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Exercise addiction, obsessive passion and the use of nutritional supplements in fitness center attendees

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Abstract

Exercise addiction is characterized by excessive and obsessive exercise patterns. New research indicates that the risk of exercise addiction is largely predicted by passion, but most evidence comes from studies employing relatively low sample sizes. The aim of this study was to examine the relationship between addiction, passion, the use of nutritional supplements, differences between competing versus non-competing exercisers and exercise in solitude versus with others. We conducted an online survey with 1255 fitness attendees with a mean age of 31.7 years and an average of 7.5 weekly exercise hours. The prevalence of high risk of exercise addiction was 7.7%.

Results indicated that obsessive passion was a strong predictor of addiction, accounting for 48% of the variance. The addiction group used the most performance-enhancing nutritional supplements (e.g. caffeine and proteins). Those who exercised alone reported higher addiction scores and obsessive passion compared to those who exercised with others. Similar results emerged for competing exercisers compared to non-competing exercisers.
This study confirm the strong relationship between exercise addiction and obsessive passion and suggests that those at high risk of addiction consume more nutritional supplements than other exercisers, exercise more for competition, and are more often “lonely wolves”.

**Keywords:** exercise addiction; fitness, passion; nutrition; competition

**Introduction**

**Risk of Exercise Addiction (REA)**

Regular exercise can reduce the risk of lifestyle diseases, enhance physical functioning, improve quality of life and enhance psychological well-being.\(^1\),\(^2\),\(^3\) The number of adults who engage regularly in some form of exercise has increased significantly during the last few decades.\(^4\) Exercising in fitness centers is very popular especially in large urban areas.\(^5\)

Hunting the health benefits of exercise may in some cases result in excessive and obsessive exercise patterns that eventually lead to physical and psychological distress. Exercise becomes a priority before family and friends, and withdrawal symptoms appear when prevented from exercise. This phenomenon has been described as ‘exercise addiction’\(^6\),\(^7\),\(^8\) and may lead to negative health consequences such as sport injuries, illness and loss of social relations.

Research indicates that the prevalence of exercise addiction varies between 2% and 10% in fitness populations.\(^9\) In specific samples (e.g. triathlon) significantly higher rates have been reported.\(^9\),\(^10\) However, it should be noted that prevalence studies only assess the possible ‘risk’ which may never turn into a morbid pattern of exercise behavior, or exercise addiction.

**Passion for exercise**

Passion is a powerful emotion or feeling that can be directed towards an activity that a person enjoys, or even loves, finds important and, therefore, spends considerable time and energy on. Vallerand et al\(^11\) forwarded a dual model for passion comprised by harmonious passion (HP) and obsessive passion (OP). The former is bound to positive subjective experiences that create a balance between the passionate activity and the passionate person’s identity and life. The
reverse is proposed for OP, which is associated with negative emotions and behaviors causing an imbalance between the passionate activity and other life aspects.

The literature suggests that passion can be conceptualized and examined similarly across different activities, including sport and exercise. Vallerand et al\textsuperscript{11} found that participants’ willingness to engage in exercise behaviors involving severe risk of injury (e.g. cycling in hazardous conditions) was associated with higher OP ratings. Recent studies suggest that passion, especially OP, is a predictor of REA.\textsuperscript{14-16}

\textit{Nutritional Supplements}

The use of dietary supplements is increasingly reported worldwide, particularly among athletes and exercisers, who use it to enhance sport performance, stay healthy, increase energy and improve exercise recovery.\textsuperscript{17,18}

Taking nutritional supplements such as vitamins, proteins and caffeine may not necessarily be associated with unhealthy or addictive exercise. But research has shown that regular exercisers have little or inaccurate scientific information about appropriate nutrition, whereas many anecdotes exist about the amount and type of supplements.\textsuperscript{19}

Furthermore, little is known about the relationship between exercise addiction, passion and the use of nutritional supplements. One recent cross-cultural investigation reported that users of nutritional supplements scored higher on REA than non-users.\textsuperscript{20} These novel findings wait for replication and are useful in describing the complex bio-psycho-profile of an exerciser at risk of addiction.

\textit{Exercising for competitive versus non-competitive reasons}

Past research indicates that competitive exercisers report significantly higher prevalence of exercise addiction than recreational exercisers. Blaydon and Lindner\textsuperscript{21} studied 203 triathletes competing at amateur (n = 133) and professional (n = 70) levels and found that the incidence of exercise addiction ranged from 21.6\% to 30.4\%. Youngman and Simpson\textsuperscript{22} showed that about 20\% of a large sample (n = 1285) of triathletes exhibited high REA. According to the findings of McNamara and McCabe,\textsuperscript{23} 34\% of 234 Australian elite athletes were at high REA. In another work, 17\% of 95 Spanish ultra-marathoners were at high REA. A study with 262 Italian athletes showed that 18.3\% of them were at high REA.\textsuperscript{25} These high figures were
attributed to different interpretations of the items assessing REA by competitive versus non-competitive exercisers. Therefore, it is reasonable to expect that competitive exercisers might score higher in REA assessment than recreational exercisers.

**Exercising Alone or With Others**

When considering addiction, based on its components such as craving and the related urgent need of instant gratification, it becomes clear that the behavior cannot be ‘scheduled’. This is one of the reasons why Szabo and Egorov connotated exercise addicts as ‘lone wolves’. To date no focused research was performed to test the difference in the REA between those who exercise alone and those who exercise with others. However, one recent study found that OP is a stronger predictor of REA in individual exercisers than in team exercisers. The hypothesis, that REA is higher in lone exercise in contrast to exercise with others, merits further research attention.

**Aims and hypotheses**

The first aim was to examine the relationship between REA and passion in a large sample of Danish fitness attendees. The second aim was the testing of nutritional supplement use among groups with high, medium, and low REA. The third aim was to examine whether fitness exercisers who participate in competition differ in REA from those who do not compete. The fourth aim was to measure the prevalence of the REA among those who exercise alone versus those who exercise with others.

Based on the extant literature, we hypothesized that obsessive passion would be a strong predictor of REA, and that high REA would be associated with more nutritional supplement use. Finally, we hypothesized that competing, exercisers and those exercising in solitude would exhibit greater REA and passion than non-competing and group exercisers.

**Materials and methods**

**Participants**

Participants were recruited from the largest Danish fitness company’s Facebook-group (Fitness World having 177,000 followers). We advertised for participation in the study in May
and June 2018. Fitness exercisers were included if they performed regular fitness exercise at least once a week. A total of 1255 fitness attendees completed the study and 80% were female. The mean age was 31.2 years and the age range was 15-82 years with 1.5% below 18 years and 0.4% over 69 years. The participants performed exercise in average 7.5 hours per week (range 1-31 hours). The majority (89.7%) perceived themselves as habitual exercisers while 122 (10.3%) stated to be competing athletes.

**Measures**

The Danish version of the Exercise Addiction Inventory\(^28\) (EAI) was used to measure symptoms of exercise addiction. It consists of six items that are rated on a 5-point Likert scale from strongly disagree (1) to strongly agree (5). Based on the classification of Terry et al\(^29\) a total score of 24 – 30 indicates high REA, while a score of 13-23 reflects slight to moderate symptoms and a score 6-12 is equivalent to asymptomatic. The EAI has been validated across several languages, including Danish, and has shown good psychometric properties.\(^30\)

A Danish version of the Passion Scale\(^11\) was used to assess passion for exercise. The scale consists of three sub-scales measuring obsessive passion (6 items), harmonious passion (6 items) and the passion criteria (5 items measuring the construct of passion). The level of agreement is rated on a 7-point Likert scale ranging from not agree at all (1) to very strongly agree (7). The Passion Scale been translated and validated into different languages including Spanish, English and Hungarian.\(^12,13,31\)

Finally, participants were asked to answer demographic and exercise-habit related questions, such as gender, age, weekly exercise amounts, use of nutritional or other performance enhancing supplements (vitamins, proteins, caffeine, energy drinks, creatine, and other supplements), nature of exercise (competitive, non-competitive), and social environment of exercises (training alone, with others, or both).

**Ethics**

All participants gave their informed consent for scientific use by completing the questionnaire and all data were anonymized. No personal data were requested such as names, birthday, or e-mail address. The research met the required ethical standards and did not need formal ethical approval according to Danish ethical considerations.
Statistical analyses

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 24. Multiple hierarchical regression was performed to examine the predictive power of both obsessive and harmonious passion on the risk for exercise addiction. Chi-square test was employed to examine the differences in the rate of supplement use among the risk categories for exercise addiction. Finally, two multivariate analyses of co-variances (MANCOVAs) were conducted to examine the differences in the dependent measures between those who trained for competitive purposes versus non-competitive exercisers, and those who trained alone, versus those who trained with others, or both alone and with others.

Results

Prevalence of high risk of exercise addiction

Based on the three risk categories for exercise addiction the distribution of responders was calculated. We found that 7.7% (n = 97) fell into the high REA category, 80% (n = 1004) exhibited slight to moderate symptoms, and 12.3% (n = 154) were asymptomatic.

Passion and addiction

A multiple hierarchical regression was conducted to determine whether harmonious passion, obsessive passion, weekly hours of exercise, gender and age predicted REA. First, the assumption of collinearity was examined. The test-results indicated that multicollinearity was not a concern (obsessive passion, tolerance = .813, VIF = 1.230; harmonious passion, tolerance = .882, VIF = 1.133; weekly hours of exercise, tolerance = .811, VIF = 1.233; gender, tolerance = .956, VIF = 1.046; and age tolerance = .982, VIF = 1.018). The data also met the assumption of independent errors (i.e., Durbin-Watson value = 1.915). Further, the data also met the assumption of non-zero variances (obsessive passion, variance $s^2 = 52.27$, harmonious passion, $s^2 = 35.64$, weekly hours of exercise, $s^2 = 16.81$, gender $s^2 = 0.16$, and age $s^2 = 134.56$).

Using the enter method, three statistically significant regression equations were found. In the best-fit model gender and age were not significant predictors of the risk for exercise addiction ($F (3, 1253) = 441.79, p < .001, R^2 = .515, R^2 \text{ adjusted} = .513$). In predicting the risk for
exercise addiction scores, it was revealed that obsessive passion was the strongest predictor accounting for over 48% of the variance in the risk for exercise addiction, whereas harmonious passion accounted for less than 1% and the weekly hours of exercise also accounted for only slightly over 2% of the variance in the dependent variable (Table 1).

**Insert Table 1 about here**

**Nutritional supplements and exercise addiction**

Chi-square tests revealed that participants at high REA used the most exercise enhancing nutritional supplements (especially vitamins, proteins and caffeine) while asymptomatic participants reported the lowest use at all nutritional types. The results of these tests are summarized in Table 2.

**Insert Table 2 about here**

**Competing exercisers**

A MANCOVA, using gender and age as covariates and the risk of exercise addiction, obsessive passion and harmonious passion as dependent measures, revealed that those training for competitive purposes differed significantly from the non-competitive part of the sample (Wilks’ Lambda ($\lambda$) = .960, $F$ (3, 1245) = 17.49, $p < .001$, effect size as partial Eta squared ($\eta_p^2$) = .040). Age, but not gender, was a significant covariate ($p < .001$). The univariate tests showed that the two groups differed from each other in all three dependent measures, with competitive exercisers scoring higher than non-competitive exercisers. These results are summarized in Table 3.

**Insert Table 3 about here**

**Exercise alone or with others**

Another similar MANCOVA using the social aspect of exercise behaviour (alone, with others, or both alone and with others) as grouping factor also yielded a statistically significant multivariate effect (Wilks’ $\lambda$ = .975, $F$ (6, 2488) = 5.38, $p < .001$, $\eta_p^2 = .013$). Again, only age was a statistically significant covariate ($p = .002$). The univariate tests were statistically significant for all the three dependent measures as summarized in Table 4.

**Insert Table 4 about here**

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The between-groups differences were examined with Bonferroni-corrected post-hoc tests which revealed that participants who exercised with others scored lower at REA and obsessive passion than those who trained alone or both alone and with others (exercise addiction \( p < .002 \) and \( p = .003 \), respectively; obsessive passion \( p < .001 \) and \( p = .006 \), respectively). On harmonious passion those who trained alone differed (scored lower) from those who trained both alone and with others (\( p = .004 \)), but not from those who trained with others, see Table 4.

**Discussion**

The current study has the following contributions to the field of exercise addiction: 1) It confirms, in a large sample, that REA shares a very large proportion (48%) of the variance with obsessive passion; 2) It reveals that exercisers showing high REA consume more performance enhancing nutritional supplements; 3) Supports earlier findings that competing athletes report higher scores of REA than recreational or non-competing exercisers; 4) It shows for the first time that those who exercise in solitude exhibit greater REA and obsessive passion than those who exercise with others and with lower harmonious passion than those who exercise both alone as well as with others.

*Is there a relationship between exercise addiction and obsessive passion?*

The prevalence rate of REA was 7.7% in our sample. This proportion falls within the range of prevalence figures generally reported in exercise addiction research.\(^{16}\) The results support our hypothesis that OP is a strong predictor of REA. In fact, this study reveals the largest ever reported common variance (i.e. > 48%) between the two variables. This finding is in accord with the results of studies examining this association in smaller samples.\(^{14-16,32,33}\) In line with past results, our research shows that HP has little in common with REA, and therefore may be perceived as a ‘healthy aspect’ of exercise behavior as opposed to OP, which – based on the current and earlier findings - may predispose one to REA.

*Do exercise addicts consume more nutritional supplements?*

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We expected that those with a high preoccupation with exercise would use more performance enhancing supplements. Our results found that exercisers with high REA reported more use of vitamins, proteins, caffeine, energy drinks, creatine, and other supplements.

These results agree with a recent cross-cultural report in which the authors found greater consumption of various nutritional supplements in those at REA than other exercisers. These findings, however, may be misleading. Nutritional supplements are used for performance enhancement that is more important in competitive exercise than in recreational (self-controlled) exercise. Given that competitive exercisers, in general, exhibit greater REA they may be the consumers of more nutritional supplements than non-competitive exercisers. Future studies need to untangle the relationship between REA, nutritional supplement use and type of exercise behaviour.

As research has shown that the use of supplements is an area where consumers have little scientific knowledge about the recommended use, the effect, side-effects and potential harmful consequences of misuse, we recommend easy access to evidence-based coaching and courses in order to buy and consume the optimal products. Some supplements may have little or no effect on performance, health and restitutions while others may cause damage in too large amounts. An educational test and teaching program developed to investigate and educate athletes in sports nutrition has been suggested.34

Are competing exercisers at higher Risk of Exercise Addiction?

In accordance with past research21-25 competitive exercisers in this study scored higher on REA than non-competitive exercisers. As indicated earlier, it was argued that these differences could be attributed to possibly different interpretations of the items assessing REA by competitive versus non-competitive exercisers.10,14

However, whether the interpretations are different needs to be addressed empirically, since despite valid arguments, the explanation is hypothetical only. Expanding earlier findings, the current investigation also revealed that competitive exercisers scored higher on both OP and HP than non-competitive exercisers. This finding may indeed reflect a greater obsession with exercise in competing than non-competing people that, nevertheless, may be counterbalanced by the also higher level of HP, which is associated with positive feeling states and affect.
Are exercise addicts lonely wolfs?

This is the first inquiry to show that individuals who report exercising in solitude score higher on REA than those who exercise with others or both alone as well as with others. The finding agrees with the proposal of Szabo and Egorov\(^27\) that exercise addicts are ‘lonely wolfs’. But it should be remembered that the REA assessment with questionnaires does not provide a diagnosis. It is simply a screening tool that points toward the estimated susceptibility to the dysfunction.

Nevertheless, it is obvious to expect that those who are susceptible, in this case those who score higher on REA, could be more likely to develop addiction if there is a trigger\(^10\) than those who score lower on REA. It should be noted that exercising alone is different from individual exercise, which could be done in (scheduled) group setting too. Exercising in solitude means that the exerciser maintains control over her or his exercise schedule. In all forms of addictions this component is essential to enable the addicted person to fulfil the strong urge.

Limitations of the study

One major limitation of the study is the large difference in the ratio of women to men and the big age span (from 15-82 years), though 98.1% of the participants were 18-69 years. However gender was not a statistically significant covariate in any of the tests, indicating that gender might not have moderated the results reported here. However, age emerged to be a mediator of exercise addiction and passion, and this effect surfaced in the comparison of competing versus non-competing exercisers as well as lonely and group exercisers. Since age is theoretically not independent of exercise experience, future studies should assess exercise history of the participants and examine its moderating effects on the dependent measures.

Gender and age might affect responses on questionnaires addressing exercise attitudes and ethical considerations should be made when participants are below 18 years. Another limitation is the self-selection of the participants, which is a concern, in general, in questionnaire-based studies. The current findings about the use of nutritional supplements only suggest an area of awareness. This study cannot say if the use of supplements represents a risk behaviour or health concerns and causality is unknown. Future research is recommended to use validated dietary supplement tools to investigate the use. An example
could be the measure by El Khoury et al,\textsuperscript{17} which was developed and validated after the completion of the data collection of our study.

Finally, it should be mentioned that despite statistical significance in the analyses of the ‘lonely wolves’, the effect sizes were relatively small, suggesting that the group differences are relatively meagre. Future systematic research is needed to strengthen these results.

**Perspectives**

The current study shows that 7.7% percent of a large sample of exercisers might be at risk for exercise addiction. Further, as the most important contribution of the current research, the study demonstrates that almost half (48%) of the variance in the risk for exercise addiction is predicted by obsessive passion. Therefore, future research should strive to better distinguish between what is conceived as exercise addiction and passion. The study also reveals that fitness attendees with high REA consume the most performance enhancing nutritional supplements. Competing athletes have higher REA than recreational exercisers and those who exercise alone display greater REA and obsessive passion than those who exercise with others.

Health professionals, trainers, and fitness exercisers may use these findings in supporting a healthy exercise attitude, a balanced nutritional intake, and preventing the development of obsession and addiction.

**Conflict of Interest**

The authors have no conflict of interest to declare.

**References**


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### Table 1

*Model summary for the predictors of the risk of exercise addiction.*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>$R^2$</th>
<th>$t$</th>
<th>Sig. ($p$)</th>
<th>95.0% Confidence Interval for $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsessive passion</td>
<td>.354</td>
<td>.615</td>
<td>.483</td>
<td>28.28</td>
<td>&lt;.001</td>
<td>.330 - .379</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>.051</td>
<td>.073</td>
<td>.009</td>
<td>3.49</td>
<td>&lt;.001</td>
<td>.022 - .080</td>
</tr>
<tr>
<td>Weekly hours of exercise</td>
<td>.165</td>
<td>.162</td>
<td>.022</td>
<td>7.58</td>
<td>&lt;.001</td>
<td>.122 - .207</td>
</tr>
</tbody>
</table>

### Table 2

*Exercise-performance enhancing supplement use by risk of exercise addiction category.*

*Summary of the Chi-square ($\chi^2$) tests (df = 2).*
<table>
<thead>
<tr>
<th>Supplement</th>
<th>Low-risk</th>
<th>Medium-risk</th>
<th>High-risk</th>
<th>$\chi^2$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamins</td>
<td>Not using</td>
<td>88 (57%)</td>
<td>462 (46%)</td>
<td>33 (34%)</td>
<td>13.18</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>66 (43%)</td>
<td>542 (54%)</td>
<td>64 (66%)</td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td>Not using</td>
<td>125 (81%)</td>
<td>642 (64%)</td>
<td>49 (51%)</td>
<td>27.14</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>29 (19%)</td>
<td>362 (36%)</td>
<td>48 (49%)</td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td>Not using</td>
<td>145 (94%)</td>
<td>835 (83%)</td>
<td>58 (60%)</td>
<td>49.87</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>9 (6%)</td>
<td>169 (17%)</td>
<td>39 (40%)</td>
<td></td>
</tr>
<tr>
<td>Energy drinks</td>
<td>Not using</td>
<td>141 (92%)</td>
<td>818 (81%)</td>
<td>73 (75%)</td>
<td>12.79</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>13 (8%)</td>
<td>186 (19%)</td>
<td>24 (25%)</td>
<td></td>
</tr>
<tr>
<td>Creatine</td>
<td>Not using</td>
<td>143 (93%)</td>
<td>904 (90%)</td>
<td>78 (80%)</td>
<td>10.78</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>11 (7%)</td>
<td>100 (10%)</td>
<td>19 (20%)</td>
<td></td>
</tr>
<tr>
<td>Other supplements</td>
<td>Not using</td>
<td>145 (94%)</td>
<td>924 (92%)</td>
<td>84 (87%)</td>
<td>4.72</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>9 (6%)</td>
<td>80 (8%)</td>
<td>13 (13%)</td>
<td></td>
</tr>
</tbody>
</table>

Note: NS = Not Significant

Table 3
Summary of the univariate tests; means (M) ± standard deviations (SD) and the statistically significant differences between competition- (n = 122) and no-competition-oriented (n = 1129) exercisers in three dependent measures (df = 1, 1247). The effect size (Hedges g) is corrected for the difference between the two sample sizes.

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>Competitive orientation (M±SD)</th>
<th>Non-competitive orientation (M±SD)</th>
<th>F</th>
<th>p</th>
<th>Effect size Hedges g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of exercise addiction</td>
<td>19.96 (3.74)</td>
<td>17.41 (4.14)</td>
<td>39.76</td>
<td>&lt; .001</td>
<td>.622</td>
</tr>
<tr>
<td>Obsessive passion</td>
<td>17.13 (7.01)</td>
<td>13.15 (7.15)</td>
<td>30.42</td>
<td>&lt; .001</td>
<td>.559</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>30.38 (5.59)</td>
<td>27.47 (5.95)</td>
<td>25.14</td>
<td>&lt; .001</td>
<td>.492</td>
</tr>
</tbody>
</table>
Table 4

Summary of the univariate tests (df = 2, 1426); means (M) ± standard deviations (SD) and the statistically significant differences between participants exercising alone (n = 307), with others (n = 245), and both alone and with others (n = 699). Identical letter superscripts denote statistically significant differences between the superscripted means (p < .01).

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>Exercising alone (M±SD)</th>
<th>Exercising with others (M±SD)</th>
<th>Exercising both alone and with others (M±SD)</th>
<th>F</th>
<th>p</th>
<th>Effect size partial Eta squared (η₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of exercise addiction</td>
<td>18.07 (4.22) a</td>
<td>16.67 (3.77) a, b</td>
<td>17.82 (4.23) b</td>
<td>6.90</td>
<td>.001</td>
<td>.011</td>
</tr>
<tr>
<td>Obsessive passion</td>
<td>14.51 (7.48) a</td>
<td>11.62 (6.05) a, b</td>
<td>13.78 (7.38) b</td>
<td>7.63</td>
<td>.001</td>
<td>.012</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>26.99 (6.09) a</td>
<td>27.28 (5.84)</td>
<td>28.25 (5.93) a</td>
<td>5.60</td>
<td>.004</td>
<td>.009</td>
</tr>
</tbody>
</table>
Table 1.

*Model summary for the predictors of the risk of exercise addiction.*

<table>
<thead>
<tr>
<th>Predictor</th>
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<th>Standardized Coefficients</th>
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<th>Sig. ($p$)</th>
<th>95.0% Confidence Interval for $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obsessive passion</td>
<td>.354 (.013)</td>
<td>.615 (.483)</td>
<td>.483</td>
<td>28.28</td>
<td>&lt;.001</td>
<td>.330 - .379</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>.051 (.015)</td>
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<td>.009</td>
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<td>.022</td>
<td>7.58</td>
<td>&lt;.001</td>
<td>.122 - .207</td>
</tr>
<tr>
<td>Supplement</td>
<td>Low-risk</td>
<td>Medium-risk</td>
<td>High-risk</td>
<td>$\chi^2$</td>
<td>$p$</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
<td>-------------</td>
<td>-----------</td>
<td>----------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Vitamins</td>
<td>Not using</td>
<td>88 (57%)</td>
<td>462 (46%)</td>
<td>33 (34%)</td>
<td>13.18</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>66 (43%)</td>
<td>542 (54%)</td>
<td>64 (66%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td>Not using</td>
<td>125 (81%)</td>
<td>642 (64%)</td>
<td>49 (51%)</td>
<td>27.14</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>29 (19%)</td>
<td>362 (36%)</td>
<td>48 (49%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caffeine</td>
<td>Not using</td>
<td>145 (94%)</td>
<td>835 (83%)</td>
<td>58 (60%)</td>
<td>49.87</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>9 (6%)</td>
<td>169 (17%)</td>
<td>39 (40%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy drinks</td>
<td>Not using</td>
<td>141 (92%)</td>
<td>818 (81%)</td>
<td>73 (75%)</td>
<td>12.79</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>13 (8%)</td>
<td>186 (19%)</td>
<td>24 (25%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatine</td>
<td>Not using</td>
<td>143 (93%)</td>
<td>904 (90%)</td>
<td>78 (80%)</td>
<td>10.78</td>
<td>.005</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>11 (7%)</td>
<td>100 (10%)</td>
<td>19 (20%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other supplements</td>
<td>Not using</td>
<td>145 (94%)</td>
<td>924 (92%)</td>
<td>84 (87%)</td>
<td>4.72</td>
<td>.094 (NS)</td>
</tr>
<tr>
<td></td>
<td>Using</td>
<td>9 (6%)</td>
<td>80 (8%)</td>
<td>13 (13%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: NS = Not Significant
Table 3

Summary of the univariate tests; means (M) ± standard deviations (SD) and the statistically significant differences between competition- (n = 122) and no-competition-oriented (n = 1129) exercisers in three dependent measures (df = 1, 1247). The effect size (Hedges g) is corrected for the difference between the two sample sizes.

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>Competitive orientation (M±SD)</th>
<th>Non-competitive orientation (M±SD)</th>
<th>F</th>
<th>p</th>
<th>Effect size Hedges g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of exercise addiction</td>
<td>19.96 (3.74)</td>
<td>17.41 (4.14)</td>
<td>39.76</td>
<td>&lt; .001</td>
<td>.622</td>
</tr>
<tr>
<td>Obsessive passion</td>
<td>17.13 (7.01)</td>
<td>13.15 (7.15)</td>
<td>30.42</td>
<td>&lt; .001</td>
<td>.559</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>30.38 (5.59)</td>
<td>27.47 (5.95)</td>
<td>25.14</td>
<td>&lt; .001</td>
<td>.492</td>
</tr>
</tbody>
</table>
Table 4

Summary of the univariate tests (df = 2, 1426); means (M) ± standard deviations (SD) and the statistically significant differences between participants exercising alone (n = 307), with others (n = 245), and both alone and with others (n = 699). Identical letter superscripts denote statistically significant differences between the superscripted means (p < .01).

<table>
<thead>
<tr>
<th>Dependent measure</th>
<th>Exercising alone (M±SD)</th>
<th>Exercising with others (M±SD)</th>
<th>Exercising both alone and with others (M±SD)</th>
<th>F</th>
<th>p</th>
<th>Effect size partial Eta squared ($\eta_p^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of exercise addiction</td>
<td>18.07 (4.22) a</td>
<td>16.67 (3.77) a, b</td>
<td>17.82 (4.23) b</td>
<td>6.90</td>
<td>.001</td>
<td>.011</td>
</tr>
<tr>
<td>Obsessive passion</td>
<td>14.51 (7.48) a</td>
<td>11.62 (6.05) a, b</td>
<td>13.78 (7.38) b</td>
<td>7.63</td>
<td>.001</td>
<td>.012</td>
</tr>
<tr>
<td>Harmonious passion</td>
<td>26.99 (6.09) a</td>
<td>27.28 (5.84)</td>
<td>28.25 (5.93) a</td>
<td>5.60</td>
<td>.004</td>
<td>.009</td>
</tr>
</tbody>
</table>