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Which dimensions of impulsivity are related to problematic practice of physical exercise?

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Background and aims: Problematic practice of physical exercise (PPPE) has been suggested to be a behavioral addiction. Impulsivity represents a core dimension of behavioral addictions. However, little is known about impulsivity facets in PPPE. The aim of this study was to investigate the role of impulsivity facets in PPPE. *Methods:* A total of 684 students (between 18 and 25 years) took part in this study and filled up a battery of questionnaire, which consisted of following measures – Global Physical Activity Questionnaire, Exercise Dependence Scale – Revised, and the UPPS Impulsive Behavior Scale. Multiple regression analyses were utilized to investigate the predictive role of each impulsivity facet in PPPE. *Results:* Age, the total level of physical activity per day, sex (male), negative urgency, and sensation seeking were found to be significant predictors of PPPE. A categorical analysis of PPPE revealed that negative urgency, positive urgency, and sensation seeking were significantly higher in the dependent category of PPPE. *Discussion and conclusions:* Associations to negative urgency and sensation seeking might indicate that PPPE serves to regulate or alleviate negative affect or aversive emotional states. Thus, PPPE could be conceptualized as a short-term coping strategy dedicated to relieving negative affective states, like other maladaptive behaviors such as binge eating, binge drinking, or compulsive buying.

Keywords: impulsivity, problematic practice of physical exercise, behavioral addictions

INTRODUCTION

Behavior toward physical activity (PA) can be investigated on a continuum with physical inactivity on one end and excessive exercise leading to the dangers of doping and/or problematic practice of physical exercise (PPPE), more commonly known as exercise addiction or exercise dependence on the other end. At the center of this continuum are individuals who practice on a moderate and regular basis. It is these individuals who seem to benefit the most from PA (Canning et al., 2014; Kern, Romo, Kotbagi, & Muller, 2013; Spirduso & Asplund, 1995; Warburton, Nicol, & Bredin, 2006).

Much has been said about the negative consequences of physical inactivity on an individual's health (risk of cardiovascular disease, risk of type 2 diabetes, obesity risk; Lee et al., 2012; World Health Organization, 2010). On the other hand, there is also a steady rise in the scientific literature with respect to the deleterious effects of excessive exercising. According to the study of Franques et al. (2003), excessive exercising may either lead to the development of doping behaviors and/or lead to the development of a PPPE.

PPPE, better known in the literature as exercise addiction or exercise dependence, is a maladaptive pattern of excessive exercise behavior that manifests in physiological, psychosocial, and cognitive symptoms (Hausenblas & Downs, 2002a). Although PPPE falls within the field of behavioral addictions, similar to gambling disorder, it is not listed as a mental dysfunction in the latest (fifth) edition of the *Diagnostic and statistical manual of mental disorders* (DSM-5) due to the lack of sustained and methodologically rigorous evidence for exercise addiction as morbidity (American Psychiatric Association, 2013; Szabo, Griffiths, de La Vega Marcos, Mervó, & Demetrovics, 2015). Till date, only three case studies have been reported. Since it is not yet recognized by the DSM-5, we shall be addressing this phenomenon as "problematic practice of physical exercise (PPPE)" rather than exercise addiction. According to Hausenblas and Downs (2002a), there are seven clinical symptoms that can characterize PPPE: (a) Tolerance is defined as either a need for increased amounts of exercise to achieve the desired effect or diminished effect with continued use of the same amount of exercise. (b) Withdrawal is manifested by either the characteristic withdrawal symptoms for exercise or the same amount of exercise is engaged in to relieve or avoid withdrawal symptoms. (c) Intention effects represent when exercise is taken in larger amounts or over a longer period than was intended. (d) Lack

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of control is defined as a desire or unsuccessful effort to cut down exercise. (e) Time represents a great deal of time is spent on activities necessary to obtain exercise. (f) Reduction in other activities assesses social, occupational, or recreational activities are given up or reduced because of exercise. (g) Continuity represents exercise that is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the exercise (e.g., continued running despite injury).

Researchers have long been trying to characterize individual variations in impulsivity. To date, impulsivity is defined by the categories of personality dimensions and behavior with response inhibition and impulsive decision-making (MacKillop et al., 2011).

Impulsivity consists of rapid, unplanned responses to external or internal stimuli. Impulsive behavior is without sufficient contemplation for possible negative consequences and is primarily driven by a desired positive reward (Freimuth, Moniz, & Kim, 2011; Grant & Potenza, 2006). According to Barratt (1993), there are three subtypes of impulsive behavior, motor (acting without thinking), non-planning (focusing attention on the details), and attention (how to deal with problem situations). Whiteside and Lynam (2001) have on the other hand proposed a multidimensional model of impulsivity. Urgency (tendency to experience strong impulses, often accompanied by negative affect), lack of premeditation (difficulty to understand and think about the consequences of an act before doing so), lack of perseverance (inability to concentrate on a difficult task), and sensation seeking (engaging in exciting activities and being open to trying new experiences that can be dangerous) are the components of impulsivity. A fifth dimension called positive urgency has later been demonstrated (Cyders et al., 2007). This dimension represents the tendency to express strong reactions in extremely positive emotional contexts.

The essential feature of behavioral addictions is the failure to resist an impulse, drive, or temptation to perform an act that is harmful to the person or to others (DSM-5). The relationship between impulsivity and addictive behaviors has been the subject of numerous studies (Billieux & Van der Linden, 2010; Dawe, Gullo, & Loxton, 2004). Moreover, studies that have highlighted the existence of links between certain aspects of addictive behavior and facets of impulsivity UPPS model are growing (Billieux, Rochat, & Van der Linden, 2014; Bø, Billieux, & Landrø, 2016).

Exercise, which is a pleasurable activity, in its addicted form, can occur without full consideration of negative consequences (Freimuth et al., 2011). For example, the addicted runner enjoys this activity and goes for a run despite knowledge of an impending rainstorm that increases the chance of injury. However, unlike an impulse-control disorder, there is often considerable thought that precedes the action of engaging in an addiction (Freimuth et al., 2011). In line with other addictive behaviors, the person addicted to exercise often considers the negative consequences but ultimately ignores them (Cook, Hausenblas, Tuccitto, & Giacobbi, 2011; Freimuth et al., 2011). Moreover, various studies show that PPPE may be correlated to other comorbidities (Müller, Loeber, Söchtig, Te Wildt, & De Zwaan, 2015; Weinstein & Weinstein, 2014). Eating disorders are the most common disorder to co-occur with PPPE. The relationship between PPPE and eating disorders has significance for diagnosis and treatment (Freimuth et al., 2011). It was Veale (1995), who first argued that there exist two types of PPPE – primary PPPE and secondary PPPE. Primary PPPE occurs when the "performance" or the exercise is an end in itself. These individuals are internally motivated (Zmijewski & Howard, 2003). On the other hand, secondary PPPE is when PPPE is associated with an eating pathology. These individuals are externally motivated (by the motivation to control their weight or have a particular body image...) (Zmijewski & Howard, 2003). Moreover, there is some evidence that PPPE may be the possible link between the practice of PA and eating pathology (Cook & Hausenblas, 2008).

According to Szabo et al. (2015), till date, only three case studies have been reported with respect to PPPE (Griffiths, 1997; Kotbagi, Muller, Romo, & Kern, 2014; Veale, 1995), and thus, very little is known about its treatment. Although the three case studies highlight the comorbidities of PPPE with other behavioral addictions, none of the case studies throw light upon the role of impulsivity. The aim of this study is therefore to understand the possible links between impulsivity traits and PPPE.

METHODS

Recruitment

Participants were recruited during their class hours at the Université Paris Nanterre. They were explained the aim of this study. All questionnaires were anonymous. Participation in this study was voluntary and every individual who accepted to participate in this study had to sign a consent form.

Population

A total of 684 "healthy" students (between 18 and 25 years) studying at the Université Paris Nanterre took part in this study and filled up a battery of questionnaire. This sample consisted of 299 males (43.7%) and 385 females (56.3%) and had a mean age of 20.26 years ($SD = 1.81$, min. = 17, max. = 25).

Questionnaires

The participants were screened on the following questionnaires along with some sociodemographic variables (age, sex, height, weight, and year of study).

PA. PA was measured using the "Global Physical Activity Questionnaire (GPAQ)" developed by the World Health Organization (2010) and Herrmann, Heumann, Der Ananian, and Ainsworth (2013). PA can be defined as any bodily movement produced by the skeletal muscles, resulting in energy expenditure which varies from high to low and which is found to be positively correlated with physical fitness (Bouchard, Blair, & Haskell, 2007; Caspersen, Powell, & Christenson, 1985). The GPAQ is composed of

17 questions, 16 that take into account PA in different behavioral domains (at work, in transport, and recreation or leisure), and 1 question measuring sedentary lifestyle. To assess PA, the metabolic equivalent of task (MET scores) or simply metabolic equivalents were calculated separately for individual GPAQ domains and sub-domains. MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly. A MET is also defined as oxygen uptake in ml/kg/min with one MET equal to the oxygen cost of sitting quietly, equivalent to 3.5 ml/kg/min. For the calculation of a global categorical indicator of PA, the total time spent on PA during a typical week, the number of days as well as the intensity of PA were taken into account. In addition, PA was further classified based on MET-minutes into three groups as inactive/low (<600 MET-minutes), active (600–1,200 MET-minutes), and highly active (>1,200 MET-minutes). Physical inactivity was calculated under the three domains of the questionnaire (i.e., activity at work, travel to and from places, and recreational activities).

PPPE. PPPE was measured by the Exercise Dependence Scale – Revised (EDS-R) developed by Hausenblas and Downs (2002b) and validated in the French version by Kern (2007). It is a 21-item multidimensional questionnaire has seven dimensions with items based on DSM-IV criteria for substance dependence. The seven dimensions are correlated. The scale is a reliable and valid. Hausenblas and Downs (2002b) provide an SPSS syntax, which categorizes individuals into three groups: at risk of exercise dependent, non-dependent symptomatic, and non-dependent asymptomatic.

Impulsivity. Impulsivity was measured using the UPPS Impulsive Behavior Scale (UPPS-P), a questionnaire developed and validated by Whiteside and Lynam (2001) and validated in the French version by Van der Linden et al. (2006). This questionnaire is based on the theoretical concept of impulsivity and distinguishes four dimensions of impulsivity: urgency having two subtypes (positive/negative), lack of premeditation, lack of perseverance, and sensation seeking. The psychometric qualities of the scale are satisfactory (internal consistency between 0.70 and 0.84 and test–retest score between 0.84 and 0.92). We used the short French version – the UPPS-P validated by Billieux et al. (2012). According to these authors, the four-factor model of impulsivity does not involve the variations in impulsivity but highlights the distinct personality traits that contribute to impulsive behavior.

Statistical analyses

Statistical analysis was carried out using IBM SPSS Statistics Version 22. First, descriptive statistics of demographic variables were performed. Numerical variables were summarized as mean and standard deviation (*SD*), whereas counts and frequencies were used for categorical variables. *t*-tests were carried out to investigate if there exist any differences between male and female students. Pearson's correlation analysis was conducted to investigate the possible links between PPPE, its dimensions, and facets of impulsivity. The one-way ANOVA was carried out to find out the differences between the three categories of the EDS-R scale. Finally, multiple regression analysis was carried out with PPPE as the dependent variable with the aim to investigate which facets of impulsivity predicted PPPE.

Ethics

This study complied with the rules and regulations established by the Ethical Committee of Université Paris Nanterre, UFR SPSE (Department of Psychology and Education).

RESULTS

Descriptive analyses

A categorical analysis of the EDS-R revealed that 7.6% fell into the category of at risk of dependence, whereas 61.1% were categorized as non-dependent symptomatic. According to the EDS-R manual, individuals who are classified into the dependent range on 3 or more of the DSM criteria are classified as exercise dependence. The dependent range is operationalized as indicating a score of 5 or 6 for that item. Individuals who scored in the 3–4 range are classified as symptomatic. These individuals may theoretically be considered at risk of exercise dependence. Finally, individuals who scored in the 1–2 range are classified as asymptomatic (Hausenblas & Downs, 2002b). Refer to Table 1 for other descriptive statistics.

Bivariate analyses

Significant differences were found between male and female participants with respect to age, PPPE and its dimensions, level of PA per day, and the dimension of sensation seeking for impulsivity. The scores on the *t*-test are summarized in Table 2.

Table 1. Mean and *SD* of all the measures and their subscales included in this study

	Total ($N = 684$)	
Variables	*M*	*SD*
Age (years)	20.26	1.81
PA/Day (MET-minutes)	171.43	181.92
PPPE (mean/6)	2.66	1.07
Withdrawal	2.98	1.47
Continuity	2.37	1.37
Tolerance	2.91	1.46
Lack of control	2.57	1.34
ROA	2.37	1.29
Time	2.80	1.50
Intention	2.74	1.45
N_URG	9.49	2.89
P_URG	10.72	2.42
PREMED	7.96	2.38
PERSEV	7.54	2.35
Sensation seeking	10.71	2.71

Note. PA/Day: physical activity per day; ROA: reduction in other activities; N_URG: negative urgency; P_URG: positive urgency; PREMED: lack of premeditation; PERSEV: lack of perseverance; PPPE: problematic practice of physical exercise.

Table 2. Characteristic differences between males and females

	Males ($N = 299$)		Females ($N = 385$)		
Variables	*M*	*SD*	*M*	*SD*	*p*
Age (years)	19.56	1.76	20.80	1.67	**
PA/Day (MET-minutes)	244.12	191.43	127.21	160.09	**
PPPE (mean/6)	3.23	0.94	2.23	0.96	**
Withdrawal	3.03	1.46	2.95	1.48	=.447
Continuity	2.83	1.43	2.02	1.22	**
Tolerance	3.55	1.38	2.41	1.33	**
Lack of control	3.06	1.28	2.18	1.27	**
ROA	3.05	1.27	1.84	1.05	**
Time	3.68	1.36	2.11	1.23	**
Intention	3.29	1.41	2.30	1.33	**
N_URG	9.5	2.83	9.47	2.93	=.922
P_URG	10.81	2.4	10.66	2.38	=.425
PREMED	7.97	2.40	7.96	2.39	=.938
PERSEV	7.57	2.44	7.50	2.29	=.704
Sensation seeking	11.46	2.52	10.19	2.73	**

Note. PA/Day: physical activity per day; ROA: reduction in other activities; N_URG: negative urgency; P_URG: positive urgency; PREMED: lack of premeditation; PERSEV: lack of perseverance; PPPE: problematic practice of physical exercise.
**$p < .01$ significant difference between males and females.

As it can be seen from Table 3, correlations were performed between the five components of impulsivity (UPPS) and the questionnaires on PA, PPPE and its dimensions. First, significant negative correlations were found between PPPE and age and sex. Second, significant positive correlations were found between PPPE and total PA per day, negative urgency, positive urgency, lack of premeditation, and sensation seeking. However, it must be noted that although significant these correlation coefficients were weak.

As for a categorical approach to PPPE, we also conducted a one-way ANOVA to compare the three categories of PPPE. There was a statistically significant difference between groups as determined by the one-way ANOVA [$F(8, 550) = 41.06$, $p > .01$]. A Bonferroi post hoc test revealed significant differences with respect to facets of impulsivity. The dependent category had higher scores on the facet of negative urgency ($M = 10.38 \pm 3.19$) than the asymptomatic category ($M = 9.11 \pm 2.93$). However, no significant differences were found between dependent category and symptomatic category ($M = 9.54 \pm 2.78$). The facet of positive urgency was found to have higher means for the dependent category ($M = 11.74 \pm 2.96$) when compared with the symptomatic ($M = 10.73 \pm 2.32$) and the asymptomatic ($M = 10.55 \pm 2.47$) categories. However, no significant differences were found between the symptomatic and asymptomatic categories. Finally, significant differences were found between the three categories for the dimension of sensation seeking – exercise dependent ($M = 12.29 \pm 2.93$), symptomatic ($M = 10.86 \pm 2.64$), and asymptomatic ($M = 9.82 \pm 2.49$).

Multivariate analyses

A significant regression model was found [$F(8, 550) = 41.06$, $p < .01$] with an $R^2 = .37$. The significant predictors of PPPE were – age ($\beta = -0.117$, $p < .01$), total level of PA per day ($\beta = 0.002$, $p < .01$), sex (male; $\beta = -0.583$, $p < .01$), negative urgency ($\beta = 0.033$, $p < .05$), and sensation seeking ($\beta = 0.58$, $p < .01$). Table 4 gives the results of the regression analysis.

DISCUSSION

The aim of this study is therefore to understand the possible links between impulsivity traits and PPPE. As Szabo et al. (2015) report that till date, only three case studies with

Table 3. Pearson's correlation analysis between the variables

	PPPE	Withdrawal	Continuity	Tolerance	LOC	ROA	Time	Intention
N_URG	0.144**	0.248**	0.096*	0.140**	–	–	–	0.136**
P_URG	0.116**	0.148**	–	0.124**	–	–	0.081*	0.088*
PREMED	–	–	0.081*	–	–	0.116**	–	–
PERSEV	–	–	–	−0.097*	–	–	–	–
SENSEE	0.279**	0.095*	0.190**	0.217**	0.173**	0.252**	0.270**	0.222**

Note. N_URG: negative urgency; P_URG: positive urgency; PREMED: lack of premeditation; PERSEV: lack of perseverance; SENSEE: sensation seeking; PPPE: problematic practice of physical exercise; LOC: lack of control; ROA: reduction in other activities.
*Correlation is significant at the .05 level (two-tailed). **Correlation is significant at the .01 level (two-tailed).

Table 4. Multiple regression analysis with PPPE as the dependent variable

	*B**	*SE B**	*t*	*p*
Age	−0.117	0.022	−5.39	.000**
Sex	−0.583	0.081	−7.17	.000**
PA	0.002	0.000	7.28	.000**
N_URG	0.033	0.015	2.28	.023*
P_URG	−0.003	0.018	−0.187	.852
PREMED	0.002	0.018	−0.187	.852
PERSEV	−0.027	0.017	0.118	.906
SENSEE	0.58	0.014	4.03	.000**

Note. Dependent variable – PPPE. PA: physical activity; N_URG: negative urgency; P_URG: positive urgency; PREMED: lack of premeditation; PERSEV: lack of perseverance; SENSEE: sensation seeking; PPPE: problematic practice of physical exercise. *$p < .05$. **$p < .01$.

systematic clinical interviews have been reported with respect to PPPE (Griffiths, 1997; Kotbagi et al., 2014; Veale, 1995). The case studies highlight the comorbidity of PPPE with other behavioral addictions. Numerous cross-sectional studies are performed using questionnaires, which emphasize on the negative affects of PPPE on both physical health and mental health (Berczik et al., 2014; Landolfi, 2013; Lichtenstein, Christiansen, Elklit, Bilenberg, & Støving, 2014). However, to our knowledge, no studies highlight the relationship between PPPE and impulsivity.

This study was conducted on 684 college students from France. We found that males were more at risk of having a higher score for PPPE. They also reported higher scores for sensation seeking when compared with their female counterparts. According to Cross, Cyrenne, and Brown (2013), sensation-seeking-related behaviors (e.g., risky sports and substance use) are more frequently reported by males. Moreover, higher scores in males for all the dimensions of EDS-R are in line with the findings of Weik and Hale (2009). As Weik and Hale (2009) point out, the EDS-R may be gender sensitive as men tend to have higher scores on the EDS-R when compared with the Exercise Dependence Questionnaire (Ogden, Veale, & Summers, 1997).

Significant correlations were found between PPPE and the dimensions of negative urgency, positive urgency, lack of premeditation, and sensation seeking. As for the dimensions of PPPE, all the dimensions correlated significantly with the dimension of sensation seeking. Moreover, significant correlations, however with lower statistical power, were found between the dimension of lack of premeditation and the dimensions of continuity and reduction of other activities. However, lack of premeditation did not correlate with the overall score for PPPE. Billieux et al. (2014) define lack of premeditation as the tendency to fail to think and reflect on the consequences of an act before engaging in that act. For Hausenblas and Downs (2002a), continuity represents exercise that is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the exercise (e.g., continued running despite injury). On the other hand, reduction in other activities is the tendency to give up on or reduce social, occupational, or recreational activities because of exercise. Another finding of this study is that lack of control was found to be correlated only with the sensation-seeking dimension of impulsivity. Lack of control is defined as a desire or unsuccessful effort to cut down exercise (Hausenblas & Downs, 2002a). We could hypothesize that the compulsive aspect of exercising could help us explain this dimension.

The one-way ANOVA conducted and revealed that the individuals in the dependent category for PPPE were found to have significantly higher means on the facets of positive and negative urgency and sensation seeking. It could be said that PPPE is correlated to the emotional components of impulsivity (facets of urgency and sensation seeking) than the cognitive components of impulsivity (lack of premeditation and lack of perseverance).

As for the results of linear regression, age, sex (male), the amount of PA, negative urgency, and sensation seeking were found to be significant predictors of PPPE. In literature, PPPE has been theorized as an attempt at regulating negative emotions (Freimuth et al., 2011; Szabo, 1995; Thompson & Blanton, 1987). One theory that proposed to explain PPPE as it relates to emotions is the "affect regulation" hypothesis (Tomkins, 1968). Individuals exercise for two reasons either to reduce their negative affect or to increase their positive affect. Exercise addicts would most likely fit into the former as they seek to exercise as a relief from stress and discomfort (Tomkins, 1968). Significant association of PPPE with negative urgency and sensation seeking might indicate that PPPE serves to regulate or alleviate negative affect or aversive emotional states. Therefore, our findings that negative urgency and sensation seeking could predict PPPE are in line with the "affect regulation" hypothesis. In other words, PPPE could be conceptualized as a short-term coping strategy devoted to relieving negative affective states, like other maladaptive behaviors such as binge eating, binge drinking, or compulsive buying (Billieux, Rochat, Rebetez, & Van der Linden, 2008; Bø et al., 2016; Selby, Anestis, & Joiner, 2008). Several prior studies have linked negative urgency traits to a wide range of behaviors displayed to regulate negative affect in the short run, without considering its long-term consequences (Anestis, Selby, & Joiner, 2007; Bø et al., 2016; Cyders & Smith, 2008). Prospective studies of emotion and emotion regulation in the context of PPPE are needed to verify this hypothesis. Prevention and treatment interventions targeting with respect to PPPE should be designed taking into account the role of urgency trait and its association to specific mechanisms related to self-control as well as dysfunctional emotion regulation strategies (Bø et al., 2016; d'Acremont & Van der Linden, 2007; Gay, Rochat, Billieux, d'Acremont, & Van der Linden, 2008). A psychotherapeutic approach oriented toward emotional regulation alongside cognitive and behavioral approach may be more appropriate especially for individuals who use exercise as a means to avoid negative emotions.

Limitations

This study is cross-sectional in nature and can only provide an overview of the possible links between impulsivity traits and PPPE. It must be noted that the nature of this study is

limited when it comes to establishing causal inferences. This particular study was conducted on "healthy" college students and thus prospective studies should investigate the role of impulsivity in PPPE in broader, more representative samples, especially with a longitudinal design. It must also be noted that the population sample was not controlled for any other psychiatric conditions especially eating disorders. We do acknowledge the fact that diagnosing eating disorders would have been important and would have helped us to be more accurate in our findings. In addition, only auto-evaluation questionnaires were used and no DSM screening techniques were incorporated. It is important to highlight that auto-evaluation questionnaires that assess PPPE are not diagnostic tools for PPPE. Therefore it is impossible to arrive at a diagnosis of an eating disorder or a PPPE. Certainly, future studies should take into account that to be certain about PPPE, questionnaires must be coupled with systematic interviews. This study also does not take into account the notion of compulsion with respect to exercise. We believe it is necessary to take into account the compulsive aspect of PPPE simultaneously to gain a deeper understanding of the phenomena. Moreover, future studies focusing on the interaction of impulsivity traits and exercise motivations (both pathological and non-pathological) may help in better understanding of the phenomena. There is certainly a need for more empirical evidence and a process-based approach taking into account interactions between the personality, cognitive, and emotional correlates of any "addictive behavior" in focus to avoid overpathologizing of day-to-day activities (Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015). In this case, the behavior in question is exercising.

In conclusion, people with PPPE are at the risk of both physical and psychological problems. Till date, the assessment and evaluation of the PPPE remain difficult as very few individuals come forward and seek consultation. Moreover, it is extremely difficult to know just through the administration of questionnaires if PPPE is a way of managing other problems (secondary PPPE) or on the contrary is an end in itself (primary PPPE). This distinction is of utmost important from the point of view of psychotherapy and aftercare. Psychotherapy, in this case, would include cognitive work on the core beliefs, attitudes, and the meaning of the exercise, in the life of the individuals. It will be necessary to propose work on the management of negative emotions, for which the exercise has become an inadequate and inefficient coping strategy and therefore a source of suffering.

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Authors' contribution: GK, LR, and LK designed this study and developed the methodology. GK, LR, YM, and LK collected the data. YM and LK performed the analysis. GK and LK wrote the manuscript.

Conflict of interest: The authors declare no conflict of interest.

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