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INTRINSIC MOTIVATION IN SPORT MEASURED BY THE SPORT MOTIVATION SCALE IN CZECH UNIVERSITY STUDENTS

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ABSTRACT

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Objectives. This study examined the factor structure of intrinsic motivation (IM) using the Sport Motivation Scale (SMS) in a sample of Czech university athletes.
Sample and setting. A total of 229 undergraduate students (152 males, 77 females) participated in this study. The mean age of the research sample was 22 years (SD = 2.13). Students participated in a variety of different individual and team sports (number of different sports practiced within the sample N = 21).
Statistical analysis. The authors first examined the SMS factor structure using exploratory (EFA) and confirmatory factor analysis (CFA) techniques, and then evaluated possible group differences in intrinsic motivation based on gender, competition level, and frequency of physical activity using a multiple-indicators multiple-causes (MIMIC) structural modeling approach.
Results. Following exclusion of one problematic item, the EFA and CFA model fit statistics favored a 3-factor solution with subscales including intrinsic motivation to know (IM-K), intrinsic motivation to accomplish (IM-A), and intrinsic motivation to experience stimulation (IM-E). Interestingly, MIMIC modeling revealed no significant mean or item performance differences in intrinsic motivation with regard to gender, both at the latent or manifest indicator level. The same was true for competition level, where highly competitive athletes did not differ in their levels of IM from recreational athletes. Correlations between IM subscales and social physique anxiety, physical self-worth, and global self-esteem highlighted possible convergent validity issues of the three-factor IM model. Results reinforce the performance of the SMS IM factor structure in a sample of Czech university students, with minimal evidence supporting cross-cultural or group-level differences.
Study limitations. In order to obtain stable parameter estimates, latent variable modeling techniques (EFA, CFA, MIMIC modeling) are best conducted with relatively large samples and in the current study the sample was relatively small. The cross-sectional design does not allow causal inferences regarding the effects of SMS on outcomes nor to assess individual change in IM as well as factors that contribute to change over time. Future studies may want to rely on qualitative and/or longitudinal designs in order to examine developmental trends in IM as well as the usefulness of the tripartite conceptualization of IM in sport.

key words:
intrinsic motivation,
university athletes,
factorial validity,
MIMIC

klíčová slova:
motivace ve sportu,
latentní struktura,
dotazník,
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INTRODUCTION

The study of human motivation is arguably one of the most important considerations in any discussion of human activity. This is also true in the exercise and sport domain where the correct understanding of motivational processes may, for example, positively influence the low level of physical activity present in various social groups or improve the training conditions and performance of competitive athletes (Hagger & Chatzisarantis, 2007a; Treasure et al., 2007). Several conceptual frameworks have been designed to examine motivation in the specific context of sport and physical activities (Roberts, 1992). One of these frameworks, self-determination theory (SDT) (Deci & Ryan, 1985), appears to be especially useful in sport motivation research. Self-determination theory outlines a three-part conceptual framework to account for the multidimensional motivational processes taking place in the context of sport (e.g., Hagger & Chatzisarantis, 2007b). Specifically, SDT assumes that human behavior can be explained on the basis of three types of motivation: intrinsic motivation, extrinsic motivation and amotivation. In this paper, we focus exclusively on intrinsic motivation, which is considered to be a key concept within SDT.

According to SDT (Ryan & Deci, 2007), intrinsic motivation is a tendency to participate in an activity because of the activity itself. No extrinsic factors need to be applied to encourage participation or implore an individual to try harder and apply more effort. In other words, participation is based on the pure feeling of enjoyment, pleasure and satisfaction that derive from the activity alone and does not require ulterior explanations (Deci, 1975). Higher levels of intrinsic motivation are associated with a wide range of positive outcomes including self-efficacy, well-being and positive coping, to name a few (e.g., Deci & Ryan, 2000; Chatzisarantis et al., 2003). In the context of sport and athletic endeavors individuals will train and work hard for the sheer enjoyment and not for any particular reward or specific outcome (Hagger & Chatzisarantis, 2007b).

Although not the focus of this paper, extrinsic motivation refers to behavior controlled by external sources, for instance where a person chooses to engage in sports because it will yield financial rewards and garner the praise of colleagues and the public. Some individuals are extrinsically motivated to avoid criticism, for instance an athlete who is pushed to excel during training by a coach that relies on negative reinforcement to improve performance. Athletes with external motivation compete harder to avoid being told they are not trying hard enough. Amotivation poses there are no linkages between actions and outcomes (Ryan & Deci, 2000).

ASSESSING INTRINSIC MOTIVATION

On the basis of SDT, a number of self-report assessments have been constructed, which attempt to quantify the principal components of this theory[1]. One of the most frequently used instruments to assess sport and exercise motivation is the Sport Motivation Scale (SMS; Pelletier et al., 1995). Although framed by SDT, the logic behind the SMS (Vallerand & Blais, 1987) proposes that intrinsic motivation consists of three sub-constructs: intrinsic motivation to know (IM-K: "I do sport for the pleasure of discovering new training techniques"), intrinsic motivation to accomplish (IM-A: "I do sport for the satisfaction I experience while I am perfecting my abilities"), and intrinsic motivation to experience stimulation (IM-E: "I do sport for the excitement I feel when I am really involved in the activity").

[1] For overview see www.selfdeterminationtheory.org.

The three-part classification of IM has not gone without criticism (Mallet et al., 2007). For instance, Martens and Weber (Martens & Webber, 2002) reported a relatively poor fit for a 3-factor motivation model based on a sample of U.S. college athletes. Several other studies also failed to validate the IM factor structure using different age groups and non-English native speaker athletes (De Pero et al., 2009; Riemer, Fink, & Fitzgerald, 2002; Shaw, Ostrow, & Beckstead, 2005). These inconsistent findings prompted Mallet and colleagues (Mallet et al., 2007) to construct a scale assessing only the general construct of IM, a premise that was originally postulated in SDT.

Pelletier, Vallerand, and Sarrazin (2007) argued that three different types of IM may yield important insights into motivational processes particularly for sports, referring to a large number of studies conducted with atheletes supporting the validity and reliability of the SMS (Fortier et al., 1995; Hamer, Karageorghis, & Vlachopoulos, 2002; Ntoumanis, 2001; Pelletier et al., 1995; Sarrazin et al., 2001). Notwithstanding this argument, these same authors stated, that "… if one wants to nurture intrinsic motivation in sports, challenges, and stimulation should be fostered. On the other hand, curiosity and the search for knowledge should be fostered in education" (Pelletier et al., 2007, p. 2).

This context-specific delineation of motivational processes brings into question whether we need to conceptualize and measure IM as multifaceted. Moreover, in a more recent study, Pelletier et al. (Pelletier et al., 2013) cast doubts on the practical usefulness of tripartite framework of IM in sport, resulting in the creation of a revised version of SMS (SMS-II) containing items assessing only a general construct of IM (although the authors suggest the original 12 items should be used in specific research situations).

EXPLORING THE ROLE OF GENDER IN MOTIVATION

Studies on gender differences in sport motivational processes have produced a mixed bag of findings. Several studies of youth Canadian athletes found that female athletes report higher levels of IM-K and IM-A compared to males (Briere et al., 1995; Fortier et al., 1995; Pelletier et al., 1995). Likewise, (Chantal et al., 1996) reported that female Bulgarian athletes reported higher levels of IM overall than males. The authors, however, combined three SMS subscales into a single general measure of IM, a procedure that may have glossed over subtle gender differences. Cremades, Flournoy, and Gomez (Cremades, Flournoy, & Gomez, 2012) found that compared to males U.S. female collegiate athletes also reported higher levels of IM. These empirical findings did not hold up, however, in a study by Burtcher et al. (Burtscher et al., 2011) using a somewhat older sample to validate a German version of the SMS. De Pero et al. (De Pero et al., 2009) also found no evidence of gender differences in IM using a sample of older Italian athletes. Recently, López-Fernández, Merino-Marbán and Fernández-Rodríguez (2014) examined sports motivation in adult triathletes and found no evidence of gender differences in the SMS intrinsic motivation subscales. Interestingly, studies conducted with young Malaysian athletes indicated males had higher levels of IM than females (Chin, Khoo, & Low, 2012; Teo et al., 2015). Several authors have suggested that certain confounders such as age or competition level may contribute to the differences in these findings (Brodkin & Weiss, 1990; Burtscher et al., 2011).

FOCUS OF THE PRESENT STUDY

This brief review of IM indicates a lack of consistent findings from several studies examining the factorial validity of the SMS. For one thing, it is unclear whether the

three-part classification of IM using the SMS is conceptualy and practically sound when applied to different national/ethnic and age groups. Added to this are the inconsistent findings with respect to gender differences. To address these different findings we examined the factor structure of IM using the SMS in a sample of Czech university athletes. Our sample was quite heterogeneous with regard to gender composition, competition level, and frequency of exercising, all factors that may influence responses to questions about IM. Whereas previous studies have restricted tests of group differences to traditional mean and variance decomposition (i.e., t-tests and ANOVA), we examined these differences at both the latent construct (examining the latent mean differences) and the construct indicator level (examining the differential item functioning), using a latent-variable framework. This approach, which adjusts models for measurement error, produces a more veridical picture of possible group differences in IM. Taken together, the findings of this study may provide an important basis for future cross-cultural comparisons of IM in sport.

METHODS

Participants

A total of 229 undergraduate students (152 males, 77 females) with mean age of 22 years (SD = 2.13) were drawn from the Faculty of Physical Education and Sport, Charles University in Prague, Czech Republic. A single self-report item assessed the frequency of physical activity (1–2 times per week = 21.4%; 3 times per week = = 22.7%; 4 times per week = 18.3%; 5 times per week = 17.5%; 6 and more times per week = 20.1%) and a single binary item assessed level of competition (recreational = 67.7%; competitive = 32.3%). Students participated in a variety of different individual and team sports (number of different sports practiced within our sample N = 21). During the consenting procedure, all participants were told the study was voluntary and anonymous, and that no personal identifiers would be collected. By returning the questionnaire to the first author, participants consented with the processing of their data for research purposes.

MEASURES

Sport motivation scale (SMS)

Three sub-constructs of IM (IM-K, IM-A, IM-E) were measured by a Czech translated version of the SMS. We used a modified direct translation procedure in combination with protocol analysis (Behling & Law, 2000) and produced an instrument sufficiently equivalent to the English version (specific steps of the translation can be found in (Komarc & Harbichová, 2012). The Czech verison of the SMS is available from the first author of the current report. On the empirical level, all three sub-constructs of intrinsic motivation are represented by four SMS items. Respondents were asked about the reasons for their participation in sports and their responses were quantified on a 7-point Likert scale (see Appendix).

Outcome measures

We examined convergent validity of intrinsic motivation sub-scales using three other theoretically relevant constructs – social physique anxiety (SPA), physical self-worth (PSW), and global self-esteem (GSE) – all major factors related to intrinsic motivation in sport (Deci & Ryan, 1985; Standage, Gillison, & Treasue, 2007; Thogersen-Ntoumani, & Ntoumani, 2006). A modified 8-item Czech version of the social phy-

sique anxiety scale (Hart, Leary, & Rejeski, 1989) was used to measure SPA in our sample (e.g., "When it comes to displaying my physique or figure to others, I am a shy person"). To avoid methodological effects (Motl & Conroy, 2000), we excluded four items from the original version of the SPA. The SPA scale uses a 5-point Likert response formats (1 = "strongly agree," 5 = "strongly disagree").

PSW was measured by 6-item subscale from the Physical Self-Perception Profile (PSPP) (Fox & Corbin, 1989). The questionnaire employs a forced-choice alternative format to avoid socially desired responses. For each item there are two statements (e.g., some people are very competitive vs. others are not quite so competitive), each with two possible alternatives ("sort of true", and "really true"). We assessed global self-esteem using the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965). The RSES contains 10 items, five of which are positively framed (e.g., "On the whole, I am satisfied with myself") and five that are negatively framed (e.g., "At times I think I am no good at all"). The scale uses a 4-point Likert scale response format (1 = "strongly agree," 4 = "strongly disagree").

All three instruments have been applied in the Czech population (Harbichová & Komarc, 2012; Osecká & Blatný, 1997; Tomešová & Štochl, 2006), are frequently used in studies of sports participation and exercise, and have excellent psychometric properties (Byrne, 1996; Motl & Conroy, 2000; Tafarodi & Swann, 1995). Consistent with the basic tenets of SDT, we expect significant negative correlations between SPA and each of the IM sub-constructs and significant positive correlations between global self-esteem, physical self-worth, and IM subscale scores.

Analysis strategy

We first examined the factor structure of the SMS using exploratory factor analysis (EFA) and followed this with confirmatory factor analysis (CFA) (e.g., Blahuš, 1985). The former technique is quite flexible and allows cross-factor loadings, whereas the latter technique imposes simple structure, specifying that an item can have only one non-zero loading on a factor. Both sets of analyses were run with the aggregated, undifferentiated data (single group analysis). Following this step, we tested a multiple-indicators multiple-causes (MIMIC) model (e.g., B. Muthén, 1985; B. O. Muthén, 1989). The MIMIC approach uses a typical structural equation model (SEM) framework with two components; a measurement or CFA model ascertaining dimensional structure and psychometric properties and a structural regression component specifying effects of observed exogenous predictors on latent factors and their respective indicators. In this manner, the MIMIC structural modeling approach provides a simple remedy to conduct between-group hypothesis testing with relatively small samples that might normally strain the robustness of model fit statistics (Hancock, 2001) and when multiple group modeling is not an option (B. O. Muthén, 1989). Using gender as an example, specification of the structural model includes covariates representing group assignment (male vs. female) and then posits pathways from these covariates to the latent factor(s) as well as "nonstandard" effects from the covariates to factor indicators. The latter pathway represents a non-mediated effect by controlling for factor-determined variance. In the case of gender, a significant pathway to a factor indicator means that males and females differ in the item functioning. In the current study, we modeled covariates using dummy-coded predictors for gender (males vs. females), competitive level (recreational vs. highly competitive), and frequency of physical activity (1-2 times vs. 3 or more times/week). Inclusion of direct effects from covariates to each factor indicator was guided by values of modification indices (> 10) (MacCallum, 1986) and therefore only paths which were assumed to improve

the final model fit for 1 *df* change were estimated. Pearson's correlation coefficient was used to express the relationship between IM scores (both the sub-scale sum scores and the latent factor scores) and outcome measures.

All analyses were performed using Mplus 7.4 (B. Muthén & Muthén, 1998-2016) with robust maximum likelihood estimation to handle mild violations from normality (Jöreksog & Sörbom, 1989, 1999). Model fit was evaluated using the chi-square test statistic, and given its sensitivity to sample size, we also used other inferential fit indices including the root mean square error of approximation (RMSEA) (Browne & Cudek, 1993) bounded by 90% confidence intervals, Comparative Fit Index (CFI) (Bentler, 1990), Tucker-Lewis Index (TLI) (Bentler & Bonett, 1980), and standardized root mean square residual (SRMR). Both the TLI and CFI have benchmarks close to 1.0 (all of the sample variance and covariances are accounted for by the implied population model) with acceptable fit indicated by values > 0.95 (Hu & Bentler, 1999). The RMSEA should approximate 0.06 or less in good-fitting models, whereas SRMR should be less than 0.07 (Kline, 2011). Finally the Bayesian Information Criterion (BIC) (Schwarz, 1978) was also used for model fit evaluation (lower values of BIC indicate better model fit).

RESULTS

Evaluation of the hypothesized structure

In the first step we used EFA with Geomin rotation (mimicking an oblique rotation) to evaluate the number of factors underlying the sample variance-covariance matrix for the 12 SMS items. Table 1 shows the results of progressively fitting one to four factor models. Both the 1-factor and the 2-factor solutions indicated poor fit to the data. Although the 4-factor model provided an adequate fit, $\chi^2(24) = 33.6$, $p = 0.092$, RMSEA = 0.04 [90%CI = 0.00 – 0.07], TLI = 0.98, CFI = 0.99, SRMR = = 0.02, closer inspection of estimated factor loadings revealed that the solution could not be substantively interpreted. For one thing, the solution contained unexpected and moderately high cross-loadings, one of the factors was significantly saturated with only one item (SMS-23), and the remaining items had factor loadings < 0.35 for this factor. Model fit indices for the 3-factor model indicated an acceptable fit, TLI = 0.92; CFI = 0.96, SRMR = 0.03, however, the model contained a relatively high RMSEA (0.08 [90%CI = 0.07 – 0.10]) and statistically significant chi-square, $\chi^2(33) = 81.9$, $p < 0.001$. Closer inspection of the model factor loadings indicated possible misfit with item SMS-23 ("I do sport for the pleasure that I feel while learning techniques that I have never tried before"), which had an unusually high modification index (i.e., constraining the item loading to zero would significantly improve the model fit for the 1 *df* change). Therefore, we excluded item SMS-23 from further analysis and reran the EFA with one to four factors using 11 items.

Following exclusion of this problematic item, the model fit statistics (especially the lower BIC) showed an improvement and favored the 3-factor solution (see Table 1). The Geomin rotated factor loading matrix (not presented) supported the originally postulated 3-factor model of the SMS IM subscales. We then repeated this analysis using CFA techniques and minus the SMS-23 item. This model provided an excellent fit, $\chi^2(41) = 73.82$, $p = 0.001$, RMSEA = 0.059 [90%CI = 0.04 – 0.08], TLI = 0.98, CFI = = 0.99, SRMR = 0.05. Table 2 contains the standardized factor loadings and correlation coefficients for the 3-factor CFA solution. The coefficient of generic reliability based on the common factor model (McDonald's ω) for each subconstruct varied from 0.76 to 0.86 (McDonald, 1999).

Table 1 Expoloratory factor analysis of SMS intrinsic motivation items

	Factors	χ^2 (df)	p-value	CFI	TLI	RMSEA (90% CI)	SRMR	BIC
All items	1	358.5 (54)	0.000	0.77	0.71	0.16 (0.14-0.17)	0.09	8716.7
	2	169.9 (43)	0.000	0.90	0.85	0.11 (0.10-0.13)	0.05	8587.9
	3	81.9 (33)	0.000	0.96	0.92	0.08 (0.06-0.10)	0.03	8554.3
	4	33.6 (24)	0.092	0.99	0.98	0.04 (0.00-0.07)	0.02	8554.8
Item #23 excluded	1	264.6 (44)	0.000	0.80	0.75	0.15 (0.13-0.17)	0.09	7972.5
	2	105.2 (34)	0.000	0.94	0.90	0.10 (0.08-0.12)	0.04	7867.4
	3	37.9 (25)	0.048	0.99	0.97	0.05 (0.01-0.08)	0.02	7849.0
	4	14.8 (17)	0.612	1.00	1.01	0.00 (0.00-0.05)	0.01	7869.4

Table 2 Standardized factor loadings, correlations between factors and McDonald's ω for hypothesized three-factor model of IM after exclusion of item SMS-23

Item no.	IM-K	IM-A	IM-E
SMS-2	0.670		
SMS-4	0.795		
SMS-27	0.673		
SMS-8		0.656	
SMS-12		0.722	
SMS-15		0.729	
SMS-20		0.769	
SMS-1			0.642
SMS-13			0.824
SMS-18			0.840
SMS-25			0.818
Correlations			
IM-K	1		
IM-A	0.64	1	
IM-E	0.46	0.76	1
McDonald's ω	0.76	0.81	0.86

IM-K = intrinsic motivation to know; IM-A = intrinsic motivation to accomplish; IM-E = intrinsic motivation to experience stimulation

MIMIC model – group differences

We next tested a MIMIC structural model using the 11 items from the CFA model in Table 2. This model tests for factor mean differences and differential item functioning in IM based on the grouping measures (gender, competitive level, and frequency of physical activity). Figure 1 depicts the final MIMIC model with standardized estimates. Darkened lines show the significant path effects. Overall, the model showed a very good fit with the data, $\chi^2(64) = 103.3$, $p = 0.01$, RMSEA = 0.05 [90%CI = 0.03 – 0.07], TLI = 0.95, CFI = 0.97, SRMR = 0.04 and basically confirmed the postulated 3-factor structure with parameter estimates closely approximating those obtained by the CFA.

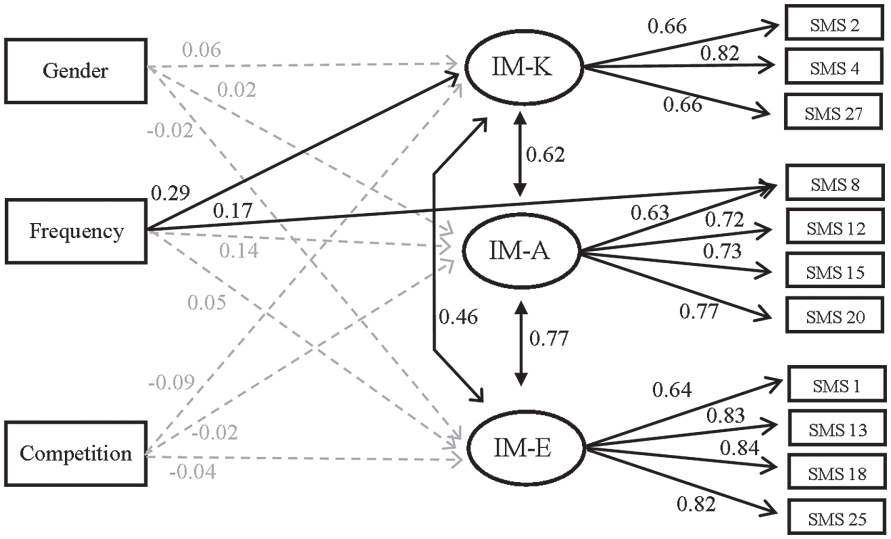

Figure 1 Final MIMIC model of IM measured by the Czech version of the SMS

The only group differences observed at the latent-variable level was for IM-K. Significant direct effect of frequency of physical activity ($b_{standardized} = 0.29$, $p < 0.05$) suggests that students participating in sports only 1-2 times per week have lower levels of IM-K, compared to students exercising/sporting more often. Frequency of physical activity also had a statistically significant direct effect ($b_{standardized} = 0.17$, $p < 0.05$) on item SMS-8 ('I do sport because I feel a lot of personal satisfaction while mastering certain difficult training techniques'), reflecting group differences on this item over and above mean differences in the latent factor (IM-A).

Interestingly, we did not find any significant differences in IM with regard to gender, both at the latent or manifest indicator level. The same was true for competition level, where nonsignificant regression coefficients indicate that athletes in our sample participating at highly competitive levels do not differ in their levels of IM from recreational athletes.

Association with outcome measures

We next assessed the convergent validity as well as a practical usefulness of the three-factor IM structure in a broader nomological network. To do this, we correlated the IM subconstructs with three other theoretically important measures including physical self-worth, self-esteem, and social physique anxiety. Table 3 contains the results of these bivariate associations using the CFA latent constructs (upper part) and the observed scale composite scores (lower part). As depicted, IM-K was not significantly associated with any of the outcome measures. There was a small, albeit significant, association between IM-A and PSW. Latent factors of PSW, SPA and GSE correlated with IM-E in a hypothesized direction with small to medium correlations (see Table 3, upper part). Subscale composites (item sum-score, which ignores the items'measurement error) correlation between SPA and IM-E, however, did not reach the significance level $\alpha = 0.05$ (see Table 3, lower part).

Table 3 Correlations of intrinsic motivation with outcome measures

		IM-K	IM-A	IM-E
Latent factors correlations	PSW	-0.07	0.19*	0.32**
	SPA	-0.03	-0.05	-0.15*
	GSE	0.11	0.14	0.25**
Sub-scales composite correlations	PSW	-0.05	0.15*	0.25**
	SPA	-0.04	-0.05	-0.13
	GSE	0.09	0.14	0.21**

* $p < 0.05$; ** $p < 0.01$. LABELS: IM-K = intrinsic motivation to know; IM-A = intrinsic motivation to accomplish; IM-E = intrinsic motivation to experience stimulation; PSW = physical self-worth; SPA = social physique anxiety; GSE = global self-esteem.

DISCUSSION

This study examined the factorial validity of the Sport Motivation Scale in a sample of Czech university athletes. We focused exclusively on intrinsic motivation, as this has been shown to be a major component of sports motivation and to yield gender differences in several cross-cultural studies. In addition, we applied a MIMIC structural modeling approach to evaluate possible group differences in latent factor scores and differential item functioning by modeling gender, competition level, and frequency of physical activity as predictors.

Tests of the underlying dimensional structure of IM using EFA indicated a relatively poor fit using the full set of 12 SMS items. Inspection of the model residuals and modification indices indicated we could improve the overall model fit with the elimination of a single IM item assessing whether individuals engage in sports for the pleasure they obtain while learning new training techniques. This trimming was no surprise as there was another SMS item assessing whether individuals engage in sport for the pleasure of discovering new training techiques. Although both items cannot be considered precise alternatives (see Øktedalen & Hagtvet, 2011), their high content similarity contributes to multicolinearlity, distorting model fit. Moreover, excluding SMS-23 did not cause an over-narrowing of the behavioral domain (see Hagtvet, 1995), however, post-hoc model modification can be quite unstable and requires further replication with a larger sample (MacCallum, 1986).

The modified EFA indicated a suitable fit and this was confirmed by CFA with the 3-factor model of IM using the three SMS subscales. The pattern of associations between IM subconstructs matched closely findings from other studies (De Pero et al., 2009; López-Fernández et al., 2014; Martens & Webber, 2002). The smallest association was observed between IM-know and IM-experience and the largest association was observed between IM-achieve and IM- experience. We also obtained satisfactory reliability estimates using McDonald's ω statistic for the three IM subconstructs.

The MIMIC modeling offers a unique way of controlling for sample heterogeneity and is an appropriate methodology given the small sample size (Øktedalen & Hagtvet, 2011). The MIMIC model provided empirical support for the factorial validity of three IM subscales even when the heterogeneity of our sample was taken into account. Interestingly, there was no evidence of differential item functioning based on gender and furthermore no evidence of mean differences in the IM subscales. These results contrast with several earlier SMS validation studies (Briere et

al., 1995; Pelletier et al., 1995) showing that French and Canadian female collegiate athletes scored higher in IM-K and IM-A and other studies showing that male athletes have higher levels of IM than their female counterparts (Chin et al., 2012; Teo et al., 2015). Other studies working with different cultures and/or age categories reinforce that men and women do not differ in IM (Burtscher et al., 2011; De Pero et al., 2009; Kingston, Horrorrocks, & Hanton, 2006), although a study with U.S. college students did provide evidence supporting gender differences (Cremades et al., 2012). The inconsistency in findings suggests additional research is needed to clarify whether there are stable gender differences in IM and elucidate factors that may contribute to these differences.

We found that IM-K significantly differed based on frequency of sport participation. Students who reported lower engagement in sports activities (1–2 times a week) reported lower levels of IM-K than students with more frequent participation in physical activities. Intrinsic motivation to know is closely related to constructs like curiosity, exploration or discovery (Gottfried, 1985; Maw, 1971) and in the context of the SMS it is conceptualized as pleasure or an enjoyment from learning new techniques, movements, and strategies. In keeping with the conceptual framework of SDT, we believe that students characterized by less frequent exercise (1–2 times a week) are motivated to participate in physical activities for reasons other than the satisfaction of their curiosity and inquisitiveness. The lower levels of IM-K also may reflect that students exercising 1 to 2 times per week may not be engaging in routine, planned training where they can learn new movements, techniques and strategies on a systematic basis. These individuals may just be popping into a gym, or going for a run as needed without a formal commitment to routine exercise, thus their curiosity is not prompting exercise.

Several studies have assessed the effect of competition level on motivation in sport (Burtscher et al., 2011; De Pero et al., 2009; Fortier et al., 1995; Chantal et al., 1996). According to SDT, high pressures and rewards in competitive sport may alter an athlete's perceived locus of control (from internal to external) and in turn diminish IM and lower their self-determination (Ryan, 1980). A number of studies have supported this premise with young athletes, while young recreational athletes (Fortier et al., 1995) and non-scholarship athletes (Cremades et al., 2012; Kingston et al., 2006) exhibited higher levels of IM than their same-age competitive and scholarship counterparts, respectively. However, Brodkin and Weiss (Brodkin & Weiss, 1990) reported that the influence of competition level on IM in sport is much more salient in younger athletes than in older adults. A study by DePero et al. (De Pero et al., 2009) revealed that senior elite competitors (over 65 years) are more intrinsically motivated than senior non-elite competitors, highlighting specific age-related perceptions of rewards and pressures present in competitive sport. Similarily, somewhat undermining SDT, Teo and colleagues (Teo et al., 2015) reported that IM did not significantly differ between young competitive and casual bowlers from Malaysia. In the present study with university athletes we found no differences between competitive and recreational athletes on any of the IM subscales. Differences in categorization of athletes into high reward/pressure group (competitive athletes, elite competitors, scholarship athletes, etc.) and low reward/pressure group (recreational athletes, casual athletes, non-elite competitors, non-scholarship athletes) may have contributed to the different empirical findings. However we believe that rewards and pressures can simply be interpreted and perceived by athletes as having more informational than a controlling role even in a competitive environment, leaving IM undistorted (Cremades et al., 2012; Ryan, 1980).

We note that there has been considerable discussion regarding the utility of using a three-factor conceptualization of IM (Lonsdale, Hodge, & Rose, 2008; Mallet et al., 2007; Martens & Webber, 2002; Pelletier et al., 2007; Pelletier et al., 2013). Some authors (Mallet et al., 2007; Martens & Webber, 2002) have reported problems with discriminant validity of IM sub-scales using the SMS, given a relatively high magnitude of association among the IM sub-scales. Others (e.g., Lonsdale et al., 2008) have reported that tripartite IM scores were not as strongly related to motivational consequences as was a general IM scale. All of these problems have raised efforts to create motivational assessment instruments in sport containing only one general IM scale. For example, even Pelletier and colleagues (Pelletier et al., 2007, p. 619), who initially considered the tripartite conceptualization of IM as very important both from theoretical and practical point of view, created a revised version of the SMS (SMS-II; Pelletier et al., 2013), which assesses a general construct of IM.

The interfactor correlations observed in our sample (r = 0.46 to 0.76) did not indicate any serious problems with discriminant validity of IM sub-scales, what is in line with many other studies conducted with (Briere et al., 1995; López-Fernández et al., 2014; Pelletier et al., 1995) and without the SMS (Lonsdale et al., 2008). However, results of our study cast doubts on convergent validity of intrinsic motivation sub-scales as measured by a Czech version of the SMS. Nonsignificant associations between intrinsic motivation to know and the three outcome measures in our sample lead us to suggest that curiosity, exploration or search for knowledge might not represent the true essence of intrinsic motivation in sport (at least in university athletes). As already noted by Pelletier, Wallerand and Sarrazin (2007, p. 619), "search for knowledge is expected to be more important in education but that seeking challenges and accomplishment and experiencing stimulation should be more important in sports." A three-factor distinction of IM in sport may therefore be questioned both from practical (shorter scale) as well as from theoretical point of view (relative importance of three different IM sub-scales in a specific context of sport).

Several limitations of the present study should also be noted. For one thing, in order to obtain stable parameter estimates, CFA techniques are best conducted with relatively large samples and in the current study our sample was relatively small (Kline, 2011). Validating the current findings with a larger sample is an essential requirement, as these efforts will reinforce the external validity of the findings. The cross-sectional design does not allow causal inferences regarding the effects of SMS on outcomes nor can we assess individual change in IM as well as factors that contribute to change over time. Future studies may want to rely on qualitative and/or longitudinal designs in order to examine developmental trends in IM as well as the usefulness of the tripartite conceptualization of IM in sport. In addition, we did not include any potential confounders on the pathways from the grouping measures to the factors, thus opening the door for alternative explanations of these relations. Finally we conducted this study with university students who have ideal lifestyle conducive to participation in sports and physical activities. Future studies may want to validate these findings using similar age cohorts from the working world as well as older participants.

In conclusion, results of this study support the construct validity and generic reliability of the IM subscales using the SMS. However our findings indicate that the three-factor delineation of IM in sport might require greater conceptual clarification, particularly in terms of convergent validity with other theoretically meaningful constructs. Researchers, sport psychologists, and coaches are advised to take advantage of recent developments in sport motivation assessment – that is to utilize new measurement instruments, which incorporate only one general construct of intrinsic moti-

vation (SMS-II, SMS-6, and BRSQ-6). However, if there is any interest in different forms of intrinsic motivation and their role in the regulation of sport behavior, further research is recommended in order to identify the position and the functioning of these forms in a broader nomological network.

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SOUHRN

Vnitřní motivace ve sportu měřené pomocí Škály sportovní motivace u českých univerzitních studentů

Cíle. Cílem této studie bylo ověření faktorové struktury vnitřní motivace ve sportu měřené pomocí české verze škály sportovní motivace (SMS – Sport Motivation Scale) u souboru českých univerzitních studentů.
Soubor. Výzkumný soubor tvořilo 229 vysokoškolských studentů s průměrným věkem 22 let (SD = 2.13 let). Participanti provozovali řadu různých individuálních a kolektivních sportů (počet různých sportů N = 21).
Analýzy. Pro ověření faktorové struktury vnitřní motivace ve sportu byly využity metody explorační i konfirmační faktorové analýzy. Možné meziskupinové rozdíly s ohledem na pohlaví

(muži vs. ženy), úroveň sportování (rekreační vs. vrcholová) a frekvence sportování (1 až 2 krát týdně vs. 3 a vícekrát týdně) byly poté analyzovány s použitím tzv. MIMIC (multiple-indicators multiple-causes) modelování.
Výsledky. Explorační i konfirmační faktorová analýza odhalily marginální nesrovnalosti v postulované struktuře, zapříčiněné jednou z položek měřících vnitřní motivaci vědět. Vyloučení této položky vedlo k akceptovatelné shodě tří-faktorového modelu se subkonstrukty: vnitřní motivace vědět, vnitřní motivace něčeho dosáhnout a vnitřní motivace něco prožít. MIMIC modelování neodhalilo žádné genderové rozdíly v žádném ze subkonstruktů vnitřní motivace, a to jak na latentní úrovni, tak na úrovni manifestní (úroveň položek). Totéž platí pro proměnnou úroveň sportování, kde nebyly zaznamenány rozdíly mezi rekreačně a vrcholově sportujícími participanty. Korelace mezi subkonstrukty vnitřní motivace na jedné straně a sociálně tělesnou úzkostí, tělesným sebepojetím a obecným sebepojetím na straně druhé poukázala na možné problémy s konvergentní validitou třífaktorové konceptualizace vnitřní motivace ve sportu.
Limitace. Jednou z možných limitací této studie je využití relativně malého výzkumného souboru pro potřeby modelování s latentními proměnnými. Průřezový návrh studie může být rovněž považovaný za limitaci, jelikož neumožňuje kauzální inference mezi sledovanými proměnnými a neumožňuje zachytit individuální změny ve vnitřní motivaci a ověřit faktory, které by mohly k individuálním změnám přispívat.

Appendix. English and Czech versions of items measuring intrinsic motivation within the SMS

		English version	Czech version							
		Instructions: Using the scale below, please indicate to what extent each of the following items corresponds to one of the reasons for which you are presently practicing your sport.	Instrukce: Na škále 1–7 označte, jak moc se ztotožňujete s odpovědí na otázku: „Proč sportuješ?“	1	2	3	4	5	6	7
				Does not correspond at all	Corresponds a little		Corresponds moderately	Corresponds a lot		Corresponds exactly
Subscale	Item no.									
IM-K	SMS-2	For the pleasure it gives me to know more about the sport that I practice.	Pro potěšení z toho, že vím víc o sportu, který provozuji.							
	SMS-4	For the pleasure of discovering new training techniques.	Pro potěšení z objevování nových tréninkových technik.							
	SMS-23	For the pleasure that I feel while learning training techniques that I have never tried before.	Protože mám radost z toho, když se učím nové techniky či pohyby, které jsem nikdy předtím nezkoušel.							
	SMS-27	For the pleasure of discovering new performance strategies.	Pro potěšení z objevování nových soutěžních strategií a taktiky.							
IM-A	SMS-8	Because I feel a lot of personal satisfaction while mastering certain difficult training techniques.	Protože cítím uspokojení při zvládání obtížných tréninkových úkolů.							
	SMS-12	For the pleasure I feel while improving some of my weak points.	Protože cítím potěšení, když zlepšuji svá slabá místa.							
	SMS-15	For the satisfaction I experience while I am perfecting my abilities.	Protože cítím uspokojení, když se v mém sportu zdokonaluji.							
	SMS-20	For the pleasure that I feel while executing certain difficult movements.	Protože cítím potěšení při provádění těžkých pohybových úkonů.							
IM-E	SMS-1	For the pleasure I feel in living exciting experiences.	Pro potěšení, cítím vzrušující zážitky.							
	SMS-13	For the excitement I feel when I am really involved in the activity.	Pro ten skvělý pocit, který zažívám, když jsem zcela pohlcen danou aktivitou.							
	SMS-18	For the intense emotions I feel doing a sport that I like.	Pro intenzivní pocity a vzrušení, které mi sport přináší.							
	SMS-25	Because I like the feeling of being totally immersed in the activity.	Protože mám rád pocit, kdy jsem zcela ponořen do dané aktivity.							

IM-K: intrinsic motivation to know; IM-A: intrinsic motivation to accomplish; IM-E: intrinsic motivation to experience stimulation