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Research article

PRELIMINARY CONFIRMATORY FACTOR ANALYSIS OF THE SERBIAN VERSION OF THE ORIGINAL SPORT MOTIVATION SCALE (SMS-28)

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Abstract. *Self-determination theory is a dominant conceptual frame in the research of sports motivation, while the original Sport motivation scale, SMS-28, is adapted in many languages. The aim of this research was to translate and adapt the original scale into the Serbian language and to conduct a preliminary factor analysis in order to confirm a seven-factor solution. The sample included 608 active athletes on an international, national or lower competition level in different individual or team sports, of both genders, with a Median value for age of 18 years, an average of 10 years of sports experience. The results indicated good internal consistency of the Serbian version (Mean alpha 0.86), with only an amotivation subscale with a low alpha value (0.54). A simplex pattern of the self-determination continuum was confirmed. The confirmatory factor analysis suggested some good fit indices ($X^2/df=4.26$; SRMR=0.07; RMSEA=0.07; GFI=0.85; AGFI=0.81), while some indices did not meet the criteria of good model fit (CFI=0.81; NFI=0.77). We suggest further research should examine the scale on a more homogeneous sample in regard to competition level.*

Key words: *motivation, sport motivation scale, intrinsic motivation, extrinsic motivation, factor structure*

INTRODUCTION

Motivation is "a light motive" of many sports phenomena, in youth sport as well as in elite sport (Cox, 2005; Horn, 2008; Jowett & Lavallee, 2007; Weinberg & Gould, 1999).

Self-determination theory is one of the most influential theories of motivation to participate in sport. According to the theory (Deci, 1996; Deci & Ryan, 1985, 1999; Ryan,

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1995; Ryan & Deci, 2000, 2004, 2006), motivation is interpreted as a continuum. The more a social norm, or the value which is its essence, is internalized the more it becomes a part of the integrated self and a basis of self-determined behavior.

At one end of the motivational continuum, there is a state of complete lack of intention for action – *amotivation*. When lacking motivation, people either do nothing at all or carry out an activity passively and without any conscious intent. *Intrinsic motivation* is at the other end of the continuum, distinct from amotivation. Behavior which is intrinsically motivated represents a prototype of autonomous and self-determined behavior. When intrinsically motivated, people are involved in the activity due to interest for the activity itself and an inner satisfaction which ensues from participating in this activity. There are three types of intrinsic motivation: *intrinsic motivation to know*, *intrinsic motivation toward accomplishments* and *intrinsic motivation to experience stimulation* (Deci & Ryan, 1985).

Intrinsic motivation to know relates to several constructs such as curiosity, exploration, the epistemic need to know and to understand. *Intrinsic motivation toward accomplishments* can be defined as engaging an activity for the pleasure and satisfaction experienced when one attempts to accomplish or create something. This type of intrinsic motivation is related to psychological constructs such as mastery motivation, efficacy motivation, task-orientation. *Intrinsic motivation to experience stimulation* occurs when someone is engaged in an activity in order to experience excitement, sensory pleasures, aesthetic experiences etc. This type of intrinsic motivation is related to the concept of flow and peak performance (Deci & Ryan, 1999).

Between amotivation and intrinsic motivation there are several types of *extrinsic motivation*. *External regulation* is the least autonomous type of extrinsic motivation and represents a classic example of motivation with rewards and punishments. The locus of control is completely external. *Introjected regulation* implies that the external regula is internalized, but is not accepted as its very own in a deeper sense. This is a type of extrinsic motivation which is partly internalized but has not become a part of the integrated self. Introjection as a form of internalization is considered largely controlling. By applying behavior based on introjection, individuals endeavor to avoid feelings of guilt and shame or to achieve a contingent self-respect, i.e. self-evaluation which depends on certain results. *Regulation by identification* is to a certain extent a more self-determined type of extrinsic motivation than the previous two. When this type of extrinsic motivation is present, there is a conscious evaluation of the aim of behavior or regulae and the acceptance of behavior as personally important. Identification is an important aspect of the process of transforming the external regula into a genuine self-regula (Deci, 1996).

In order to measure motivational continuum in sport, the sport motivation scale (SMS) was designed (Briere et al., 1995; Pelletier et al., 1995). The scale consists of seven subscales that measure three types of intrinsic motivation (to know, to accomplish things and to experience stimulation), three types of extrinsic motivation (external, introjected and identified) and amotivation. Each subscale is measured by 4 items on the scale. Early research of a French and English version showed that seven subscales display the presence of the self-determination continuum. Support for this continuum was obtained through the display of a simplex pattern where adjacent subscales have positive correlations, while the subscales at the opposite ends of the continuum have the most negative correlations. The internal consistency of the subscale was assessed by Cronbach's alpha and the values varied from 0.74 to 0.80 (Pelletier et al., 1995).

In the past few decades, self-determination theory was tested in different cultures and life domains. Psychological instruments based on an SDT theoretical background were translated and adapted in many languages. It was shown that the SDT theoretical concept and instruments are applicable in the USA, Canada, South Korea and Russia (Howard, Gagne & Bureau, 2017; Vallerand et al., 1989; Vallerand & Ratelle, 2004; Chirkov, Ryan & Wellness, 2005). Also, the scale was adapted and translated into Hungarian, and validated on male and female athletes (Paic et al., 2017), into German and validated on male and female mountain runners (Burtscher, 2011), into Italian and validated on male and female athletes (Candela et al., 2013). There is also version of the scale in Arabic (Bayyat et al., 2016). The Arabic version of the scale was validated on a sample of students of the Physical Education Department of the University of Jordan. There is also a Brazilian version of the scale (Bara Filho et al., 2009), etc.

The aim of this research was to conduct a preliminary confirmatory factor analysis of the Serbian version of the Sport Motivation Scale (SMS-28), in order to check the seven-factor structure.

METHODS

Participants

The ample included 608 active athletes on the international, national or lower competition level in different individual or team sports (basketball, football, volleyball, handball, rowing, kayak, judo, shooting, tennis). Participants were of both genders, 25% females, 68% males, and 41 participants did not indicate their gender. The median value for age was 18 years, but 64 participants did not indicate their age. The oldest participant was 42 years old, and 95% of the sample were under the age of 30. The range of sports experience was from 5 to 22 years.

Instrument

The Sport Motivation Scale, SMS-28 (Pelletier et al., 1995) was translated from English to Serbian according to the parallel back translation procedure suggested by previous studies (Vallerand et al., 1989; Nunez et al., 2006). First, the scale was translated by a bilingual individual from English to Serbian. In second step, the translation was again performed by another bilingual individual without knowing the original scale. The procedure was repeated once again in order to have four bilingual individuals involved in parallel back translation to the SMS Serbian version. The different versions were evaluated by the individuals involved in the translation process and by an expert in sport psychology and self-determination theory. Adjustments to the scale and instructions were made. Finally, the Serbian version of SMS scale was obtained.

As the English scale, the Serbian version consists of 28 items, 4 items for each of the seven factors-subscales: intrinsic motivation to know (items 2, 4, 23, 27), intrinsic motivation towards accomplishments (items 8, 12, 15, 20), intrinsic motivation to experience stimulation (items 1, 13, 18, 25), extrinsic motivation by identification (items 7, 11, 17, 24), extrinsic motivation by introjection (items 9, 14, 21, 26), extrinsic motivation by external regulation (items 6, 10, 16, 22) and amotivation (items 3, 5, 19, 28). Each item answered the following question: “Why do you practice your sport?” and were rated on a 7-point Likert-type scale from (1) *does not correspond at all* to (7) *correspond exactly* with the midpoint (4) *correspond moderately* (the Final version of the scale in the Serbian language is in the Appendix).

Procedure

Participants were asked to take part in the study on a voluntary basis by filling out the Serbian version of the Sports Motivation Scale (SMS-28) anonymously, providing only basic demographic data such as gender and age.

Statistical analysis

The factor structure and model fit indices of the scale were assessed using confirmatory factor analysis (CFA) with a maximum likelihood method in statistical analysis software IBM SPSS Amos 20. The model fit was evaluated through several model fit indices: chi-square relative to degrees of freedom (X^2/df), standardized root mean residual (SRMR), root mean square error of approximation (RMSEA), the comparative fit index (CFI), normed fit index (NFI), goodness of fit (GFI), adjusted goodness of fit (AGFI). X^2/df values of less than five indicate a reasonable model fit (Marsh & Hocevar, 1985). For SRMR (Hu & Bentler, 1999) and RMSEA (Browne & Cudeck, 1993), suggested values of 0.08 and less are acceptable and indicate an adequate model fit. CFI and NFI values should be above 0.90 (Bentler & Bonett, 1980). GFI values should be equal to or greater than 0.85 and AGFI values equal to or greater than 0.80 (Cole, 1987; Marsh, Balla & McDonald, 1988). The internal consistency of the scale and its subscales (factors) were assessed using reliability analysis coefficient Cronbach's alpha in IBM SPSS 23.

RESULTS

Although there is no definite agreement in psychometric literature about values of fit indices, it is clear that the value of X^2/df meets < 5 criteria. SRMR is below 0.08, while RMESEA with a value of 0.07 meets the criteria of being below 0.1. GFI and AGFI are both above 0.80, while CFI and NFI are not above 0.90 (Table 1).

Table 1 Model fit indices

X^2	1401.65
df	329
X^2/df	4.26
SRMR	.07
RMSEA	.07
CFI	.81
NFI	.77
GFI	.85
AGFI	.81

Legend: X^2 – value of the CHI square test; df – degree of freedom; X^2/df – relative value of the CHI square test; SRMR = standardized root mean residual; RMSEA = root mean square error of approximation; CFI = comparative fit index; NFI = normed fit index; GFI – goodness of fit index; AGFI – adjusted goodness of fit index.

As shown in Figure 1, all item loadings are over 0.3 with the exception of item 28 ("*I often ask myself: I can't seem to achieve the goals that I set for myself").*

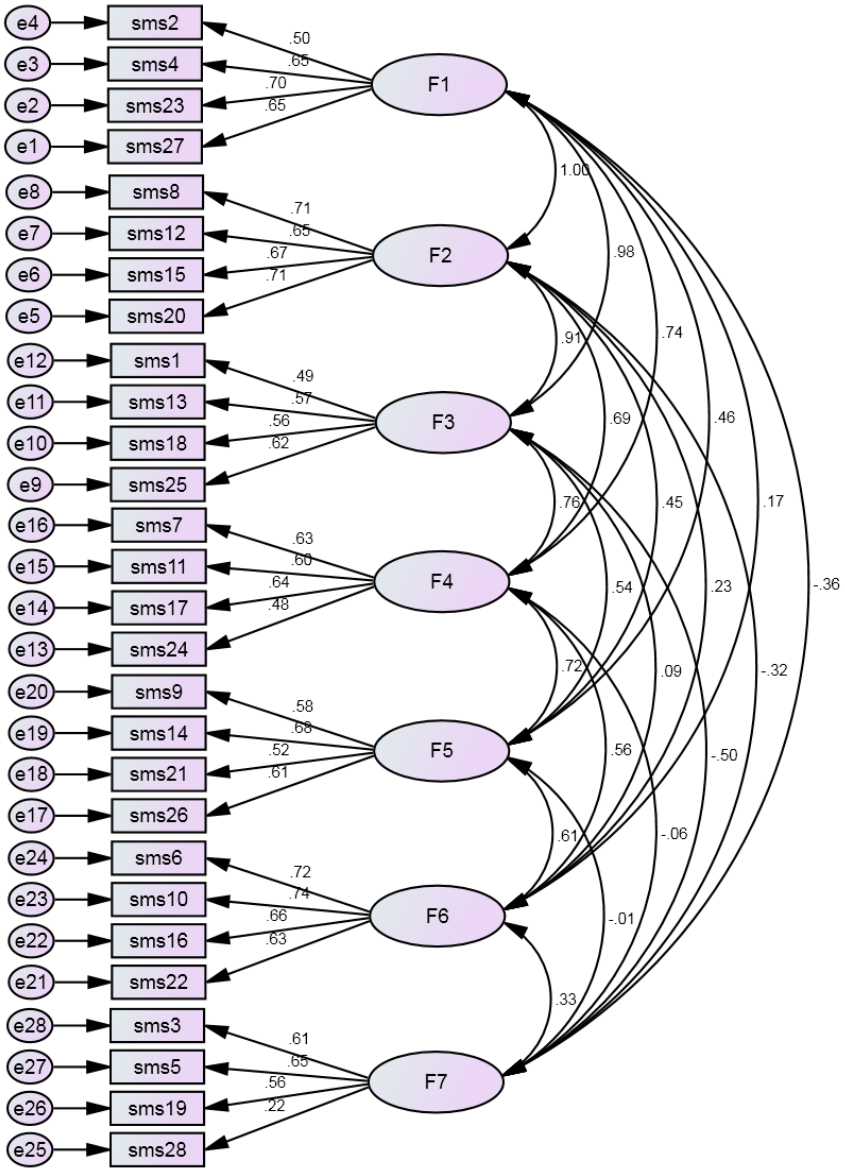

Fig. 1 Seven-factor model structure

The reliability analysis confirmed good internal consistency of the scale (Mean alpha 0.86). Since each subscale is made up of four items, Chronbach's alpha values vary from 0.78 for *Intrinsic motivation towards accomplishments* to only 0.54 for the *Amotivation* subscale (*IM to know*=0.72; *IM to experience stimulation*=0.65, *EM by identification* = 0.66; *EM by introjection*=0.68; *EM by external regulation*=0.75).

The correlation analysis confirmed the simplex pattern of the self-determination theory continuum. Intrinsic motivation factors are positively inter-correlated and negatively correlated with amotivation. Extrinsic motivation by identification and introjection are positively correlated with intrinsic motivation and with external regulation, but not with amotivation. Amotivation is only positively correlated with extrinsic motivation by external regulation (Figure 1).

DISCUSSION

The first version of the Sport Motivation Scale was designed in 1995 in French, as Echelle de Motivation dans les Sports (Briere et al., 1995). Briere et al. conducted three studies with the aim to develop, validate and determine the psychometric properties of the scale. Studies were conducted on Canadian adults, both male and female undergraduates, mean age of approximately 18 years, recreational players from different sports (ice hockey, football, basketball, badminton, handball, volleyball, dance-exercise, swimmers). In the first study, 70 items were used, while in the second study only 28 items were included. The third study conducted factor analysis and confirmed a seven-factor solution with 28 items. The same year, Pelletier et al. (1995) translated the scale into English and titled it the Sport Motivation Scale (SMS). The participants were also undergraduates, with an average age of 19, from different sports, and with at least two years of competitive experience at the high school or college level. Pelletier et al. concluded that scale has satisfactory reliability and validity in the English language, confirmed the seven-factor solution of the French scale and pattern recommended by the self-determination theory. Research conducted by Briere at al. (1995) and Pelletier et al. (1995) showed similar and satisfactory values in internal consistency with Cronbach's alpha ranging from 0.71 to 0.92, and 0.63 to 0.80. Levels of temporal stability were moderate in these two studies, from 0.54 to 0.82, and 0.58 to 0.84.

Soon after, new studies followed. By applying structural equation modelling, a simplex pattern was confirmed in accordance with self-determination theory. It has been shown that the scale is equally applicable to different samples of athletes, both male and female, team and individual sports, and the scale was also adapted for children. Studies also explored the correlation between SMS-28 and the antecedents and outcomes of sports motivation. It was shown that the SMS-28 can predict persistence in training, frequency of workout and probability of starting a physical activity (Chantal et al., 1996; Li & Harmer, 1996; Pelletier et al., 2001; 2007). Autonomous forms of motivation predict positive outcomes such as self-esteem, positive emotions, vitality, well-being, copying strategies, task vs. ego orientation (Conroy, 2004; Gagne et al., 2003; Amiot et al., 2004). The non-autonomous subscales seemed good predictors of negative phenomena such as exercise addiction, burnout, fear of failure and dropping out in sport (Hamer et al., 2002; Zahariadis et al., 2005; Mladenovic & Marjanovic, 2011; Alexandris et al., 2002; Standage et al., 2003; Cresswell & Eklund, 2005).

At the same time, there were many studies indicating the weakness of the scale (Vlachopoulos et al., 2000; Raedeke & Smith, 2001; Martens & Webber, 2002; Martin & Cutler, 2002). The seven-factor structure of the scale is the main issue that was in question and came out of the research of Mallet et al. (2007). They found a 6-factor solution, and conducted research on 614 Australians. The vast majority of their respondents were university freshmen engaged in competitive sports, but there were also 19% of elite athletes who represented Australia at international competitions (track and field, swimming).

Mallet et al. argued that the original scale has items that are cross loaded or poorly loaded onto hypothesized factors, and that there is a lack of discrimination between the three forms of intrinsic motivation. They suggested a unique intrinsic motivation scale. In their study, Mallet et al. also indicated that the identification factor was not statistically distinguishable from the intrinsic motivation. The integrated factor showed better internal consistency than the identified factor, and it measures the most self-determining form of extrinsic motivation. Mallet et al. questioned if statistical data are dependent on the sample. If that is the case, translation and adaptation of the scale in different languages and countries is a necessity.

In order to answer the critiques, a panel of experts on SDT (Pelletier et al., 2013) revisited the original sport motivation scale, SMS-28. They reviewed the structure of the scale and the face validity of all its items. Some items were removed, and some items were modified. Pelletier et al. (2013) agreed with the critics that including intrinsic motivation subscales into one scale is a good solution, since all varieties of intrinsic motivation are not important for many researchers in sport . Also, the authors of the new version of the sport motivation scale agreed that it is important to add an integration subscale. The total number of items were three instead of four per subscale. New revisited version of SMS, titled SMS-II, showed satisfactory reliability and construct validity. Pelletier et al. (2013) concluded that SMS-II better responds to critiques of the original scale, than for example SMS-6 (Mallet et al., 2007), but that it is important to further investigate the scale in different contexts, cultures, sports, age and over time.

Adaptation of the scale in different languages mostly included the original version of the scale that represents the seven-factor solution (Pelletier et al., 1995). In our research conducted in the Serbian language, we also aimed to explore the seven-factor solution of the original scale. The Greek and Spanish adaptations confirmed the psychometric properties established by Pelletier at al. in 1995 (Doganis, 2000; Nunez et al., 2006), but by conducting a confirmatory factor analysis we did not get an ideal model fit. Some of the fit indices in our research met the required psychometric criteria, while others were just below it (CFI and NFI). Other researchers also confirmed usage of the scale as a reliable instrument for measuring sports motivation, but also indicated specificity of the obtained results. For example, adaptation of the scale in Brazil (Bara et al., 2011) showed good reliability and validity of the Portuguese version, with an acceptable level of internal consistency. However, the Brazilian version showed some peculiarities since the lowest alpha value was noted for Amotivation. In our research we also obtained the lowest alpha value for the amotivation subscale, but that differs from studies that emphasized the weakness of the identified regulation subscale (Pelletier et al., 1995; Doganis, 2000; Nunez et al., 2006). The Italian adaptation of the scale supported the seven-factor solution, providing good validity and reliability in Italian language (Candela et al., 2014). As in Brazilian and our research as well, the amotivation subscale in Italian research was the only subscale that revealed a weaker structure. Another study, conducted by Burtscher et al. (2011) showed good internal consistency of the scale in German, but also suggested how important it is to conduct more studies on senior athletes in competitive sports. Burtscher et al. (2011) point out that extrinsic motivation plays a bigger role as the competitive level is higher. Studies that have examined the sport motivation scale and concept of sport motivation in light of self-determination theory, usually have young athletes as participants, exercisers and students of the first year at university. Application of the scale on athletes that perform at the international level may bring some insight not just in the psychometric properties of different versions of the scale, but also in the structure of motivation in elite sport.

Also, it is important to mention that some adaptations of the scale confirmed better validity of the SMS-II, such as the Hungarian study (Paic et al., 2017). Application of structural modeling in a study by Guzman et al. (2006) in Spanish provided results that go in line with the research started by Martens & Webber (2002), and Mallet et al. (2007).

In our research, the Serbian version of the original scale showed good internal consistency, with the amotivation subscale as the weakest point, as in Italian and Brazilian sample. Conducting a confirmatory factor analysis did not bring all the fit indices to a significant level. As suggested in the Australian and German studies of the scale, it might be important to apply the scale at different level of competitions. In our research, homogeneity of the sample was not provided. We had a wide age range, and athletes from many different sports and different levels of competitions. Future research on the Sport motivation scale in Serbian should additionally specify the sample, especially in terms of the level of competition.

CONCLUSION

A preliminary confirmatory factor analysis of the Serbian version of the original sport motivation scale indicated that a seven-factor model might fit well. As some other studies emphasized, it might be important to consider scale properties at different competition levels. In our study we had international competitors as well as lower competition level athletes. The seven-factor model is usually clearly obtained among college athletes. Including elite athletes in a sample along with lower level competition participants, as we did in our research, might question the seven-factor model fit. We suggest future research be conducted on elite athletes only, in order to provide evidence on the better model fit.

In our research the scale showed good reliability and internal consistency, with only the amotivation subscale displaying a low internal consistency. The simplex pattern suggested by the self-determination theory continuum is confirmed.

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PRELIMINARNA KONFIRMATORNA FAKTORSKA ANALIZA SRPSKE VERZIJE ORIGINALNE SKALE SPORTSKE MOTIVACIJE (SMS-28)

Teorija samodeterminacije je dominantan konceptualni okvir u istraživanjima sportske motivacije, dok je Skala sportske motivacije, SMS-28, adaptirana na mnoge jezike. Cilj ovog istraživanja bio je da se originalna skala prevede i adaptira na srpski jezik i da se sprovede preliminarna konfirmatorna faktorska analiza za potvrdu sedmofaktorskog rešenja. Uzorak se sastojao od 608 aktivnih sportista koji se takmiče na međunarodnom, nacionalnom ili nižem nivou takmičenja, iz individualnih i ekipnih sportova, oba pola, sa vrednošću medijane od 18 godina. Rezultati su pokazali dobru internu konzistentnost srpske verzije skale (srednja vrednost alfa 0.86), sa izuzetkom subskale nemotivisanosti koja je pokazala najnižu vrednost alfe (0.54). Simpleks patern kontinuuma samodeterminacije je potvrđen. Konfirmatorna faktorska analiza pokazuje dobre indekse pristajanja na nekim koeficijentima (X^2/df=4.26; SRMR=0.07; RMSEA=0.07; GFI=0.85; AGFI=0.81), dok neki indeksi nisu zadovoljoli kriterijum prihvatljivih vrednosti (CFI=0.81; NFI=0.77). Naredna istraživanja trebalo bi da provere faktorsku strukuru skale posebno uzimajući u obzir homogenost uzorka u odnosu na nivo takmičenja.

Ključne reči: *motivacija, skala sportske motivacije, intrinzička motivacija, ekstrinzička motivacija, faktorska analiza*

APPENDIX

Items of the Sport Motivation Scale (SMS-28) in Serbian.

SPORTOM koji sam izabrao BAVIM SE....

1. ...zbog uživanja u novim iskustvima.
2. ...zbog zadovoljstva što saznajem više o svom omiljenom sportu.
3. ...nekada sam imao dobre razloge da vežbam i bavim se sportom, a sada sam u dilemi da li treba da nastavim.
4. ...zbog zadovoljstva što učim nove veštine.
5. ...ne znam zaista, imam utisak da nisam u stanju da se bavim sportom.
6. ...da bi me ljudi koje poznajem poštovali.
7. ...zato što je to jedan od najboljih načina da se upoznaju novi ljudi.
8. ...zato što osećam veliko zadovoljstvo kada ovladam nekim teškim vežbama ili tehnikama.
9. ...zato što je bavljenje sportom aspolutno neophodno svakome ko želi da ostane u formi.
10. ...zbog ugleda i statusa.
11. ...zato što je to jedan od najboljih načina da razvijem sebe u celini.
12. ...zbog zadovoljstva koje osećam kada unapredim neke svoje slabe tačke.
13. ...zbog lepog doživljaja koji osećam kada učestvujem u sportskoj aktivnosti.
14. ...zato što moram da vežbam i bavim se sportom da bih se osećao dobro.
15. ...zbog zadovoljstva koje osećam dok usavršavam svoje sposobnosti.
16. ...zato što ljudi oko mene smatraju da je važno biti u formi.
17. ...zato što je to dobar način da se nauče mnoge stvari koje mogu biti korisne u životu uopšte.
18. ...zbog jakih osećanja koja imam dok se bavim sportom koji volim.
19. ...nije mi više jasno, mislim da mi nije mesto u sportu.
20. ...zbog zadovoljstva koje osećam kada izvedem neke teške poteze.
21. ...zato što bih se osećao loše ako ne bih učestvovao u sportu.
22. ...da pokažem drugima koliko sam dobar u sportu kojim se bavim.
23. ...zbog zadovoljstva koje osećam kada učim tehnike koje ranije nikada nisam poznavao.
24. ...zato što je to jedan od najboljih načina da održim dobre odnose sa prijateljima.
25. ...zato što volim da potpuno utonem u sportsku veštinu koju savladam.
26. ...zato što sam sebe primoravam da redovno vežbam i bavim se sportom.
27. ...zbog zadovoljstva što otkrivam nove strategije za postizanje uspeha.
28. ...često se pitam da li uspevam da dostignem ciljeve koje postavim sebi.