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## Passion and exercise addiction: Healthier profiles in team than in individual sports

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New evidence suggests that passion is linked to exercise addiction. The objective of this work was to determine the strength of the relationship between exercise addiction, obsessive passion, and harmonious passion in team versus individual sports. Athletes ( $n = 190$ ) from three team and three individual sports were examined. Results of hierarchical multiple regressions revealed that obsessive passion and harmonious passion were significant ( $p < .001$ ) predictors ( $R^2 = .39$ ) of exercise addiction. Obsessive passion accounted for 25% and 50% of the variance in team and individual sports, respectively. Harmonious passion added little to the shared variance (3–4%). The levels of risk for exercise addiction were identical (15%) in the two groups. In team sports, harmonious passion was higher than in individual sports ( $p < .001$ ). The current results suggest that profiles of passion in team sports are superior to those in individual sports, while the risk for exercise addiction is similar.

**Keywords:** athlete; commitment; competition; dependence; training

A physically active lifestyle yields numerous health benefits (Bellocco, Jia, Ye, & Lagerros, 2010; Lee et al., 2011). It is known that regular physical activity is associated with better mental health (Clow & Edmunds, 2013). Based on this widespread information, many people engage in physical activities to cope with the hassles and challenges of the daily life (Berczik et al., 2012). Ironically, physical activity, including sports and exercise, may also become sources of stress (Stevens, Loudon, Yow, Bowden, & Humphrey, 2013). Repeated urge to exercise in increasingly higher volumes, with simultaneous loss of control over it, in the scholastic literature is known as “exercise addiction” (Berczik et al., 2014; Szabo, 2010; Szabo, de la Vega, Ruiz-Barquín, & Rivera, 2013). Other analogous terms used in the literature are: “exercise dependence” (Adams, 2009), “compulsory exercise” (Murray, Maguire, Russell, & Touyz, 2012), “obligatory exercise” (Thome & Espelage, 2007), and/or “exercise abuse” (Calogero & Pedrotty, 2004).

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Exercise addiction is often mixed-up with “commitment to exercise” (Szabo, 2010) that involves passion for and dedication to an activity. MaClaren and Best (2007) warn that although exercise addiction is related to the volume of exercise, the latter is not an index of addiction. Passion towards an activity is a notion that refers to engaging in a beloved activity that one finds important, invests time and energy into it, because of an emotional component attached to the activity (Mageau et al., 2009). Vallerand et al. (2003) conceptualise passion as an intense affinity towards an activity that people love, value, and invest effort and time in it. Love and value separate this activity from others towards which the person may show interest or even intrinsic motivation, but are of lesser significance (Mageau et al., 2009). Individuals demonstrate affinity for their beloved activity in both autonomous and controlled ways, which determine the form of their passion through behavioural regulation. In the context of the latter, people could love and value their activity (i.e. sport) for autonomous reasons motivated by the inherent satisfaction generated by the activity itself, or for controlled reasons serving the compensatory function of the activity (Mageau et al., 2009; Vallerand et al., 2003). Although full separation of these two reasons may be impractical, an activity performed for autonomous reason is characterised more by harmonious passion, while an activity undertaken for rigidly controlled reasons is characterised more by obsessive passion (Mageau et al., 2009).

Harmonious passion is, therefore, a result of autonomous internalisation that generates an intense, but controlled, drive to be part of the activity that is freely accepted by the person, and it is in congruence with aspects of the self in which it becomes integrated (Mageau et al., 2009). Harmonious passion becomes evident when one flexibly engages in the autonomously internalised activity, which then is strongly and directly related to positive affect, while being inversely associated with negative affect (Stenseng, Rise, & Kraft, 2011; Vallerand et al., 2003, 2006; Vallerand & Miquelon, 2007).

In contrast, obsessive passion surfaces in the absence of fulfilment of one’s intrinsic needs that may result in the internalisation of intra- or interpersonal pressures or both; it may emerge when one internalises the activity in a rigid/controlled way, when the participation is obligatory, which is strongly related to negative affect (Stenseng et al., 2011; Vallerand et al., 2003, 2007; Vallerand & Miquelon, 2007). An obsessively passionate person attaches importance to activity contingencies such as self-esteem and escape from problems (i.e. stress), which makes it difficult to stop the passionate activity (Vallerand, 2010). Thus, self-pressures may arise from contingencies attached to the activity, but also loss of control over the activity, and/or social pressure (Mageau et al., 2009). Vallerand et al. (2003) propose that engaging in an activity with obsessive passion may be a substitute self-worth that motivates the indulgence in the activity for ego-nourishment. Obsessively passionate individuals feel compelled to pursue their activity. Therefore, although the person likes, or even loves, the activity (Vallerand, 2015), she/he feels an urge to engage in it because of one or more internal contingencies. Consequently, extrapolating from Kenrick and Cialdini’s (1977) thought on romantic passion, obsessive passion, despite the intrinsic motivational aspects and love for the activity like those seen in harmonious passion, may be perceived as being primarily regulated by negative reinforcement that characterises the compelled nature to the chosen activity, in contrast to harmonious passion that is regulated via positive reinforcement as mirrored by the freely chosen characteristic of the behaviour.

Currently, there is little empirical work connecting exercise addiction and passion. Obsessive passion was found to be positively associated with exercise addiction in endurance sports and other leisure physical activities (Schipfer & Stoll, 2015; Stenseng et al., 2011). It was shown that obsessive passion is linked to all the dimensions of exercise addiction (time, reduction in other activities, tolerance, withdrawal, continuance, intention effects, and lack of control),

which was not the case for harmonious passion that was only related to time and tolerance (Paradis, Cooke, Martin, & Hall, 2013). Furthermore, it was revealed that harmoniously passionate exercisers can increase the time spent on exercise, without decreasing time spent on other important life activities, which is not the case for obsessively passionate exercisers, who spend an exaggerated time on exercise, while taking time away from other important life activities (Paradis et al., 2013). The gist of these findings was strengthened by a Greek study demonstrating that obsessive passion bears a stronger relationship to exercise addiction than harmonious passion (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014).

The link between exercise addiction and passion, as a function of athletic level of competition, was explored in a recent work examining a large sample of low-, high-level competitive athletes and non-competitive leisure exercisers (De La Vega, Parastatidou, Ruíz-Barquín, & Szabo, 2016). The findings revealed that obsessive passion was a strong predictor of exercise addiction, accounting for 37% of its total variance. In contrast, harmonious passion was not a significant component in the model. While athletes in formal competitive sports scored higher than leisure exercisers on all measures, no differences were disclosed in exercise addiction and passion between athletes competing at low and high levels. Finally, De La Vega et al. (2016) showed that athletes in team sports may report greater harmonious passion as well as obsessive passion than those taking part in individual sports.

The objectives of the current work were to investigate directly the connection between exercise addiction and passion in team and individual sports, and because exercise volume is related to exercise addiction (İrem & Bavli, 2016; MaClaren & Best, 2007), we also assessed the triangular link between reported weekly hours of exercise, passion, and exercise addiction. The importance of examining this link lies in the proposal of De La Vega et al. (2016) who suggest that “The concept of exercise addiction is not a plain and independent construct and may not reflect a psychological dysfunction in the athletic population” (p. 325), which could explain the consistently higher exercise addiction scores noted in athletes – regardless of the form of participation (i.e. individual or team) – than leisure or recreational exercisers (Szabo, Griffiths, de la Vega, Mervó, & Demetrovics, 2015). The high exercise addiction scores in athletes could reflect the passion for sport rather than a behavioural addiction.

We hypothesised that both obsessive passion and weekly hours of exercise, but not harmonious passion, will be predictors of exercise addiction. To directly test De La Vega et al.’s (2016) recent findings, we hypothesised that team-sport athletes will exhibit greater passion, both obsessive and harmonious passion, than athletes in individual sports. Furthermore, given that athletes in general (whether they are involved in team or in individual sports) report higher exercise addiction than recreational exercisers (Szabo et al., 2015), and since all participants in the current study were athletes, we postulated that team and individual athletes will not differ in their risk for exercise addiction scores.

## Methods

### *Sample size calculation*

The required sample size ( $n$ ) for regression was calculated using the G\*Power (v. 3) software (Faul, Erdfelder, Lang, & Buchner, 2007). The a priori test (power  $(1 - \beta) = 0.95$ , medium effects size ( $f^2$ ) = .15,  $\alpha = .05$ , with three predictors (obsessive passion, harmonious passion, and weekly hours of exercise)) revealed that the required sample size was 119. The minimum sample size for the group comparisons or between-group analyses (power  $1 - \beta = 0.95$ , medium effects size ( $f^2$ ) = .15, and  $\alpha = .05$ , with three dependent measures (obsessive passion, harmonious passion, and exercise addiction) and two covariates (age and weekly hours of exercise)) was 73.

## Participants

The study was carried out at the Budapest University Athletics Club, incorporating over 10 organised sports. Using a “one in three” systematic randomisation method, members of three teams (defined as people interacting and depending on each other while working for a shared goal) and three individual sports clubs, who trained with an equal frequency (three times per week), were solicited to take part in the study. The sports were: cheerleading,<sup>1</sup> soccer, and basketball representing team sports ( $n = 92$ ) and gymnastics, running, and kettlebell forming the individual sports ( $n = 98$ ). We examined 190 volunteers (78 men and 112 women; mean age = 22.94,  $SD = 4.64$  years). They trained an average of 6.20 ( $SD = 3.30$ ) hours per week for an average of 6.08 ( $SD = 5.48$ ) years, for a minimum of 1 year. Participants came from middle and upper middle class and they all were of Hungarian origin. Ethical clearance for the study was granted by the Research Ethics Committee (REC) of the Faculty of Education and Psychology at Eötvös Loránd University, which ensured that the work was carried in accord with the ethical principles for research with human participants of the Helsinki Declaration (World Medical Association, 2008).

## Materials

A demographic questionnaire was used to determine the participants' gender, age, weekly hours of exercise, and history of exercise. The Exercise Addiction Inventory (Terry, Szabo, & Griffiths, 2004) was used to assess the risk for exercise addiction. This is a 6-item scale. Sample items include: “Exercise is the most important thing in my life.” or “If I have to miss an exercise session I feel moody and irritable.” The Exercise Addiction Inventory is rated on a 5-point Likert scale and ranges from “strongly disagree” to “strongly agree”; the scale comes with good psychometric properties (Griffiths et al., 2015; Monók et al., 2012; Terry et al., 2004). Its internal reliability (Cronbach's  $\alpha$  [ $\alpha$ ]) ranges between .68 and .80 across several international studies (Griffiths et al., 2015).

Another paper and pencil tool used was the psychometrically revalidated Passion Scale (Marsh et al., 2013). Sample items include: “This activity is in harmony with the other activities in my life.” or “If I could, I would only do my activity.” The word “activity”, in this case, refers to the practised sport. The scale gauges harmonious passion on a 6-item subscale and obsessive passion on another 6-item subscale. Both subscales are rated on a 7-point Likert scale, ranging from “not agree at all” to “very strongly agree”. The internal reliability of both subscales is good; Cronbach's  $\alpha$  of the obsessive passion scale is .86 and that of the harmonious subscale is .83. In the current study a validated Hungarian version of the scale was used with internal reliabilities of .80 and .88 (Tóth-Király, Bőthe, Rigó, & Orosz, 2017).

## Procedure

Following the reading and signing of a written informed consent form, the participants completed the two questionnaires in their natural training environments before their scheduled training. Data were entered in an SPSS (Statistical Package for Social Sciences) file (Version 22.0), verified by two experimenters, and analysed with the same software.

## Statistical analyses

Initial correlations were followed by hierarchical multiple regression analysis to test the predicting power of obsessive passion, harmonious passion, and weekly hours of exercise, on exercise addiction scores. A multivariate analysis of covariance (MANCOVA) was used to test the null hypothesis that athletes in team and individual sports do not differ from each other in obsessive passion, harmonious passion, and exercise addiction.

Table 1. Statistically significant correlations between the exercise addiction (exercise addiction), obsessive passion (obsessive passion), harmonious passion (harmonious passion), and reported weekly hours of exercise (Pearson  $r$ ;  $p < .001$  in all instances).

	Obsessive passion	Harmonious passion	Weekly hours of exercise
Exercise addiction	0.599	0.493	0.391
Obsessive passion		0.582	0.519
Harmonious passion			0.499

## Results

As expected, initial correlations yielded statistically significant relationships among all the measures (Table 1). Therefore, the weekly hour of exercise was also included, along with obsessive passion and harmonious passion, in the hierarchical multiple regression to test the predicting power of these variables on exercise addiction. First, an analysis of the standard residuals (St. Resid.) was carried out to identify any outliers in the data. This test indicated that participant no. 114 needed to be removed. After removing this outlier, the sample size decreased from 190 to 189. The re-test of the standardised residuals indicated that the new data did not contain any further outliers (St. Resid. Min. =  $-2.665$ , St. Resid. Max. =  $2.359$ ). Subsequently, the test of the assumption of collinearity indicated that multicollinearity was not a concern in the data (harmonious passion, tolerance =  $.608$ , VIF (variance inflation factor) =  $1.644$ ; obsessive passion, tolerance =  $.592$ , VIF =  $1.689$ ; weekly hours exercise, tolerance =  $.672$ , VIF =  $1.488$ ). The data also met the assumption of independent errors (Durbin–Watson value =  $1.946$ ). Finally, the data met the assumption of non-zero variances (harmonious passion, variance ( $s^2$ ) =  $26.686$ ; obsessive passion,  $s^2$  =  $36.393$ ; weekly hours of exercise,  $s^2$  =  $10.896$ ). The order of entering the independent variables in the hierarchical regression was obsessive passion, harmonious passion, and weekly hours of exercise. Results of the regression analysis provided partial confirmation for our research hypothesis. Beta coefficients for the three predictors were: obsessive passion,  $\beta = 0.253$ ,  $t = 6.073$ ,  $p < .001$ ; harmonious passion,  $\beta = 0.132$ ,  $t = 2.747$ ,  $p = .007$ ; and weekly hours of exercise,  $\beta = 0.056$ ,  $t = 0.789$ ,  $p > .05$ . The best-fitting model for predicting exercise addiction is a linear combination of obsessive passion and harmonious passion ( $R = .624$ ,  $R^2 = .390$ ,  $F(1, 186) = 9.621$ ,  $p = .002$ ). However, despite statistical significance, harmonious passion had a small contribution to the model ( $R^2$  change =  $.032$ ).

The 2 (type of sports: individual sport and team sport) by 2 (gender: men and women) (the dependent measures: obsessive passion, harmonious passion, and exercise addiction) MANCOVA using age and the weekly hours of exercise as the covariate, yielded a statistically significant multivariate main effect for the type of sport (Pillai's trace =  $.097$ ,  $F(3, 181) = 6.50$ ,  $p < .001$ , partial ETA squared ( $\eta_p^2$ ) =  $.097$ , power ( $1 - \beta = 0.969$ )). While age was not significant, the other covariate, weekly hours of exercise, was also statistically significant (Pillai's trace

Table 2. Means and standard deviations in brackets,  $F$  and  $p$  values (in brackets), and effects sizes (partial ETA squared ( $\eta_p^2$ )) for three dependent measures.

	Team sport	Individual sport	$F$ ( $p$ )	$\eta_p^2$
Exercise addiction	20.80 (3.21)	19.99 (3.47)	0.054 (.817, NS)	.000
Obsessive passion	25.42 (5.01)	22.74 (6.62)	2.31 (=130, NS)	.012
Harmonious passion	36.35 (2.96)	32.21 (5.94)	17.29 (<.001)	.086

Note: NS: not significant.

Table 3. Result of the Bootstrap (1000 bootstrap samples) ANOVA for harmonious passion (harmonious passion) comparing team and individual sports.

	Statistic	Bias	Standard error	Bootstrap confidence intervals (95%)	
				Lower	Upper
Team sport	Mean	.0049	.2947	35.771	36.968
	SD	-.0270	.2564	2.490	3.3841
Individual sport	Mean	.0113	.6054	30.982	33.488
	SD	-.0439	.4866	5.039	6.724

= .287,  $F(3, 181) = 24.34$ ,  $p < .001$ ,  $\eta_p^2 = .287$ ,  $1 - \beta = 1.0$ ). No gender main effect, or gender by type of sport, interaction has emerged from this analysis ( $p > .05$ ). The follow-up univariate tests revealed that athletes in team sports scored statistically significantly higher on harmonious passion than those in individual sports ( $F(1, 183) = 17.29$ ,  $p < .001$ ,  $\eta_p^2 = .086$ ,  $1 - \beta = 0.985$ ; Table 2). This finding was then further examined with a Bootstrap ANOVA to determine robustness and bias (Table 3).

Given the group differences found in harmonious passion, we were interested in re-examining the relationship between passion and exercise addiction, now separately for the two groups, by repeating the hierarchical multiple regression analysis initially performed for the whole sample.<sup>2</sup> Given that weekly hours of exercise was not a significant predictor in the regression analysis of the full sample, only obsessive passion was entered first, followed by harmonious passion in these hierarchical multiple regressions. After ascertaining that assumptions were met, as done for the full-sample regression described above, we found two models that were statistically significant (Table 4). Given the fact that harmonious passion only added 4% and 3%, respectively, to the second model in both cases, only the first model, containing obsessive passion as the predictor of exercise addiction (boxed in Table 4), was further tested with an analysis of covariance (ANCOVA) to verify the interaction between obsessive passion (used as covariate) and team and individual sport groups' exercise addiction as the dependent measure. The interaction was statistically not significant, indicating that the slopes of the regression line of the covariate did not differ, merely the predictor's (obsessive passion) range was statistically significantly different in the two groups ( $F(1, 185) = 84.79$ ,  $p < .001$ ,  $\eta_p^2 = .314$ ). Therefore, the relationship of obsessive passion to exercise addiction was stronger in individual than in team sports.

Table 4. Summary of the results of the hierarchical multiple regression analyses performed separately for team sports ( $n = 91$ ) and individual sports ( $n = 98$ ).

		Predictor	<i>R</i>	<i>R</i> <sup>2</sup>	<i>F</i>	<i>p</i>	<i>B</i>	SE	<i>t</i>	<i>p</i>
Team sports	Model 1	Obsessive passion	.45	<b>.21</b>	22.92	<.001	.29	.06	4.79	<.001
	Model 2	Obsessive passion	.50	.25	14.40	<.001	.23	.07	3.49	=.001
		Harmonious passion					.25	.11	2.21	=.03
Individual sports	Model 1	Obsessive passion	.69	<b>.47</b>	84.99	<.001	.36	.04	9.22	<.001
	Model 2	Obsessive passion	.71	.50	48.27	<.001	.29	.05	5.96	<.001
		Harmonious passion					.14	.05	2.57	=.012

Note: The  $R^2$  is highlighted in both cases to stress the difference in the predictive power of obsessive passion on (obsessive passion) the dependent variable, exercise addiction (exercise addiction), in the two forms of organised sports. B: unstandardised coefficients; SE: standard error.



Finally, we calculated the prevalence of the risk for exercise addiction (indicated by a score of 24 or more on the exercise addiction; Terry et al., 2004) in the studied samples. The overall rate of risk for exercise addiction was 15.3%. When examining the prevalence in team and individual groups, a Chi-Square indicated that the groups did not differ and had an approximately equal rate of risk for exercise addiction, 15.4% in team sports and 15.3% in individual sports.

## Discussion

The key findings emerging from the current investigation are that obsessive passion is a significant component of exercise addiction, especially in individual sports, and that athletes in organised team sports report greater harmonious passion than athletes in individual sports. In contrast to our hypothesis, the weekly volume of exercise was not a predictor of exercise addiction, but harmonious passion was, despite the fact that it contributed only 3–4% to the variance in exercise addiction. Exercise volume is, in general, relatively high in athletes and does not reflect exercise addiction (Szabo et al., 2015). Thus, unlike in recreational exercisers (Szabo, 2010), the relationship between exercise volume and exercise addiction seems to be absent in athletes whether they are in individual or in team sports.

Finally, the results reveal that the prevalence of the risk for exercise addiction in organised sports is relatively high (15%) and that there are no differences in this figure when comparing participants in team sports with those taking part in individual sports. These findings are consistent with previous reports stemming from studies on exercise addiction with elite athletes (Szabo et al., 2015).

Our findings replicate the recent results of De La Vega et al. (2016). Like their findings, the current results show that obsessive passion is a determinant of exercise addiction. In fact, obsessive passion determines more than one-third of the variance (37% in de La Vega et al. and 36% in the current work) in exercise addiction. These results corroborate past reports linking obsessive passion to exercise addiction (Paradis et al., 2013; Schipfer & Stoll, 2015; Stenseng et al., 2011). They also match the results of Parastatidou et al. (2014) showing that obsessive passion manifests a stronger relationship to exercise addiction than harmonious passion. Indeed, in De La Vega et al.'s study, harmonious passion was not a significant predictor of exercise addiction, and similarly in the present inquiry, despite the statistical significance, it only accounted for 3% of the variance in exercise addiction. Consequently, while obsessive passion and exercise addiction overlap to a large extent, the latter is relatively independent of harmonious passion.

The current findings expand those reported by De La Vega et al. (2016) by showing that the commonality between exercise addiction and obsessive passion is much stronger in individual sports than in team sports. Indeed, in the former, obsessive passion accounted for nearly half (47%) of the total variance in exercise addiction, while in the latter for less than half (21%) of that seen in individual sports. While these are novel findings, concerning the differences between team and individual sports, it should be mentioned that the relationship between obsessive passion and exercise addiction appears to be mediated via introjected regulation (Parastatidou et al., 2014) that is a component of external motivation (Pelletier et al., 1995). Since Parastatidou et al. studied fitness participants in leisure centres, the next step is to study the moderating role of motivational factors in the relationship between passion and exercise addiction in organised sports, with expanded focus on the differences between team and individual athletes.

The current findings reveal that harmonious passion is higher in athletes taking part in team sports in contrast to those in individual sports. This finding replicates the results of De La Vega et al. (2016) and agrees with the results reported by Vallerand et al. (2003). An explanation for this finding is that in addition to the physical and mental aspects of the athletic activity found in individual sports, team sports have a social context that could affect harmonious passion. Indeed,



collective motivation, shared success, and successful cooperation may be associated with greater harmonious passion in team versus individual sports. Furthermore, the level of socialisation, which is higher in team than in individual sports (Devecioglu, Sahan, Yildiz, Tekin, & Sim, 2012), may also contribute to the greater harmonious passion in the former group. The higher harmonious passion, combined with weaker link between obsessive passion and exercise addiction, shows that athletes in team sports demonstrate a healthier profile in these variables than those in individual sports. Indeed, individual athletes are likely to exert greater internal pressure and control on their training, which is linked to higher obsessive passion, and do not profit from the social aspects of athletic training, which could mirror a lower harmonious passion in contrast to team players.

The prevalence of the risk for exercise addiction emerged to be relatively high in the present study in both team and individual sports. However, the here obtained figure (15%) is lower than in other studies (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012; Szabo et al., 2013), that ranged from 17.0% to 41.4%. However, it is much higher than the prevalence among leisure athletes which ranges from 1.9% to 3.2% (Szabo et al., 2015). It was argued that the differences could be due to the diverse interpretation of the items measuring the exercise addiction between athletes and leisure exercisers (Szabo et al., 2015). The current study is not without limitations; the use of more than one exercise addiction assessment tool is warranted. While the work was successful in replicating past results, how representative the selected team and individual sports' athletes are of the athletic population, in general, is uncertain. Furthermore, although the required sample size was calculated a priori, to generate a robust conclusion interpretable at population level a larger sample may be needed. Finally, cultural differences in passion may exist (although not reported to date), which could also affect the generalisability of the current findings. Future research with a greater representation of team and individual sports is necessary. The results obtained here may only be tentative, but should provide an incentive for further work.

## **Conclusions**

The study replicates recent findings in the field revealing that obsessive passion is a strong predictor of exercise addiction, while harmonious passion has a limited predictive power in the latter. The present work also expands past reports by showing that the connection between obsessive passion and exercise addiction is twice as high in individual sports than in team sports. Consequently, exercise addiction may be re-conceptualized as a hybrid of obsessive passion and addiction, especially in individual sports. The work also provides evidence for higher harmonious passion in team sports than in individual sports; taken together, these findings project a healthier profile in passion and obsessive passion–exercise addiction relationship in team versus individual sports.

## **Ethical clearance**

Ethical permission for the study was obtained from the Research Ethics Committee of the Faculty of Education and Psychology at ELTE Eötvös Loránd University.

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statistical analyses. R.V. had major theoretical input on passion and the data interpretation. R.R.-B. took part in data analysis and reviewed the coherency of the paper as well as he cross-checked the references. A.S. helped in the design and wrote the Methods, Discussion, as well as the Conclusion sections of the report.

## Notes

1. Unlike soccer and basketball that are open skill team sports, cheerleading is an interactive closed skill team sport in which 15–25 individuals work together and depend of each other.
2. Given that group-sample size was lower than the whole sample size, the power ( $1 - \beta$  error probability) decreased from 0.95 to 0.91 in the team sports group ( $n = 91$ ) and to 0.93 in the individual sports group ( $n = 98$ ).

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