

Psychometric evaluation of the Croatian version of the revised sports motivation scale in youth athletes

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Abstract:

Background: Motivation is one of the key psychological attributes for success in competitive sports and for continuing participation in non-competitive sports and other forms of physical activity. Therefore, assessing the motivation profile in both competitive and recreational athletes is necessary. The psychometric properties of the revised sports motivations scale (SMS-2) have not been assessed in the Croatian language. This study aimed to evaluate the psychometric properties of the Croatian version of the SMS-2, including factor structure, internal consistency, test-retest reliability, and discriminative validity among Croatian youth athletes participating in various sports. **Methods:** The research involved 83 participants (44 females and 39 males) aged 14-23 years. Data were collected on demographic variables, sports-related factors, and sports motivation measured by the SMS-2 translated into Croatian. Exploratory factor analysis with principal component analysis was used to determine the factor structure of the SMS-2-CRO. Internal reliability was checked using Cronbach's alpha; composite reliability, using McDonald's omega; and test-retest reliability, using the intraclass correlation coefficients and 95% confidence intervals. Gender and sport type differences were calculated by the Mann-Whitney U test. **Results:** Factor analysis revealed four independent main factors that explained 69.98% of the variance. The internal consistency of the Croatian version of the SMS-2 was acceptable for all the subscales (Cronbach's α up to 0.86), except for the introjected regulation subscale. Similarly, composite reliability was acceptable for all the subscales (for which McDonald's ω reached 0.87), except for introjected regulation. **Conclusions:** Compared with female athletes, the included athletes had high autonomous motivation, while males had higher levels of external regulation. The SMS-2-CRO has satisfactory psychometric properties, and it can be used in future research and by coaches to optimize athlete performance. What is more, this study has broader applications since the Croatian language is very similar to languages in the neighboring countries (i.e., Serbia, Montenegro, Bosnia and Herzegovina), which means that it could be used in those countries as well.

Key Words: adolescents, self-determination theory, sport psychology, recreation, exercise

Introduction

Being involved in sports or any type of physical activity regularly has numerous positive outcomes, such as increased fitness, vitality, and self-esteem, and is considered one of the pillars of lifestyle medicine (Rippe, 2018). Even though the majority of people know the positive benefits of being physically active, many people do not continue practicing sports. Thus, numerous studies have been conducted to determine what lies in the context of regular sports participation (Moradi, Bahrami, & Dana, 2020; R. J. Vallerand, Deci, & Ryan, 1987). Having a better understanding of these variables can aid in the development of long-term sports participation plans. Determining the motivating factors is especially crucial for encouraging regular participation in physical activities (Popovych et al., 2024). Motivation in sports refers to the presence of processes and elements that encourage athletes to be active or passive in various settings (Clancy, Herring, & Campbell, 2017). Over the last four decades, research has shown that the type of athlete motivation influences their decisions about which activities to participate in, which activities to continue participating in, how much effort to expend on the activity, what the desired level of performance is, and how activity participation can influence their well-being (Deci & Ryan, 2013; Hagger & Chatzisarantis, 2007; Popovych et al., 2023; Rodrigues et al., 2021). The aforementioned statement follows self-determination theory (SDT), which is the most comprehensive and consistent concept for understanding athletic motivation in a variety of circumstances (Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). Researchers can learn more about the internal and external forces influencing athletes' behaviour by using SDT. In sporting contexts, this knowledge may then be applied to develop more potent motivating techniques.

According to SDT, athletes are often driven by either external (e.g., rewards, pressure from opponents, or other people's opinions) or internal (e.g., curiosity, desire to progress, or self-improvement) causes (Deci & Ryan, 2013). It also illustrates how different motivations are related to participation in physical exercise and sports in various ways (Vallerand & Losier, 1994). Motivation is depicted as a continuum in SDT, spanning from

amotivation (absence of motivation) to extrinsic (managed) motivation to intrinsic motivation, which is the most autonomous and self-determined (Deci & Ryan, 2013). This continuum aids in understanding athletes' participation in sports and in classifying their motivation levels. Knowing an athlete's position on this continuum might help coaches offer more specialised support. To measure sports motivation according to the SDT, the Sports Motivation Scale (SMS) was developed in 1995 (Pelletier et al., 1995). The SMS consists of 28 items with a 7-factor structure that includes three types of intrinsic motivation, three types of extrinsic motivation, and amotivation. The original SMS was confirmed to be valid in different populations and different types of sports and was translated into multiple languages (L.G. Pelletier et al., 2013). However, the original SMS did not include integrated regulation, and it was believed that the scale does not represent all constructs of the SDT without such regulation (Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson, 2007). Therefore, the panel of experts decided to modify some items of the SMS and improve its structure by creating the revised SMS (SMS-2) (L.G. Pelletier et al., 2013). The SMS-II showed improved factor and construct validity and better reliability than did the original SMS and proposed that it adequately assesses motivation according to the SDT framework (Pelletier et al., 2013). The SMS-2 is now a more complete instrument for evaluating sports motivation thanks to these improvements. It overcomes earlier shortcomings and provides a more sophisticated comprehension of the motivational characteristics of athletes.

The SMS-II is divided into six subscales: amotivation (the least self-determined kind of motivation); external motivation (which comprises external, introjected, identified, and integrated regulation); and intrinsic motivation (the most autonomous sort of motivation) (Pelletier et al., 2013). Amotivation is the least self-determined form of behavior control and refers to the state in which an individual lacks the urge to act. Extrinsic motivation is divided into four constructs: (i) external regulation; (ii) introjected regulation, representing motivation to obtain external rewards and avoid punishment; (iii) identified regulation, where behavior is initiated out of choice; and (iv) integrated regulation, the most self-determined type of extrinsic motivation. Intrinsic motivation is the first on the motivation continuum and depicts participation out of pure pleasure, fun, and enjoyment, without external pressure or expecting rewards for one's own actions (Pelletier et al., 2013). The SMS-II was validated and used in several sports (Luc G. Pelletier, Rocchi, Guertin, Hébert, & Sarrazin, 2019; Rodrigues et al., 2021). A more thorough examination of what motivates athletes is made possible by the SMS-2's thorough classification. This may be very helpful for creating customised training and incentive plans.

However, only the original SMS was adapted for the Croatian language thus far, and the psychometric properties of the SMS-2 have not been checked in the Croatian language or in the entire territory of southeastern Europe (Milavić, Milić, Jurko, Grgantov, & Marić, 2015). Therefore, the aim of this study was to determine the psychometric properties of the Croatian version of the SMS-2, including factor structure, internal consistency, test-retest reliability, and discriminative validity, in youth Croatian athletes practicing different sports. This study hypothesized that the Croatian version of the SMS-2 would have good psychometric properties and that there would be differences in the motivation variables across sport type and sex. As Croatia has great success in sports and is rapidly developing, measuring motivation could be helpful for coaches to optimize their athletes' performance. By offering a validated technique for evaluating sports motivation among Croatian youth athletes, this study seeks to close a significant gap in the literature. The results may have a big impact on improving athlete performance and development in the area.

Materials and Methods

Participants

This research included 83 participants (44 girls and 39 boys) between the ages of 14 and 23. Nine percent of the athletes were categorized as recreational (1st category), 10% participated in local competitions (2nd category), and 81% were good athletes who had at least one medal at the national championships (3rd category). Sixty-six percent of the participants participated in team sports, including soccer, basketball, and volleyball, while 34% participated in individual sports. The average years of training experience was 6.91 ± 3.77 years.

Before the study began, participants were made aware of its protocols, and they either signed an informed consent form or, in the case of participants under the age of 18, their legal guardians signed an informed consent form. The inclusion criteria were practicing sports for at least 1 year continuously and not being injured or mentally ill. The Ethical Board Faculty of Kinesiology, University of Split, approved the study (Ref. no. 2181-205-02-05-22-0012).

Variables and Procedures

In this study, the following variables were investigated: (i) demographic variables (gender and age), (ii) sports variables (sport type, sports experience, and quality of athletes), and (iii) sports motivation.

The online survey platform SurveyMonkey (SurveyMonkey, Inc., San Mateo, CA, USA) was utilized to administer the revised Sport Motivation Scale (SMS-II) to estimate sports motivation (L.G. Pelletier et al., 2013). The original questionnaire was translated into Croatian by two knowledgeable researchers. A third researcher then translated the items into English, and a native English speaker assessed the final scale. After two Croatian researchers corrected terms that they could not understand, the final versions of the questionnaires were translated into Croatian. The questionnaire consisted of 18 statements that assessed the level of motivation of

individuals toward sports, i.e., their intrinsic motivation, extrinsic motivation, and amotivation. The questionnaire is divided into 6 subscales that exhibit varying degrees of autonomy (amotivation, external, introjected, identified and integrated regulation, and intrinsic motivation) and consists of statements such as “Because learning new things about my sport gives me pleasure”, “Because people around me reward and praise me when I do sports”, and “I used to have good reasons for training, but now I wonder why I train”. Participants chose the statement on a Likert scale from 1 to 7, where 1 represented not true at all and 7 represented completely true. Participants completed the questionnaire during PE classes and university lessons using their mobile devices. The questionnaire was completed twice, 10 days apart, to determine the test-retest reliability.

Statistical analysis

Descriptive statistics included means, standard deviations, and minimum and maximum values for all included variables. The Kolmogorov–Smirnov test was used to check the normality of the distribution of the data. The reliability of the questionnaire was checked by several methods. First, the internal reliability of the total scale and the internal consistency of each item and subscale at both the test and retest points were checked using Cronbach’s alpha, with values interpreted as follows: <0.5 as unacceptable; ≥0.5 to <0.6 as poor; ≥0.6 to <0.7 as questionable; ≥0.7 to <0.8 as acceptable; ≥0.8 to <0.9 as good; and >0.9 as excellent (Bonett & Wright, 2015). The composite reliability was calculated using McDonald’s Omega, with values greater than 0.7 indicating an acceptable level (Hayes & Coutts, 2020). Finally, the test-retest reliability was determined using the intraclass correlation coefficient (ICC) and 95% confidence intervals (CIs), with ICC values <0.50 indicating low reliability, 0.50 to 0.75 indicating moderate reliability, 0.75 to 0.90 indicating good reliability, and > 0.9 indicating excellent test-retest reliability (Portney & Watkins, 2009).

To analyze the factor structure of the scale, an orthogonal varimax-type exploratory factor analysis with Kaiser’s varimax criterion and principal component analysis (PCA) were employed on 18 items of the instrument. If the loading was equal to or greater than 0.50, the item was maintained. The Kaiser–Meyer–Olkin (KMO) test and Bartlett sphericity test (Bartlett test) were used to determine sampling adequacy (Bartlett, 1950). The KMO test result should be more than 0.6, and the Bartlett test should be connected with a significant p-value (Worthington & Whittaker, 2006).

Validity was checked by using multiple Mann–Whitney U tests (as some variables were not normally distributed) to determine differences according to sex (male/female) and sport type (individual/team sport). A p value of 0.05 was set, and the statistical package Statistica (TIBCO, Palo Alto, CA) was used for all the statistical procedures.

Results

The results for all the items supported the factor analysis (KMO = 0.84, Bartlett’s test of sphericity $p < 0.001$) and revealed four independent main factors that explained 69.98% of the variance in the data. The value of the first major component of autonomous motivation (composite of intrinsic motivation and integrated and identified regulation) accounted for 38.80% of the total variance (eigenvalue = 6.98), the second (extrinsic regulation) accounted for 17.42% (eigenvalue = 3.14), the third component of amotivation accounted for 8.05% (eigenvalue = 1.45), and the fourth component accounted for 5.70% (eigenvalue = 1.03). Therefore, the first two independent main factors determined 46.66% of the total variance. The correlation matrix of the 18-item scale confirmed the SDT framework, as the variables closer to each other at the motivation continuum had higher correlation coefficients (Table 1).

Table 1. Correlations between SMS-2-CRO subscale scores

Variable	1	2	3	4	5
Amotivation	1.00				
External regulation	0.44***	1.00			
Introjected regulation	0.14	0.33**	1.00		
Identified regulation	-0.18	0.11	0.60***	1.00	
Integrated regulation	-0.26*	0.10	0.55***	0.78***	1.00
Intrinsic motivation	-0.11	0.02	0.48***	0.82***	0.66***

Note. *denotes $p < 0.05$, ** denotes $p < 0.01$, *** denotes $p < 0.001$

The reliability of the SMS-2-CRO is displayed in Table 2. At the first testing point (test), introjected regulation displayed poor internal consistency, amotivation, and external regulation displayed acceptable internal consistency, while identified regulation, integrated regulation, and intrinsic motivation had good internal consistency based on Cronbach’s alpha coefficient values. At the second testing point (retest), external and introjected regulation had unacceptable internal consistency; amotivation had questionable internal consistency; and identified regulation, integrated regulation, and intrinsic motivation had good internal consistency. Composite reliability was determined using McDonald’s omega coefficients. At the first testing point, all the motivation variables except introjected regulation had an acceptable level of composite reliability. At the second testing point, identified regulation, integrated regulation, and intrinsic motivation had acceptable composite

reliability, while the other variables were above the acceptable levels (Table 2).

The ICC values and adjacent 95% confidence intervals were used for calculating the test-retest reliability. Introjected regulation, external regulation, and identified regulation had moderate reliability, while amotivation, integrated regulation, and intrinsic motivation had good test-retest reliability (Table 2).

Table 2. Internal consistency, composite reliability, and test-retest reliability of the SMS-2-CRO

Variable	Test (n=83)		Retest (n=70)		Test-retest reliability	
	Cronbach's α	McDonald's ω	Cronbach's α	McDonald's ω	ICC	95% CI
Amotivation	0.70	0.71	0.63	0.64	0.77	0.63-0.86
External regulation	0.72	0.77	0.46	0.46	0.71	0.54-0.82
Introjected regulation	0.54	0.63	0.45	0.47	0.62	0.39-0.77
Identified regulation	0.85	0.87	0.77	0.76	0.73	0.56-0.83
Integrated regulation	0.81	0.83	0.81	0.82	0.84	0.74-0.89
Intrinsic motivation	0.86	0.86	0.90	0.90	0.84	0.74-0.89

Note. ICC – intraclass correlation coefficient, CI – confidence intervals

Descriptive statistics revealed a low level of amotivation and external regulation and a high level of intrinsic motivation in the total sample of athletes, which supports the SDT motivation continuum framework (Figure 1).

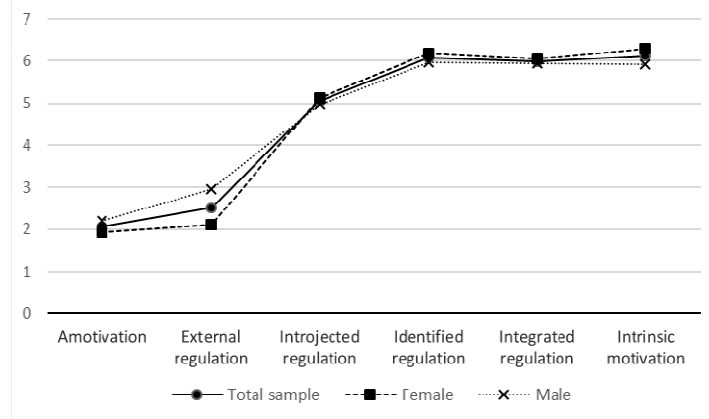


Figure 1. Motivation profile displayed on the motivation continuum for the total sample and stratified by sex. The results of the Mann–Whitney U test for determining sex differences revealed the difference between males and females in the external regulation variable, with males having greater values. Calculations of differences according to sport type did not reveal significant differences in the motivation variables between athletes from individual and team sports. Means and standard deviations are provided to clarify the observed data (Table 3).

Table 3. Differences in motivation variables according to sex and type of sport.

Motivation variables	Differences according to gender					
	Female (n=44)		Male (n=39)		MWU Test	
	Mean	SD	Mean	SD	U	p value
Amotivation	1.92	1.04	2.21	1.22	754.00	0.34
External regulation	2.11	0.85	2.97	1.34	517.50	0.00
Introjected regulation	5.12	1.05	4.97	1.19	819.50	0.73
Identified regulation	6.20	0.79	5.96	1.19	826.00	0.77
Integrated regulation	6.05	0.99	5.94	1.14	836.50	0.85
Intrinsic motivation	6.30	0.96	5.93	1.14	666.00	0.08
Motivation variables	Differences according to sport type					
	Individual (n=28)		Team (n=55)		MWU Test	
	Mean	SD	Mean	SD	U	p value
Amotivation	1.82	0.99	2.18	1.19	624.50	0.16
External regulation	2.32	1.16	2.62	1.19	652.00	0.26
Introjected regulation	5.21	1.35	4.97	0.97	610.50	0.13
Identified regulation	6.17	1.05	6.04	0.98	677.50	0.38
Integrated regulation	6.11	1.04	5.94	1.07	684.50	0.41
Intrinsic motivation	6.00	1.24	6.19	0.96	726.00	0.68

Discussion

This study aimed to investigate the psychometric properties of the SMS-2-CRO questionnaire in Croatian youth athletes. The results of this study revealed several important findings:

- The SMS-2-CRO questionnaire had satisfactory factor validity, overall acceptable internal consistency, composite reliability, and test-retest reliability.
- The included athletes had an optimal motivation continuum, with lower values of amotivation and external regulation related to high values of intrinsic motivation.
- There was a greater level of external regulation in males than in female athletes, while the motivation variables did not differ according to the type of sport.

Psychometric properties of the SMS-2-CRO

Factor analysis revealed four main factors of the SMS-2-CRO. Previous studies that adapted the SMS-2 to other languages reported appropriate factor structures and alignments with the motivation continuum. For example, studies on Swedish, English, and French athletes confirmed a six-factor structure (Luc G. Pelletier et al., 2019; Stenling, Ivarsson, Johnson, & Lindwall, 2015). However, a study of Spanish adolescent athletes reported that the factor of introjected regulation lacks adequate discriminant validity; thus, a five-factor model was proposed as the best solution (Viciana, Mayorga-Vega, Guijarro-Romero, Martínez-Baena, & Blanco, 2017). In support of the results of our study, a study on Czech adaptation in SMS-2 patients revealed strong mutual correlations between intrinsic, integrated, and identified regulatory effects (Jelínek, Květon, & Burešová, 2021). Given the proximity of these components along the self-determination continuum and the fact that they are all types of autonomous motivation, it was both empirically and conceptually appropriate to investigate a modified model in which these elements were compressed into a single one (Jelínek et al., 2021). Therefore, according to the findings of the Czech study, we also proceeded with the analysis based on the four-factor model, as it fully corresponds to the SDT motivation framework.

The most relevant information, according to the SDT, is located on the diagonal, where relations between adjacent dimensions may be identified. While the relationships between intrinsic motivation and integrated regulation, between integrated regulation and identified regulation, and between external regulation and amotivation are clearly consistent and positive, the relationships between introjected regulation and both the neighboring dimensions identified and external regulations are far more heterogeneous. Another noteworthy result concerns the three aspects of autonomous motivation. The average correlation coefficients are more than 0.80, and these features appear to be experimentally indistinguishable. The findings revealed positive correlations between the more autonomous subscales and negative associations between the more regulated subscales, which is also supported by a study using the SMS-2 in adolescent Czech athletes (Jelínek et al., 2021). The internal consistency of the SMS-2-CRO was acceptable for all the subscales except for the introjected regulation subscale. Similarly, composite reliability was acceptable for all subscales except for introjected regulation, which was above the threshold value. The introjected regulation subscale was also problematic in a Spanish study where it did not have good validity (Viciana et al., 2017). The results indicated moderate to good test-retest reliability, which indicated that the SMS-2-CRO has sufficient temporal stability in young Croatian athletes from various sports. Specifically, controlling the likeness of the same person's replies to the questionnaire at different times but in the same experimental setting is what the temporal stability of the questionnaire entails. Similarly, a recent study of athletes from Tunis reported good temporal stability, with ICC values reaching up to 0.96 (Baaziz et al., 2023). Collectively, the results showed that the SMS-2-CRO has sufficient internal consistency, composite reliability, and test-retest reliability in the population of youth Croatian athletes.

Motivation profile of young Croatian athletes and differences according to sex and type of sport

The results revealed a low level of amotivation and external regulation and a high level of intrinsic motivation in the included athletes, which supports the SDT motivation continuum framework. This can be explained by the fact that the average years of sports participation of the included young athletes was 7 years, which means that they were committed to their sport and that they had reasons to continue participation. Namely, persons with greater autonomous motivation are more likely to continue playing their sport and are less likely to drop out. Indeed, research on athletic students has shown a link between the intention to continue engaging in sports and autonomous motivation (Keshtidar & Behzadnia, 2017). Similarly, a study of adolescent athletes from several sports revealed that intrinsic motivation led to sports practice adherence (Almagro, Sáenz-López, Moreno-Murcia, & Spray, 2015).

Keeping this in mind, recent research on volleyball players revealed a favorable association between autonomous motivation and satisfaction, which most likely keeps athletes engaged in their sport (Mosqueda, López-Walle, Gutiérrez-García, García-Verazaluce, & Tristán, 2019). Indeed, research on Hungarian teenage athletes investigating commitment and motivation revealed a link between intrinsic motivation and sports commitment (Berki, Piko, & Page, 2019). Moreover, a study on youth wrestlers noted that better wrestlers had greater intrinsic motivation than lower-level wrestlers (Skugor et al., 2023). According to the aforementioned findings, autonomous motivation not only encourages individuals to be more devoted and strive for greater achievements owing to personal pleasure but also promotes perseverance in sports. We may theorize that

perseverance is related to autonomous motivation since athletes enjoy, have fun, and are content with themselves when participating in sports.

Our results did not reveal significant differences in the motivation profiles of team and individual sports athletes. In support of our results, a study using the SMS-2 in athletes from Tunis also did not report differences in motivation variables between individual and team sports athletes (Baaziz et al., 2023). Thus, the theory that athletes differ in motivation according to sport type was not proven in our study of Croatian youth athletes, which can be explained by the optimal motivation continuum and the high self-determined motivation subsets. This latter means that athletes are motivated out of fun and enjoyment and do not participate in sports by seeking external awards. Furthermore, the difference between males and females is noted in the external regulation variable, with males having greater values. Similarly, a study of Spanish athletes using the SMS-2 revealed that the external regulation factor was significantly lower in females than in male athletes (Viciano et al., 2017). Similarly, it was previously reported that males score higher on competitiveness, win and goal orientation, and sensation seeking, while females place more importance on friendship (Braathen & Svebak, 1992). Therefore, it can be stated that, compared with female athletes, male athletes in our sample placed more importance on external rewards.

Limitations and strengths

One limitation of this study is that we included only young athletes. Thus, future studies should include athletes from other age groups to be able to fully determine the psychometric properties of the SMS-2-CRO. The strength of this research is that this is the first study to evaluate the validity and reliability of the SMS-2-CRO, which will enable the use of this scale in young Croatian athletes in future studies.

Practical Applications

Knowing that motivation is important for athletes to be devoted maximally to their sports performance, instruments for assessing this topic are very important. Specifically, the SMS-2-CRO could be used by coaches and sports psychologists on athletes in Croatia to identify the type of motivation that drives the actions of athletes. Consequently, coaches could optimize their motivation profile toward more autonomous motivation, as this motivation is connected with greater persistence and devotion to reach optimal sports performance.

Conclusions

The SMS-2-CRO questionnaire had satisfactory factor validity, internal consistency, composite reliability, and test-retest reliability, which means that it can be used to assess motivation in Croatian athletes. The athletes showed low levels of controlled motivation and high levels of autonomous motivation, according to the findings, indicating an ideal motivation profile in line with the self-determination theory (SDT) framework. This shows that rather than being motivated by external demands or incentives, Croatian young athletes are primarily motivated by internal variables like personal growth, happiness, and self-improvement. The study revealed notable disparities in motivation across genders, as male athletes shown greater degrees of external control in contrast to their female counterparts. This knowledge can help develop focused motivating techniques to deal with these variations. Nonetheless, motivation factors did not considerably change based on the kind of sport, indicating that the SMS-2-CRO may be used consistently to a variety of sports. Satisfactory psychometric qualities of the SMS-2-CRO highlight its practical applicability as well as validating its usage in research. This test may be used by coaches and sports psychologists to evaluate and improve athletes' motivation, which will eventually improve performance and encourage long-term participation in sports. The SMS-2-CRO makes a substantial contribution to both the theoretical understanding of athlete motivation and the actual attempts to enhance athletic performance by offering a trustworthy measure of sports motivation. As a result, this study advances the field of sports psychology and provides a useful tool for enhancing the motivating techniques used by Croatian coaches. What is more, this study has broader applications since the Croatian language is very similar to languages in the neighboring countries (i.e., Serbia, Montenegro, Bosnia and Herzegovina), which means that it could be used in those countries as well.

Informed Consent from the Participants' Legal Guardians (if the participants were minors)

Written informed consent to participate in this study was provided by the participants' legal guardian.

Author Contributions

B.G. and K.S. conceived the idea. B.G. developed the theory and performed the computations. M.S. collected the data. B.G. and K.S. wrote the manuscript text.

Conflict of Interest

The authors declare no conflict of interest.

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