicum. 2009;33(1):163-8. Available at: https://hrcak.srce.hr/39547
15. Buntić L. Kineziološka aktivnost u strukturi slobodnog vremena studenata zagrebačkog Sveučilišta. In: Findak V, editor. 15. ljetna škola kineziologa Republike Hrvatske: zbornik radova. Zagreb: Hrvatski kineziološki savez; 2006. Available at: https://www.hrks.hr/skole/15_ljetna_skola/14.pdf [Croatian]
16. Andrijašević M, Paušić J, Bavčević T, Ciliga D. Participation in leisure activities and self-perception of health in the students of the University of Split. Kinesiology. 2005;37(1):21-31.
17. André N, Grousset M, Audiffren M. A behavioral perspective for improving exercise adherence. Sports Med Open. 2024;10(1):56. https://doi.org/10.1186/s40798-024-00714-8
18. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68-78. https://doi.org/10.1037110003-066X.55.1.68
19. Ryan RM, Williams GC, Patrick H, Deci EL. Self-determination theory and physical activity: The Dynamics of Motivation in Development and Wellness. Hell J Psych. 2009;6(2):107-24. Available at: http://selfdeterminationtheory.org/SDT/documents/2009_RyanWilliamsPatrickDeci_HJOP.pdf
20. Teixeira PJ, Carraça EV, Markland D, Silva MN, Ryan RM. Exercise, physical activity, and self-determination theory: a systematic review. Int J Behav Nutr Phys Act. 2012;9:78. https://doi.org/10.1186/1479-5868-9-78
21. Wang JCK, Hagger MS. Self-determination theory in physical activity contexts. In: Ryan RM, editor. The Oxford Handbook of Self-Determination Theory. Oxford Academic; 2023. https://doi.org/10.1093/oxfordhb/9780197600047.013.37
22. Espada M, Romero-Parra N, Bores-García D, Delfa-De La Morena JM. Gender differences in university students' levels of physical activity and motivations to engage in physical activity. Educ Sci. 2023;13(4):340. https://doi.org/10.3390/educsci13040340
23. Lin B, Teo EW, Yan T. Development and validation of Chinese university students' physical activity motivation scale under the constraint of physical education policies. Front Psychol. 2022;13:722635. https://doi.org/10.3389/fpsyg.2022.722635
24. Markland D, Ingledew DK. The measurement of exercise motives: Factorial validity and invariance across gender of a revised Exercise Motivations Inventory. Brit J Health Psych. 1997;2(4),361-76. https://doi.org/10.1111/j.2044-8287.1997.tb00549.x
25. Markland D. The Exercise Motivations Inventory. Psychol. 1999;3:477-89. Available at: https://www.livingstrong.org/articles/ExerciseMotivations.pdf
26. Državni zavod za statistiku RH. Visoko obrazovanje u 2017. Zagreb: Državni zavod za statistiku; 2018. Available at: https://www.dzs.hr/Hrv_Eng/publication/2018/SI-1621.pdf [Croatian]
27. Vlašić J, Barić R, Oreb G, Kasović M. Exercise motives in middle-aged and elderly female population. In: Milanović D, Prot F, editors. Proceedings of the 3rd International scientific conference Kinesiology - new perspectives. Zagreb: Kineziološki fakultet; 2002.
28. Markuš D. Razvoj modela za predviđanje životnog stila srednjoškolaca na osnovi stavova prema kineziološkim aktivnostima [Doktorska disertacija]. Zagreb: Kineziološki fakultet; 2011. [Croatian]
29. Brown A, Maydeu-Olivares A. How IRT can solve problems of ipsative data in forced-choice questionnaires. Psychol Methods. 2013;18(1):36. https://doi.org/10.1037/a0030641
30. Blaise M, Marksteiner T, Krispenz A, Bertrams A. Measuring motivation for cognitive effort as state. Front Psychol. 2021;12:785094. https://doi.org/10.3389/fpsyg.2021.785094