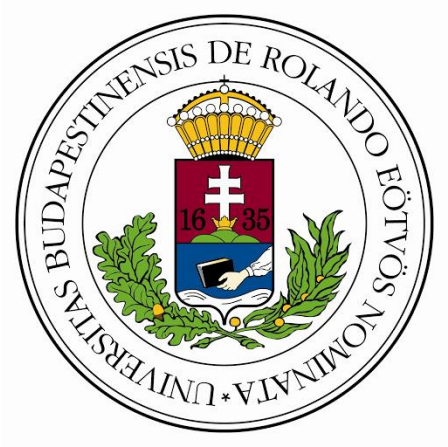

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DOCTORAL (PHD) DISSERTATION

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Studies on the determinants of exercise addiction

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EÖTVÖS LORÁND UNIVERSITY
FACULTY OF EDUCATION AND PSYCHOLOGY
INSTITUTE OF HEALTH PROMOTION AND SPORT SCIENCES

Doctoral dissertation in Psychology **DOI:**

Studies on the determinance of exercise addiction

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ABSTRACT

The aim of my dissertation is to explore the unknown areas of exercise addiction, which can help the scientific community to better understand this condition. Exercise addiction is not yet classified as a separate addiction in the DSM IV system. Furthermore, I hope that my dissertation contributes to a better understanding of this condition, as well as a better understanding of the difference between harmonious passion and obsessive passion. In this paper, I present the findings of studies that put exercise addiction into a more compound perspective based on different exercise habits and other demographic factors.

My first research sought to examine the extent to which harmonious and obsessive passion predetermine the risk for exercise addiction, and in parallel, to replicate previous studies with Hungarian samples, thus supporting the idea that different types of passion may influence the susceptibility to exercise addiction. In addition, I also wished to shed light on the question of whether there is a difference between individual and team sports participants in exercise addiction.

In the second and third studies, I went further and wanted to examine the relationship between training intensity and training volume in terms of harmonious passion, obsessive passion and commitment to sport, and how and to what extent these affect the risk for exercise addiction.

In the fourth study, I focused on cultural and gender differences. This resulted in a great Spanish-Hungarian cooperation, which demonstrated the importance of cultural differences in terms of interpretation. The results also revealed several significant differences in the relationship between the risk for exercise addiction and passion.

In the fifth study, I conducted an unprecedented longitudinal study that lasted two semesters. The examination of the participants in the sample was about the motivational factors that the incorporation of a new sport activity into their lives would bring, as well as how much it would influence their risk for exercise addiction.

Despite several significant new findings, there are still several unexplored factors determining and controlling the risk of exercise addiction, but I wished to contribute to future studies in similar fields with my research.

ABSZTRAKT

A doktori disszertációm célja feltárni a testedzésfüggőség olyan szürke foltjait, mely hozzásegíti a tudományos világot ahhoz, hogy ezt a - jelenleg még a DSM rendszerben nem önálló addikcióként elimert kórképet-, jobban lehessen felsimerni és megérteni, mi a különbség a szenvedélyes sportolás és a már obszesszív viselkedés között. A tanulmányban olyan vizsgálatok eredményét ismertetem, mely a testedzés függőséget egy összetettebb komplexebb megvilágításba helyezik, a különböző sportolási szokások, és egyéb demográfiai tényezők alapján.

Az első tanulmányom célja annak felderítésa volt, hogy a harmónikus szenvedély és az obszesszív szenvedély mennyire predesztinálja a testedzésfüggőségi kockázatot és ezzel párhuzamosan pedig replikálni korábbi tanulmányokat magyar mintán, ezzel is alátámsztva, hogy a szenvedélynek a különböző fajtái befolyásolhatják a testedzésfüggőségi hajlamot. Mindezek mellett fényt akartam deríteni arra is, hogy van-e különbség az egyéni és csapat sportot űzők között ezen a területen.

A második és harmadik tanulmányban már tovább haladtam és meg akartam vizsgálni az edzésintenzitás és az edzés mennyiség összefüggésében is mind a harmónikus szenvedély, mind az osezsszív szenvedély, mind pedig a sport iránti elköteleződés faktorát, hogy mennyire és hogyan hatnak a testedzésfüggőség kockázatára.

A negyedik tanulmányban a kultúrális különbségek és a nemek közötti különbségeket helyeztem előtérbe. Így egy remek spanyol és magyar koprodukció születhetett, melyből kiderül, hogy mennyire sokat számítanak a kultúrális különbségek az értelmezés szempontjából. Az eredmények is sok szignifikáns különbséget mutattak a testedzésfüggőségi kockázat és a szenvedély kapcsolatában.

Az ötödik tanulmányban pedig úgy döntöttem, hogy eddig egyedülálló módon egy hosszútávú kutatást végzek, mely két iskolai szemeszteren át tartott. A mintában szereplő személyek vizsgálata arról szólt, hogy egy új sportág bejövetele az életükben milyen motivációs faktorokat jelent és ezzel összefüggésben mennyire fogja befolyásolni a testedzésfüggőségi kockázatot.

Mindezek ellenére még rengeteg feltáratlan területe van a testedzésfüggőséget befolyásoló tényezőknek, de kutatásommal szerettem volna segítséget nyújtani a jövőbeni hasonló területen születő tanulmányok megkezdéshez.

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Hiba! A könyvjelző nem létezik.

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LIST OF ABBREVIATIONS

ANOVA = Analysis of variance

ANCOVA = Analysis of covariance

CFI = Comparative fit index

CP = Passion Criteria

DSM = Diagnostic and Statistical Manual of Mental Disorders

EA = Exercise Addiction

EAI = Exercise Addiction Inventory

EDQ = Exercise Dependence Questionnaire

EDS = Exercise Dependence Scale

HP =Harmonius Passion

ICD = Impulsive control disorders

LGM = Latent growth modeling

MANOVA = multivariate analysis of variance

MANCOVA = Multivariate analysis of covariance

OEQ = Obligatory Exercise Questionnaire

OP = Obsessive Passion

PS = Passion Scale

REA = Risk of exercise addiction

RMSEA = Root mean square error of approximation

SE = Standard error

SLT = Social Learning Theory

SMS II = Sport Motivation Scale II

SPSS = Statistical Package for Social Sciences

SRMR = Standardized root mean square residual

ST = Standard deviation

TLI = Tucker-Lewis Index

CHAPTER 1

1. General Introduction

The positive role that physical exercise can play in the prevention and treatment of a variety of medical conditions has received a great deal of attention over recent years, with numerous high-profile reports supporting the popular message that exercise is beneficial for your health. An active lifestyle has many health benefits (Bellocco et al., 2010; Lee et al., 2011). Several comprehensive reviews of exercise psychology literature have been published in the past decade, providing positive, although cautious support for the role that exercise can play in the promotion of positive mental health. This optimism is based on the growing number of controlled studies that have identified the positive effects of exercise (Scully et al., 2016). Regular physical activity and sport are also linked to better mental health and play an important role in the treatment of mild to moderate mental illnesses, especially depression and anxiety (Clow & Edmunds, 2013). McAuley found a positive correlation between exercise, self-esteem, self-efficacy, mental well-being, and cognitive functioning and a negative correlation between exercise, anxiety, stress and depression. Therefore, I can conclude that people engage in physical activities or play sports to cope with the challenges ofeveryday life (Berczik et al., 2012). Incorporating daily sports into ouves has almost become mandatory in the 21st centurymaintain our physical and mental health. This is the reason why several sports movements around the world were launched, whose impact is still being felt today. Suddenly, people discussed not only the positive aspects of the sport but also its disadvantages. Paradoxically, both sports and exercise could become a source of stress (Stevens et al., 2013). The need to exercise in increasingly higher volumes could become compulsive, leading to loing control over the activity. This transformation results in dysfunctional behavior,referred to as "exercise addiction" in the scholastic literature (Szabo, 2010; Szabo, Griffiths, Marcos, Mervó, & Demetrovics, 2015). Other synonyms used in the literature include "exercise dependence" (Adams, 2009), "compulsory exercise" (Murray et al., 2012), "obligatory exercise" (Thome & Espelage, 2007), and "exercise abuse" (Calogero & Pedrotty, 2004).

1.1 Sport as a coping technique

Stress is a serious challenge for everyone in everyday life. Sport was shown to be a type of coping strategy. In addition, several studies have found that exercise tends to influence stress responses (Scully et al., 2016).„In contrast to studies/ research on alcohol and drug abuse. The alcohol or drug users, in this case, the fundamental benefits of sport are often emphasized too. Some earlier studies have shown that sport helps to overcome anxiety and depression biologically through its effect on our bodies. As a result, I can easily fall into the trap of thinking that sport no longer just makes us feel good, but I (and perhaps many others) can't even imagine our days without exercise, which brings up the negative aspect of the sport. Morgan, (1979) also cited numerous examples of runners who continue to run despite circumstances that suggest they should reduce or have time off from running. Several authors have also suggested that excessive exercise may serve as a defense against paralyzing depression, self-punishment, or as a way to cope with negative emotions such as anxiety, anger, or depression (Garner et al., 1983).

1.2 Definition of Exercise Addiction

Glasser (1976) believed that too much of a good thing is better than too much of a bad thing. Therefore, he describes the term positive addiction in the scientific literature to represent the personally and socially beneficial aspects of a consistent and sustained exercise behaviour, in contrast to some self-destructive behaviours such as drug or alcohol abuse. Indeed, many athletes, for example many runners, claimed to be addicted to running when they were simp deeply committed to their chosen sport. Morgan (1979) has acknowledged that as a semantic issue, and in order to discuss the negative aspects of excessive exercise behaviour, he introduced the term "negative addiction", as opposed to Glasser's "positive addiction". Commitment to exercise is a measure of how devoted an individual is to activity. It is a measure of one's commitment to a healthy and beneficial activity that is part of one's daily life. During the activity, a committed person feels satisfaction, enjoyment andstrives to achieve happiness. This person is motivated by the thought, "This is good for me" Sachs (1981). believed that commitment to exercise stems from an intellectual analysis of the rewards

gained from the activity, including social status, health, prestige, or even financial gains. The key point (main argument) is probably that committed exercisers control their activity rather than being controlled by it (Johnson, 1995). On the other hand, when feelings have more obsessive aspects, the negative aspects of too much (excessive) activity emerge. In Godman's (1990) view, addiction is a behavioural process that could provide pleasure /gratification or relief from internal discomfort, and it is characterized by repeated failure to control and maintain that behaviour in spite of significant negative consequences. The key term is withdrawal symptoms, which occurs when an individual feels "I cannot stop", so the obstructive factor is not sports injuries or other aspects. According to Sachs' (1981) definition, committed exercisers (1) engage in exercise for extrinsic rewards, (2) consider their exercise an important but not central part of their lives, and (3) may not suffer from severe withdrawal symptoms when they are unable to exercise for some reason. In contrast to this, addicted exercisers are (1) more likely to exercise for intrinsic rewards, (2) view exercise as a central part of their lives, and (3) experience distressing feelings of deprivation when they are unable to exercise (Sachs, 1981). Szabo (1995) suggested that addicted exercisers experience more severe withdrawal symptoms than committed exercisers. A more thorough/ detailed way to distinguish between the two may be via the individuals' actions and motives for exercise, for example, Sachs' classification (1981). It is important to draw a separating line between healthy committed exercisers and unhealthy "at risk" exercisers, as those who are addicted to exercise engage in exercise/activity that negatively alters their lifestyle, causing physical, medical, financial or social problems.

Since Baekland's (1970) work on excessive exercise behaviour, there has been an increasing amount of research in this area. Hausenblas and Symons Downs (2002) conducted a systematic review of the most frequently used terms for exercise addiction and concluded that excessive exercise has also been termed "dependent" (Cockerill and Riddington, 1996), "obligatory" (Pasman and Thompson, 1988), "compulsive" (Lyons and Cromey, 1989), "abusive" (Davis, 2000).

1.3 Exercise Addiction Symptoms

Griffiths (1996, 1997, 2002, 2005) redefined the light of Brown's 'General Components of Addictions' theory (1993), and adapted them to behaviours such as

exercise, gambling, sex, and internet addictions. This model includes the following six components.

1. *Salience*

This symptom is represented when physical activity becomes the most important activity in the individual's life and the person is constantly thinking of the activity, which defines feelings and behaviour. For instance, even if the individual does not actually perform the exercise, he or she will be thinking about the next time. Addicted exercisers are completely obsessed with exercise and always look forward to the next time they can engage in the given activity again.

2. *Mood modification*

As I mentioned earlier/ As previously stated, this symptom refers to the subjective experiences that the individual reflects (considers?) as a consequence of engaging in the particular activity and could be considered a coping strategy. Many exercisers report positive feelings during and after exercise. This part of mood modifications of sport is very traditional and positive. The breaking point is the mood modification, when exercisers feel negative psychological feelings because he or she missed or skipped the activity.

3. *Tolerance*

It is the process whereby increasing amounts of a particular activity is required in order to achieve the former effects. For instance, runners have to run longer and longer distances to experience positive feelings, a euphoric state of mind. Tolerance is the main reason why exercisers who are addicted to an activity gradually and consistently increase the frequency, duration and intensity of their workout program.

4. *Withdrawal symptoms*

As I mentioned earlier/ as previously stated, withdrawal symptoms are the unpleasant psychological and physical states of feelings that occur when the individual is unable to continue the workout program or misses the usual training. The most commonly reported symptoms are guilt, anxiety, irritability, lack of energy, melancholy, or depression. These withdrawal symptoms manifest differently in addicted exercisers. Some people simply feel a void, or that something is missing, when he or she is unable

to complete the planned exercise. Others must exercise to avoid withdrawal symptoms, even if it means foregoing other more important obligations.

5. *Conflict*

This symptom represents the conflict between exercise addicts and those around them, the conflict with one's job, social life and hobbies or the conflict within the exercisers themselves who are concerned with the particular activity. Interpersonal conflict is usually caused by the neglect of relationships with friends or family, as a result of spending too much time engaged in the activity. Conflict in daily activities can arise because of the abnormally high prioritization of exercise compared to some basic survival activities.

6. *Relapse*

This is the habit of returning to previous exercise patterns after a break, whether that break was voluntary or involuntary. Relapse could be observed following an injury, in this case, the break was involuntary. In another case, the exerciser experienced symptoms of exercise addiction and decided to take a break. Upon resumption of the activity, the addicted individual may soon end up exercising as much, if not more, than they did before reducing the volume or intensity of their exercise.

1.4 Behaviour Addiction and Exercise Addiction

Exercise in appropriate quantity and of proper quality redounds significantly to the improvement of an individual's health. Excessive exercise, on the other hand, may be harmful to one's health. The term "exercise addiction" is becoming widely used to describe the latter phenomenon. Although exercise addiction is not currently recognized in diagnostic systems, it is important to include it among other disorders. Based on the previously mentioned diagnostic value symptoms, exercise addiction is classified as a behavioural addiction and has similar characteristics to gambling and shopping addictions (Demetrovics and Kurimay, 2008). Accordingly, exercise addiction, among other behavioural and mental disorders, can be well described within the obsessive-compulsive spectrum. According to Hollander, the disturbances treated in the diagnostic systems and those observed outside of the DSM systems indicate similar characteristics. Based on these similarities, he created a spectrum based on common pathologies

(obsessive disorder) and repetitive, compulsive traits where such behavioural disorders can be classified. Exercise addiction can also be best characterised on this spectrum. The researcher classified exercise addiction as an impulse-control disorder (ICD). Gambling, shopping disorders and sexual compulsion can all be found in this category (Hollander, 1993). The graph below depicts where gambling falls on the scale; exercise addiction falls in the same place on the scale as gambling.

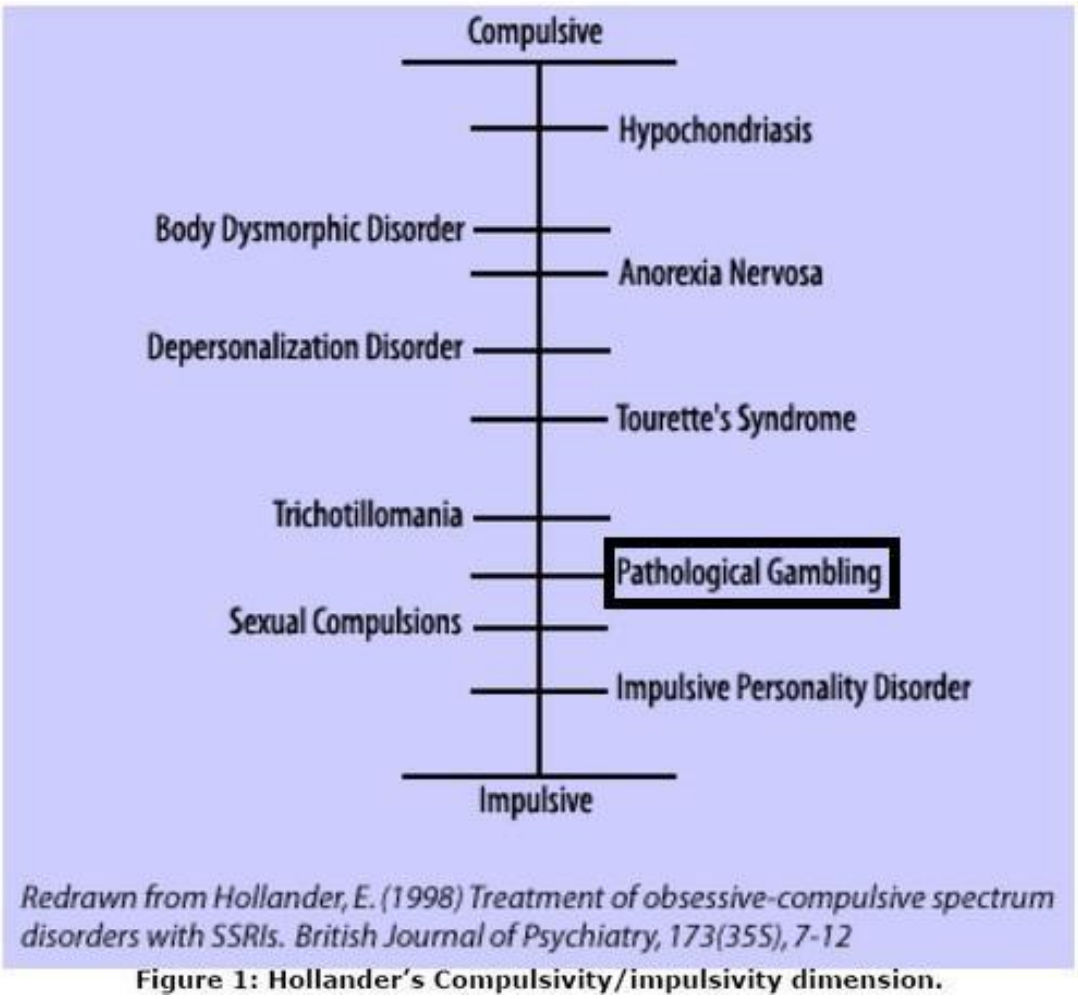

Figure 1: Hollander's Compulsivity/impulsivity dimension.

Figure 1.

1.5 Assessment of Exercise Addiction

Although symptoms are important in assessing health conditions, exercise addiction is a combination of co-occurring symptoms and is a more precise index of maladaptive exercise. Some exercise addiction questionnaires, that are based on common symptoms, assess a certain level of addiction. However, these scores only show the degree of the *risk of* exercise addiction rather than positively diagnose the condition. I will briefly

present the four most commonly used psychometrically validated questionnaires for assessing exercise addiction.

1. *Exercise Addiction Inventory EAI (Terry, Szabo and Griffiths, 2004)*

This is the shortest psychometrically validated questionnaire to date. It can be found in only six statements that correspond to Griffith's six-symptom model of addiction. Each statement had a five-point Likert response option. The statements were coded so that high scores reflected the characteristics of addictive exercise behaviour
: 1 = "strongly disagree", 2 = "disagree", 3 = "neither agree nor disagree", 4 = "agree", 5 = "strongly agree". The six statements that comprise the inventory are: 1) "Exercise is the most important thing in my life (salience), 2) "Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do" (conflict), 3) "I use exercise as a way of changing my mood" (mood modification), 4) "Over time I have increased the amount of exercise I do in a day" (tolerance), 5) "If I have to miss an exercise session I feel moody and irritable" (withdrawal symptoms), and 6) "If I reduce the amount of exercise I do and then start again, I always end up exercising as much as I did before" (relapse). The EAI cut-off score for exercisers considered at risk of exercise addiction (REA) is 24. This score represents individuals whose scores are in the top 15% of the total scores. Individuals with a score of 13 to 23 were chosen to represent a potentially symptomatic person, and those with a score of 0 to 12 were chosen to represent an asymptomatic individual. The internal reliability of the original scale was high (α = .84) and ts concurrent validity was low r = .80. The EAI is the most commonly used and shortest questionnaire aimed at the assessment of the REA. In my research, I will use this tool to reveal some correlations of exercise addiction.

2. *Obligatory Exercise Questionnaire OEQ (Pasman and Thompson, 1988)*

This questionnaire was a newly discovered instrument aimed to assess exercise addiction. It is a modified version of the Obligatory Running Questionnaire (Blumenthal, O'Tolle and Chang, 1984). The questionnaire consists of 20 items pertaining to exercise habits that are rated on a four-point frequency scale: 1 = "never", 2 = "sometimes", 3 = "usually", 4= "always". The internal reliability of the OEQ was reported to be α = .96 and ts concurrent validity was r = .96.

3. Exercise Dependence Questionnaire EDQ (Ogden, Veale and Summers, 1977)

The EDQ was developed using a sample of 449 participants who engage in the activity for more than 4 hours per week. The questionnaire consists of 29 items and 8 subscales: 1) interference with social/family/work life, 2) positive reward, 3) withdrawal symptoms, 4) exercise for weight control, 5) insight into problem, 6) exercise for social reasons, 7) exercise for health reasons, and 8) stereotyped behaviour. The EDQ has good internal reliability ranging from $\alpha = .52$ to $\alpha = .84$. The concurrent validity of the instrument with other instruments has not been reported.

4. Exercise Dependence Scale EDS (Hausenblas and Symons Downs, 2002b)

The Exercise Dependence Scale is based on the Diagnostic and Statistical Manual of Mental Disorder-IV criteria for substance dependence (DSM IV- American Psychiatric Association, 1994). The EDS is able to differentiate between individuals who are a-risk, non-dependent symptomatic, and non-dependent asymptomatic individuals. The questionnaire contains 21 items that are rated on a six-point Likert frequency scale. The ranging is from 1 (never) to 6 (always). This questionnaire described the previous section: 1) tolerance, 2) withdrawal, 3) intention effects, 4) loss of control, 5) time, 6) conflict, and 7) persistence. It has been shown that the scale has good internal reliability ($\alpha = .78$ to $\alpha = .92$) and test-retest reliability ($r = .92$)

1.6 Exercise Addiction Theories

The exercise addiction literature by Murphy (1994) presented the three most significant psychophysiological explanations for exercise addiction: the thermogenetic hypothesis, the catecholamine hypothesis, and the endorphin hypothesis. The thermogenetic hypothesis suggests that exercise raises body temperature, which reduces somatic anxiety (Morgan, 1988). The catecholamine hypothesis proposes that exercise causes the release of catecholamines, which are strongly implicated in the control of attention, mood, movement, endocrine, cardiovascular, and stress responses (Kety, 1965). Furthermore, high levels of catecholamines are thought to be associated with euphoria and positive state of mood. The endorphin hypothesis seems to be the most widely accepted by the general scholastic society. This hypothesis suggests that exercise causes endogenous morphines to be produced, resulting in a reinforcing enhanced mood state. Despite general acceptance of the endorphin hypothesis, there is little conclusive

evidence indicating a precise mechanism of effect (Murphy, 1994). Moreover, not only should the type of exercise and mood be taken into consideration in the role of mood modulation, but so should the person's psychological constitution state. This state also involves passion for exercise, that as I show in the later sections of this work, is closely related to exercise dependence and the risk of exercise addiction.

1.7 Passion

Exercise addiction is often confused with "commitment" to exercise (Szabo, 2010), which entails passion and dedication to activity. McLaren (2007) warns that although exercise addiction is related to the volume of exercise, the latter is not an indicator of addiction. Passion for an activity is a concept that refers to engaging in a specific activity that one finds important and in which one invests time and energy. Research suggests that the risk of exercise addiction (REA) increases with the level of sport competition. Szabo et al. (2013) found that elite ultramarathon runners reported higher levels of exercise addiction than university athletes. Similar results were found for competitive and recreational runners (Pierce et al., 1993) as well as for professional and amateur triathletes (Blaydon and Lindner, 2002). In this study, competitive athletes reported higher levels of exercise addiction than the latter. In line with the recent argument, these differences may not demonstrate greater psychological morbidity in athletes compared to non-athletes, but I need to examine the reason for this difference.

"*Passion toward an activity is motion that refers to engaging in a beloved activity that one finds important and invests time and energy into."* (Ricardo de la Vega, 2016). Vallerand et al. (2003) presented a dual model of passion that includes harmonious passion and obsessive passion. According to some research, passion toward an activity surfaces when a person enjoys the activity, freely chooses it, and/or wishes to take part in it, as well as internalizes the activity into the self. Harmonious passion (HP) occurs when the activity is internalized into the self in an autonomous mode, when one engages in the activity flexibly, which is positively associated with positive affect, while it is negatively associated with negative affect (Stenseng, Rise, & Kraft, 2011; Vallerand et al., 2003; Vallerand et al., 2006; Vallerand & Miquelon, 2007). Obsessive passion (OP), on the other hand, emerges when one internalizes the activity in a controlled way, when participation is rigidly controlled, which is positively related to negative affect (Stenseng et al., 2011; Vallerand et al., 2003; Vallerand et al., 2007;

Vallerand & Miquelon, 2007). Additionally, an obsessively passionate individual attaches great importance to activity contingencies such as self-esteem and escape from difficulties (i.e., stress), making it difficult to stop the passionate activity (Vallerand, 2010).

1.8 Passion and Exercise Addiction

The scholastic literature connects exercise addiction and passion. OP has been positively associated with exercise addiction in endurance sports and other recreational physical activities (Schipfer & Stoll, 2015; Stenseng et al., 2011). That was shown that OP is linked to all dimensions of exercise addiction (time, reduction in other activities, tolerance, withdrawal, continuance, intention effects, and lack of control), whereas HP was only related to time and tolerance (Paradis, Cooke, Martin, & Hall, 2013). Moreover, it was discovered that harmoniously passionate exercisers could increase the time spent on exercise without decreasing the time spent on other important life activities, whereas obsessively passionate exercisers spend an excessive amount of time on exercise while taking time away from/ neglecting other important life activities (Paradis et al., 2013). The gist of these studies was reinforced by a Greek study that demonstrated that OP bears a stronger relationship to exercise addiction than HP (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014).

The link between exercise addiction and passion as a function of the athletic level of competition was explored by examining a large sample of low and high-level competitive athletes and non-competitive leisure exercisers (De La Vega, Parastatidou, Ruiz- Barquin, & Szabo, 2016). The findings of de la Vega and his colleagues (2016) revealed that OP was a strong predictor of exercise addiction, predicting 37% of the total variance in the latter. In contrast, HP was not a significant component in the model. While athletes in formal competitive sports scored higher than leisure exercisers on all measures, no differences between exercise addiction and passion were disclosed between athletes competing at low and high levels. Finally, De La Vega et al. (2016) showed that athletes participating in team sports reported greater levels of harmonious and obsessive passion than those taking part in individual sports.

1.9 Predictors of the Risk for Exercise Addiction and Passion

Motivation has been shown to be one of the key factors influencing behaviour (Fortier, Vallerand, & Guay, 1995), so it is reasonable to assume that athletes' motivations for engaging in sports might underlie their passion for sports and their risk for exercise addiction (REA). Following the well-established conceptual model of self-determination theory (SDT; Ryan & Deci, 2017), I can distinguish between intrinsic motivation (i.e., doing sports for the enjoyment and pleasure derived from it) and four types of extrinsic motivation ranging from the more autonomous to the more controlled, including integrated (i.e., doing sports is congruent with one's values and self), identified (i.e., doing sports is personally valued), introjected (i.e., doing sports due to internal pressures), and external regulations (i.e., doing sports due to external pressures). Finally, amotivation refers to the complete lack of motivation and intention to perform exercises. Typically, more autonomous motivations (intrinsic, identified and integrated motivations) have been associated with positive outcomes, while controlled motivations (introjected, external and amotivation) with negative outcomes (Ryan & Deci, 2017).

1.10 Passion and Cultural Differences

The Collective Constructionist Theory (Kitayama, Markus, Matsumoto, & Norasakkunkit, 1997) suggests that day-to-day situations vary among cultures and generate specific learned expectations by yielding distinct psychological frameworks that systematically vary from culture to culture. People who adhere to their acquired cultural values and social expectations exhibit behavioural tendencies consistent with those values and expectations. Cultural differences in passion have indeed been shown to exist in romantic relationships, social life, risk-taking, and gastronomy (Aaker, Benet-Martinez, & Garolera, 2001). Furthermore, it has been demonstrated that Russian employees who exhibited greater OP for work were more satisfied with their jobs and more committed to their occupations, a relationship that was absent in the case of Chinese employees (Burke, Astakhova, & Hang, 2015). Cultural differences also exist in the strength of compliance with socio-political norms (Gelfand et al., 2011) and in the patterns of physical activity across nations (World Health Organization Regional Office for Europe, 2016a, 2016b).

Passion for a sport or exercise reflects the extent to which individuals value that activity, devote substantial time and energy to it, and enjoy it (Vallerand, 2015).

Vallerand et al. (2003) previously proposed a dual model of passion that comprises obsessive and HP. The surfaces when the activity is internalised into the self in an autonomous mode; when the individual engages in the activity with flexibility. It is positively related to positive affect, while being inversely associated with negative affect and self-compassion (Stenseng et al., 2011; Vallerand et al., 2003). The role of passion for sports and exercise has received a great deal of research attention in recent years. For example, it was shown that HP towards exercise is positively associated with one's perceived autonomy support, identified regulation, intrinsic motivation, needs for autonomy, competence and relatedness, while OP has been shown to be strongly and positively associated with introjected regulation for one's exercise participation (Parastatidou, Doganis, Theodorakis, &Vlachopoulos, 2012). However, cross-cultural studies are lacking. It is important to study cultural differences since they may influence the results of research in this area as well as both past and future research interpretations. Currently, the majority of studies on passion and exercise originate from a few countries, such as Canada, the United States, the United Kingdom, Greece, and Spain. Knowledge about the effects of culture on the passion-exercise relationship is important in interpreting the findings of this and future studies. Moreover, for cultural reasons, gender roles and gender schema vary between men and women as well as across nations. Thus, gender, as a possible moderating factor in passion for exercise, also merits explicit attention (Seguin Levesque et al., 2003; Office for Europe, 2016a, 2016b). It was reported that Italian football fans exhibited higher levels of OP and HP than French supporters (Vallerand et al., 2008), but these results cannot be applied to individuals' physical activity. Therefore, other researchers have speculated that there may be cultural differences in passion concerning physical activity based on research evidence and the Collective Constructionist Theory (Philippe, Vallerand, & Lavigne, 2009). To the best of my knowledge, no previous study has examined obsessive and HP in physical activity in a cross-cultural context, which is significant as it could moderate the interpretation of research findings on passion for exercise.

1.11 Passion and Gender

Some research has indirectly examined gender differences in relation to passion in physical activity. These studies have generally shown that there are no gender differences in passion in exercise (De La Vega, Parastatidou, Ruiz-Barquin, & Szabo, 2016; Donahue, Rip, & Vallerand, 2009; Parastatidou et al., 2012; Stenseng, 2008), but

such differences in passion related to other activities have been reported including activities such as internet use (Seguin-Levesque et al., 2003). It is possible that gender has an impact on passion in some activities but not in others. Nevertheless, the *specific* testing of gender differences in obsessive and harmonious passion in physically active people is warranted (Philippe et al.,2009). Such theory, as well as past research in other domains, suggests that cultural differences and gender could affect research outcomes on passion. Indeed, Philippe et al. (2009) suggested that "*Future research might do well to examine if cultural differences exist in the relationship between passion and well-being and as a function of age and gender*." The aim of the present study was to preliminary examine the hypothesis that passion in physical activity may vary between cultures and gender. While no justification is needed for gender, Spain and Hungary were chosen for the cultural comparison because these two distinct nations represent two very different European cultures (geographically and politically) that differ in the strength of their social norms and tolerance of novel nonconforming behaviour. In contrast to possible expectations, Hungarians score lower on conforming behaviour than the Spanish (Gelfand et al., 2011) and there is a greater percentage of adults reaching the World Health Organization's recommended physical activity levels in Hungary (85.4%) than that in Spain (66.4%; see World Health Organization Regional Office for Europe, 2016a, 2016b). Therefore, the two forms of passion for exercise may be expected to differ in these nations. Consequently, we hypothesised that both gender and cultural differences will emerge when comparing physically active Hungarian and Spanish samples.

1.12 Objectives of the current dissertation

1. The first study aims were to replicate recent findings in the area, which show that while HP is a good predictor of the REA, it has a small association (3-4%) with the latter.

2. The second study's objective was to confirm recent results in the field showing that HP is an indicator of REA but has only a minor impact on it. This research will add to previous studies by clarifying whether exercisers who participate in more sports have higher REA, exercise speed, and both OP and HP.

3. The third goal was to investigate the relationship between REA and exercise frequency in high- and low-exercise volume groups using two tests, one with and one without enthusiasm, as a covariate

4. In The fourth study's objective was to assess, my aims whether there are cultural and gender differences in OP and HP among people who engage in regular physical activity. Should differences emerge, researchers should avoid extrapolating results from studies conducted in a single country. Further, knowing that certain people appear to be more passionate or feel more HP or OP for exercise, may shed light on motivational aspects and commitment to exercise, as well as provide insight into the aetiology of exercise dependence.

5. Finally, I intended to show that a single weekly 90-minute training session increases enthusiasm and REA.. The aim of this work was also to show that motivation plays a role in the observed results as a partial mediator. Although the rise in passion is theoretically sound, the rise in REA could represent a conceptual misinterpretation of evaluation tool items and responses, rather than just the rise in OP.

CHAPTER 2

2. Does Passion Predict Exercise Addiction? A Survey Within Team- and Individual Sports[1]

2.1 Abstract

Background: New empirical evidence reveals a connection between passion and exercise addiction. The aim of the current inquiry was to examine the relationship of obsessive- and harmonious passion to exercise addiction in people practicing team- and individual sports.

Method: Athletes (n=190, 59% women, age=22.94±SD=4.64 years) represented six sports, three team- (cheerleading, soccer, and basketball; n=92) and three individual sports (running, gymnastics, and kettlebell; n=98). Participants completed the Exercise Addiction Inventory and the Passion Scale.

Results: A regression analysis revealed that obsessive- and harmonious passion were strong ($p<.001$) predictors of exercise addiction and together accounted for 39% of the variance in it. Separate regressions for team and individual sports, revealed that passion accounted for 25% of the variance in exercise addiction in the former, but for twice as much in the latter (50%). However, harmonious passion had a weak contribution in both cases (4-3%). The prevalence of exercise addiction were identical (15%) in the two groups. Athletes in team sports scored higher on harmonious passion than those in individual sports ($p<.001$). All psychological measures correlated with the weekly hours of exercise ($p<.001$), which was not a predictor in the model for exercise addiction.

[1] this study was already peer reviewed and published: Kovacsik, R., Soós, I., de la Vega, R., Ruíz-Barquín, R., & Szabo, A. (2018). Passion and exercise addiction: Healthier profiles in team than in individual sports. International Journal of Sport and Exercise Psychology, 18(2), 176–186. doi:10.1080/1612197x.2018.1486873

Conclusions: The findings support the emerging empirical results suggesting that exercise addiction is largely determined by obsessive passion. They expand the extant knowledge by distinguishing the predictive power of obsessive passion within team- and individual sports. The study also replicates recent findings revealing that athletes in team sports report greater harmonious passion than those practicing individual sports.

Keywords: Commitment to sport, Competition, Elite athlete, Exercise Dependence, Training

2.2 Introduction

Nowadays, it is textbook knowledge that a physically active lifestyle grants numerous health benefits (Bellocco, Jia, Ye, & Lagerros, 2010; Lee et al., 2011). It is also well known that regular physical activity is associated with better mental health (Clow & Edmunds, 2013). Based on this knowledge, many people engage in exercise to cope with the numerous hassles and challenges of the daily life (Berczik et al., 2012). Ironically, sports and physical activity themselves may be sources of stress (Stevens, Loudon, Yow, Bowden, & Humphrey, 2013).

Exercise addiction it 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 toward an activity is a notion that refers to engaging in a selected activity that one finds important, invests time and energy into it. Vallerand et al. (2003) presented a dual model of passion consisting of harmonious and obsessive passion. According to these authors, passion toward an activity surfaces when a person enjoys the activity, freely selects it, and/or wishes to take part in it, and also internalizes the activity into the self. Harmonious passion occurs when the activity is internalized into the self in an autonomous mode, when one flexibly engages in the activity, which is positively related to positive affect, while it is negatively associated with negative affect (Stenseng, Rise, & Kraft, 2011; Vallerand et al., 2003; Vallerand et al., 2006; Vallerand & Miquelon, 2007). In contrast, obsessive passion emerges when one internalizes the activity in a controlled way, when participation is rigidly controlled, which is positively related to negative affect (Stenseng et al., 2011; Vallerand et al., 2003; Vallerand et al., 2007; Vallerand & Miquelon, 2007). Additionally, an obsessively passionate individual

attaches great importance to activity contingencies, such as self-esteem and escape from problems (i.e., stress), which makes it difficult for one to stop the passionate activity (Vallerand, 2010). At this time, 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, which was only related to time and tolerance (Paradis, Cooke, Martin, & Hall, 2013). Further, 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 were strengthened in 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 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, Ruiz- Barquin, & Szabo, 2016). The findings revealed that obsessive passion was a strong predictor of exercise addiction, predicting 37% of the total variance in the later. 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 reported greater harmonious- as well as obsessive-passion than those taking part in individual sports.

The aim of this current study was to replicate De La Vega et al.'s (2016) work, and to further investigate the connection between exercise addiction and passion, with an additional focus on the possible differences between team- and individual sports. In contrast to De La Vega et al., we examined a sample having a different social and cultural background, a more balanced ratio in team/individual sport participation, and instead of focusing on competition level (that made no difference in De La Vega et al.'s

work), we simply set organized sportsparticipatioand at least one year of continuous participation history as criteria. Finally, since exercise volume is related to exercise addiction scores (İrem & Bavli, 2016; MaClaren & Best (2007), we also assessed the link between self-reported weekly hours of exercise, passion, andexercise addiction.

2.3 Methods

2.3.1 Participants

The study was carried out in a large metropolitan athletics club1 incorporating more than a dozen of organized sports. The required sample size (n) for linear multiple regression was calculated using the G*Power (v. 3) software (Faul, Erdfelder, Lang, & Buchner, 2007). The *a priori* test was, based on a pre-set power (1 - _ = .95), a medium effects size (*f2* = .15), _ = .05, with three predictors (obsessive-, harmonious-passion, and weekly hours of exercise), revealed that the required sample size was 107. Using the same software, for calculating the sample size for a between-groups analysis, based on a pre-set power (1 - _ = .95), a medium effects size (*f2* = .25), and _ = .05, with three dependent measures (obsessive, harmonious passion, and exercise addiction) the required n was 80.

Based on equal frequency (not duration) of training and urban proximity, three teamand three individual sports clubs were approached to collaborate with the researchers. These were: cheerleading2, football (soccer), and basketball (team sports; n = 92) and gymnastics, running, and kettlebell (individual sports; n = 98). All trained three times per week. We examined a total of 190 volunteers (78 men and 112 women; mean age = 22.94, SD = 4.64 years). They trained an average of 6.22 (SD = 3.30) hours per week for an average of 6.11 (SD = 5.48) years, but a minimum of one year. Participants shared a common social and cultural background. Ethical clearance for the investigation was granted by the Research Ethics Committee at a large urban university1, which ensured that the research was carried in accord with the ethical principles for research involving human participants of the Helsinki Declaration (World Medical Association, 2008), as well as in concordance with the British psychological guidelines for ethical considerations in research with human subjects (British Psychological Society, 2010).

2.3.2 Materials

A demographic questionnaire was used to determine the participants' gender, age, weekly hours of exercise, and past history of exercise. The 6-item Exercise Addiction Inventory (EAI; Terry, Szabo, & Griffiths, 2004) was used to assess the risk for exercise addiction. 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 EAI is rated on a 5-point Likert scale, ranging from *strongly disagree* to *strongly agree*, and it comes with relatively good psychometric properties (Griffiths et al., 2015; Monók et al., 2012; Terry et al., 2004). The other paper and pencil instrument was the revised Passion Scale (PS; 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 practiced sport. The scale gauges harmonious- and obsessive-passion with two 6-item subscales that are rated on a 7-point Likert scale, ranging from *not agree at all* to *very strongly agree*.

2.3.3 Procedure

Following the reading and signing of a written informed consent form, the participants completed the two questionnaires, in their habitual training environments in the presence of an experimenter. Data collection lasted over a period of two months. The collected data were manually entered into Excel files, verified by at least two of the researchers, then imported into the Statistical Package for Social Sciences (SPSS) software data-base (Version 22.0).

2.3.4 Statistical Analyses

Initial correlation analyses were followed by a stepwise regression analysis to test the predicting power of obsessive- and harmonious passion, and the weekly hours of exercise, on exercise addiction scores. A multivariate analysis of covariance (MANCOVA) was used to test the hypothesis that team sports athletes score higher on harmonious passion than athletes in individual sports.

2.4 Results

Initial correlation analyses yielded statistically significant relationships among all the questionnaire measures and the weekly hours of exercise (Table 1). Therefore, the latter was also included, along with obsessive and harmonious passion, in the stepwise regression analysis to test the predicting power of these variables on exercise addiction scores. In this process, 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 re-test of the standardized residuals indicated that the 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* = .609, *VIF* = 1.642; obsessive passion, *tolerance* = .592, *VIF* = 1.689; weekly hours exercise, *tolerance* = .674, *VIF* = 1.484). The data also met the assumption of independent errors (Durbin-Watson value = 1.889). Finally, the data met the assumption of non-zero variances (harmonious passion, variance (*s2*) = 26.686, obsessive passion, *s2* = 36.393, and weekly hours of exercise, *s2* = 10.896). Using the *stepwise* method, a statistically significant regression equation was obtained in which obsessive- and harmonious passion were the two components of the equation model ($F(2, 186) = 59.45$, $p < .001$, *R2* = .39, *R2 adjusted* = .38). Therefore, in predicting the exercise addiction scores, it was revealed that obsessive passion (_ = 0.263, $p < .001$), and harmonious passion (_ = 0.142, $p = .002$) were statistically significant predictors, while the weekly hours of exercise was not (_ = 0.056, $p > .05$). The proportion of variance (*R2 change*) explained in exercise addiction was substantial (.36) by obsessive passion and only minimal or even negligible (.03) by harmonious passion. The 2 (type of sport: individual-, team-sport) by 2 (gender: men, women) by 3 (the dependent measures: obsessive, harmonious passion, exercise addiction) MANCOVA using the weekly hours of exercise as covariate, yielded a statistically significant multivariate main effect for the type of sport (Pillai's Trace = .096, $F(3, 182) = 6.48.0$, $p < .001$, partial ETA squared (*_p2*) = .096). The covariate was also statistically significant sport (Pillai's Trace = .288, $F(3, 182) = 24.50.0$, $p < .001$, *_p2* = .288). 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, 184) = 17.27.0, $p < .001$, *_p2* = .086; Table 2).

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

	Exercise addiction	Obsessive passion	Harmonious passion	Weekly hours of exercise
Exercise addiction		0.584	0.48	0.37
Obsessive passion			0.58	0.52
Harmonious passion				0.5

[2]

Table 2. Means and standad deviatons in brackets F and p values (in brackets) and effects sizes (partial ETA squared) for three dependent measures.

	Team sport	Individual sport	F, p	ηp^2
Exercise addiction	20.80. (3.21)	19.99 (3.47)	0.05 (.817, NS*)	.000
Obsessive passion	25.42 (5.01)	22.74 (6.62)	2.31 (=.130, NS*)	.012
Harmonious passion	36.35 (2.96)	32.32 (5.94)	17.29 (< .001)	.086

*Note: NS = Not Significant

[3]

This finding was then further examined with a Bootstrap (1000 times) ANOVA to determine robustness and bias (Table 3). Given the group differences found in harmonious passion, we were interested in reexamining the relationship between passion and exercise addiction, now separately for the two groups, by repeating the stepwise regression analysis initially performed for the whole sample.3 After ascertaining that assumptions were met, as done for the all-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% 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 analyzed further. An analysis of covariance (ANCOVA) was used to determine the interaction between obsessive passion (used as a covariate) and

[2] *Information withdrawn for anonymity.*

[3] *Unlike soccer and basketball that are open skill team sports, cheerleading is an interactive closed skill team*
sport in which 15 to 25 individuals' work together and depend of each other.

team- and individual sports groups in the context of exercise addiction as the dependent measure. The sought interaction was statistically not significant, indicating that the slopes of the regression line of the covariate did not differ. Accordingly, only the strength of the relationship between obsessive passion and exercise addiction was stronger in individual sports than in team sports. Finally, we calculated the prevalence of the risk for exercise addiction (indicated by a score of 24 or more on the EAI; 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.

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

				Bootstrap Confidence Intervals (95%)	
	Statistic	Bias	Standard error	Lower	Upper
Team Sport	MEAN	.0049	.294	35.771	36.968
	SD	-.0270	.256	2.490	3.3841
Individual Sport	MEAN	.0113	.605	30.982	33.488
	SD	-.0439	.487	5.039	6.724

Table 4. Summary of the results of the stepwise regression analyses performed separetly for team sports (n=91) and individual sports (n=98). The R^2 is boxed on both occasions to stress the difference in the predictive power of obsessive passion on the dependent variable, exercise addiction, in the two forms of organised sports.

		Predictor	R	R^2	F	p	B*	SE**	t	p
Team Sport	Model 1	Obsessive passion	.45	.21	22.91	<.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 Sport	Model 1	Obsessive passion	.69	.47	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	2.56	=.012

Note: B* = Unstandardized coefficients; SE** = Standard error

4

2.5 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 organized team sports report greater harmonious passion than athletes in individual sports. The current results also demonstrate that the weekly amount of exercise needs to be taken in consideration in the examination of the link between passion and exercise addiction. Finally, the results reveal that the prevalence of the risk for exercise addiction in organized sports is relatively high (15%) and that there are no differences in this figure when comparing those participating in team sports with those taking part in individual sports.

Our findings fully replicate the recently obtained results by De La Vega et al. (2016). Similar to their findings, the current results show that obsessive passion is a significant part, or component, of exercise addiction scores determined with the Exercise Addiction Inventory (Terry et al., 2004). In fact obsessive passion determine more than one third of the variance (37% in de La Vega et al. and 36% in the current

[4] *Given that sample size was lower than in the whole sample, the power (1 - _ error probability) decreased from 0.95 to 0.91in the team sports group (n = 91) and to 0.93 in the individual sports group (n = 98).*

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 agree with the results obtained by 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. study, harmonious passion was not a significant predictor of exercise addiction, and in the current study, in spite of statistical significance, it accounted for only 3% of the variance in the dependent variable. 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 an 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 private leisure centers, the next step is to study the moderating role of motivational factors in the relationship between passion and exercise addiction in organized sports, with expanded focus on the differences between team- and individual sports.

The current findings reveal that both obsessive and harmonious passion are higher in athletes taking part in team sports athletes than those involved in individual sports. This result replicates those of De La Vega et al. (2016) and also agrees with the results reported by Vallerand et al. (2003), which demonstrated that harmonious passion was greater in team sports in contrast to individual sports. A possible but speculative explanation for this finding is that in addition to the physical and mental aspects of the athletic activity found in individual sports, team sports also possess an important social context that may affect harmonious passion characterized by positive affect. Indeed, collective motivation, shared success, successful cooperation may be associated with greater harmonious passion than in individual sports where these components may be absent. Further, the level of socialization (extent of social life) that appears to be more intense in athletes participating in team sports, vis-a-vis to those involved in individual

sports (Devecioglu, Sahan, Yildiz, Tekin, & Sim, 2012), may also contribute to greater harmonious passion. Future inquiries should examine the relationship between passion and types of sport by also examining the social and psychological components that differentiate the two sporting environments.

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 those reported for athletes in organized or competitive sports (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012; Szabo et al., 2013), that range from 17.0%% to 41.4%. Nevertheless, it is high in contrast to the prevalence among leisure athletes that ranges from 1.9% and 3.2% (Szabo et al., 2015). It is argued that the nearly fivefold discrepancy in the prevalence of exercise addiction between those in organized/competitive sports and leisure exercisers is due to different interpretations of the items on the Exercise Addiction Inventory (Terry et al., 2004) in the two populations (Szabo et al., 2015). Therefore, future work should use more than one instrument in gauging exercise addiction or complement the questionnaire data with interviews to better understand the perception of exercise addiction in organized sports.

2.6 Conclusion

The current research replicates recent findings in the field, revealing that obsessive passion is a strong predictor of the risk for exercise addiction, while harmonious passion has a limited association (3-4%) with the latter. The present work also expands the previous reports by showing that the connection between obsessive passion and the risk for 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 differences in harmonious passion in team sports in contrast to individual sports, with the former scoring higher than the latter.

CHAPTER 3

3. The Role of Passion in Exercise Addiction, Exercise Volume, and Exercise Intensity in Long-term Exercisers[5]

3.1 Abstract

Recent studies have shown a relationship between the risk for exercise addiction (REA) and passion. This research examined whether levels of REA, volume of exercise (in weekly hours), and self-reported exercise intensities yield differences in obsessive passion and harmonious passion in people with long exercise history. Respondents (n=360) completed the Exercise Addiction Inventory, Passion Scale, and Borg Scale, and reported their volume of exercise. Regression analysis demonstrated that exercise intensity, obsessive passion, and harmonious passion were significant predictors (r^2 =.381, p<.001) of the REA with obsessive passion being the strongest predictor (r^2 =.318). Exercisers classified as at REA reported higher obsessive passion, harmonious passion, and exercise intensity ($p\leq.001$) than those classified as symptomatic, who in turn scored higher on these measures ($p\leq.006$) than asymptomatic exercisers. Participants reporting greater volumes of exercise also scored higher on obsessive passion, harmonious passion (p<.001), exercise intensity (p=.032), and REA (p=.042) than individuals who exercised less. Finally, women exercising between low and high intensities exhibited greater obsessive passion, as well as harmonious passion ($p\leq.005$) than men reporting similar exercise intensities. These findings support the recently reported relationship between passion and REA. They also expand the current knowledge by demonstrating that obsessive passion and harmonious passion are greater in the individuals who exercise at higher volumes and with higher intensities of exercise.

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[5] this study was already peer reviewed and published:Kovacsik, R., Griffiths, M. D., Pontes, H. M., Soós, I., de la Vega, R., Ruíz-Barquín, R., … Szabo, A. (2018). The Role of Passion in Exercise Addiction, Exe rcise Volume, and Exercise Intensity in Long-term Exercisers. International Journal of Mental Health and Addiction, 17(6), 1389–1400. doi:10.1007/s11469-018-9880-1

Keywords: exercise dependence, exercise addiction, harmonious passion, obsessive passion, perceived, weekly exercise

3.2 Introduction

The risk of exercise addiction (REA) is often confounded with a commitment to exercise (Szabo, 2010) that involves passion for a beloved activity. Schreiber and Hausenblas (2017) admit that it is difficult to discern the fine line between passion and addiction, especially for enthusiastic exercisers. However, there is a dual model for passion, reflecting harmonious and obsessive variants (Vallerand et al., 2003).

To date, few empirical studies examined the relationship between REA and passion. Obsessive passion has been found to be positively associated with the REA in endurance sports as well as other leisure physical activities (Schipfer & Stoll, 2015; Stenseng et al., 2011). It has also been shown that obsessive passion is associated with all the dimensions of the REA (i.e., time, reduction in other activities, tolerance, withdrawal, continuance, intention effects, and lack of control), which has not been established for harmonious passion which has only been found to relate to time and tolerance (Paradis, Cooke, Martin, & Hall, 2013). Moreover, it has been shown that harmoniously passionate exercisers can increase their exercise volume (i.e., frequency or duration) without jeopardizing essential life responsibilities. This does not appear to be the case for the obsessively passionate exercisers, who spend exaggerated amounts of time on exercise while neglecting important responsibilities (Paradis et al., 2013). These findings are also supported by a Greek study showing that obsessive passion has a stronger link to REA than harmonious passion (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014), and a Swedish study demonstrating that those at high REA score higher on obsessive passion than those at low REA (Back, 2015).

The relationship between the REA and passion, as a function of the athletic level of competition, was investigated in a recent study examining a large sample of low-level and high-level competitive athletes and non-competitive leisure exercisers (De La Vega, Parastatidou, Ruiz-Barquin, & Szabo, 2016). In accord with Parastatidou et al. (2014), the findings demonstrated that obsessive passion was a relatively important predictor of the REA by accounting for 37% of the total variance in the latter. In contrast, harmonious passion was not a predictor of the REA. However, De La Vega et al. (2016) also reported that athletes scored higher on both obsessive and harmonious passion than leisure exercisers. Since exercise volume, in terms of the weekly hours of exercise, was greater in athletes than in leisure exercisers, the differences in passion

may also be associated with exercise volume rather than athletic status. However, De La Vega et al. did not test this hypothesis.

Research has also demonstrated a stronger relationship of obsessive passion with total months of exercise than compared to harmonious passion (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2012; Vallerand et al., 2003). Thus, studying the association between REA and passion in long-term exercisers may provide a better understanding of the overlap between the two concepts. This rationale is expanded by Parastatidou et al.'s (2012) findings that both obsessive and harmonious passion are also positively related to the frequency of high-intensity exercise in addition to an individual's exercise history.

Given this background, the aims of the present study were to investigate further the association between the REA and passion in long-term exercisers (at least two years) as a function of the level of REA (low: *asymptomatic*, moderate: *symptomatic*, and high: *at risk*) as well as in categories of high and low exercise volume (using weekly hours of exercise), and high and low exercise intensities. Based on previous research showing the positive relationships between passion and exercise history, and passion and the REA, it was hypothesized that in long-term exercisers the association between passion and REA would be even stronger than in previous research. It was also hypothesized that passion would be stronger in those individuals who exercise at a higher intensity and in larger volumes.

3.3 Methods

3.3.1 Simple size calculation

The minimum required sample size (n) for multiple linear regression was calculated with the G*Power (v. 3) software (Faul, Erdfelder, Lang, & Buchner, 2007). The *a priori* test as based on a pre-set power (1 - β = .95), a medium effects size (f^2 = .15), and α = .05, with four predictors (obsessive passion, harmonious passion, exercise volume, and exercise intensity), demonstrated that the required sample size was 129. Using the same software for calculating the sample size for between-groups analyses based on a pre-set power (1 - β = .95), a medium effects size (f^2 = .25), and α = .05, with four dependent measures, the required minimum sample size was 80. Consequently, the current sample size exceeded the calculated minimum sample size.

3.3.2 Participants

Recruitment flyers and web adverts targeted the participants of a large city's fitness- and recreational athletics clubs and solicited interested individuals to complete a five-minute online survey using Qualtrics software (Qualtrics, 2017). Within a three-month interval, 504 participants completed the survey of who 360 met the criteria for inclusion of being aged 18 years, being continuously physically active for at least two years, and exercising at least three hours every week. Among the 144 respondents whose data were not included in the analyses, three were under 18 years of age, 16 did not supply the information regarding their exercise history, 76 were physically active for less than two years prior to the study, and 49 reported less than three hours of regular exercise per week.

The final sample comprised 209 men (58%) and 151 women (42%). Participants' mean age was 24.37 years (SD = 6.51, range 18-78) years, and they exercised an average of 6.99 hours per week (SD = 4.08, range 3-30 hours), for an average of 8.95 years (SD = 6.97, range 2-40), and were involved in 32 different forms of exercise. Ethical clearance for the investigation was granted by the research team's university Ethics Committee

3.3.3 Materials

A demographic questionnaire was used to determine the participants' gender, age, weekly hours of exercise, and past history of exercise. The 10-item Borg scale (Borg, 1982) was used to assess the subjectively perceived usual or typical exercise intensity. The six-item Exercise Addiction Inventory (EAI; Terry, Szabo, & Griffiths, 2004) was used to assess the risk for exercise addiction. 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*." EAI items are rated using a 5-point Likert scale, ranging from '*strongly disagree'* to '*strongly agree'*, and have good psychometric properties (Griffiths et al., 2015; Monók et al., 2012; Terry et al., 2004). In the present sample, the internal reliability of the EAI (Cronbach's α) was .65, which may be considered questionable. However, it falls within the range reported for several cross-cultural research samples (i.e., .58 to .80) by Griffiths at al. (2015).

Passion was assessed using the revised Passion Scale (PS; 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 form(s) of exercise engaged in. The scale gauges harmonious passion (HP) and obsessive passion (OP) across two 6-item subscales that are rated on a 7-point Likert scale, ranging from *'not agree at all'* to *'very strongly agree'*. In the present study, the internal reliability of the OP and HP subscales (Cronbach's α) were .77 and .79, respectively, which are acceptable, but somewhat lower than the values reported by Marsh et al. for the original scale (i.e., .86 and .83, respectively).

3.3.4 Procedure

Participants were able to take part in the study from anywhere by connecting to the Qualtrics platform, accessible via any computer or mobile phone connected to the Internet. The first page of the survey contained the informed consent form on which the participants had to click on an 'agree' button before accessing the questions. Data collection lasted over a pre-determined period of three months. The collected data were downloaded in SPSS (Statistical Package for Social Sciences, V.22) file format directly from the Qualtrics platform. After verifying the file for the completeness of the responses and meeting the criteria for participation, statistical analyses were performed with the same software.

3.3.5 Statistical Analyses

Spearman rank correlations were performed to establish the relationships between the studied variables. Subsequently, a multiple stepwise linear regression was used to identify the predictors (and their strength) of the REA. Low and high exercise volume groups, as well as exercise intensity groups, were created by using median splits. While dichotomization is criticized in the literature (Irwin & McClelland, 2003), two recent re-evaluations demonstrate that the practice is robust and reliable (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015a, 2015b). Between-participants differences in the dependent measures were tested with a group by gender multivariate analyses of variance (MANOVA).

3.4 Results

An initial correlation analysis yielded statistically significant positive associations between REA and all the dependent measures (see Table 5). Therefore, obsessive passion, harmonious passion, exercise intensity, and exercise volume were the presumed predictors of REA, which was tested with a stepwise regression analysis.

Since all correlations were under 0.70, none of the predictors were multicollinear. However, since the correlation between REA and exercise volume was less than 0.30, the latter could not be included in the regression analysis. First, an analysis of the standard residuals was carried out to identify possible outliers in the data. This test indicated that one participant needed to be removed. After removing this outlier, the re-test of the standardized residuals indicated that the data did not contain any further outliers (St. Rsd. Min.= -2.669, St. Rsd. Max. = 2.889). The data met the assumption of independent errors (Durbin-Watson value = 1.807) and the assumption of non-zero variances (harmonious passion, variance (s^2) = 27.27, obsessive passion, s^2 = 41.85, and exercise intensity, s^2 = 1.75). Using the *stepwise* method, a statistically significant regression equation was obtained where all the three predictors were components of the model (F[3, 355] = 72.745, p < .001, R^2 = .381, $R^{2\ adjusted}$ = .375; Table 6). The proportion of variance ($R^{2\ change}$) explained in the REA by obsessive passion was the largest (.318), less by exercise intensity (.045), and only minimal (.018) by harmonious passion.

Table 5. Spearman's rho (ρ) inter-correlations between the measures.

	Obsessive passion	Harmonious passion	Exercise volume	Exercise intensity
Risk for Exercise addiction (REA)	.543 (p < .001)	.454 (p < .001)	.129 (p = .014)	.332 (p < .001)
Obsessive passion		.636 (p < .001)	.272 (p < .001)	.352 (p < .001)
Harmonious passion			.331 (p < .001)	.330 (p < .001)
Weekly hour of exercise				.224 (p < .001)

Table 6. Summary of the results of the stepwise regression analyses where risk for exercise addiction (REA) is the dependent variable and obsessive passion, harmonious passion, and exercise intensity are predictor variables (n = 359).

Predictor	*β**	*SE***	*t*	*p*	95% confidence interval for *β*		Tolerance
Obsessive Passion	.241	.035	6.88	<.001	.172	.310	.570
Exercise Intensity	.063	.014	4.48	<.001	.035	.090	.855
Harmonious Passion	.138	.043	3.18	=.002	.053	.223	.569

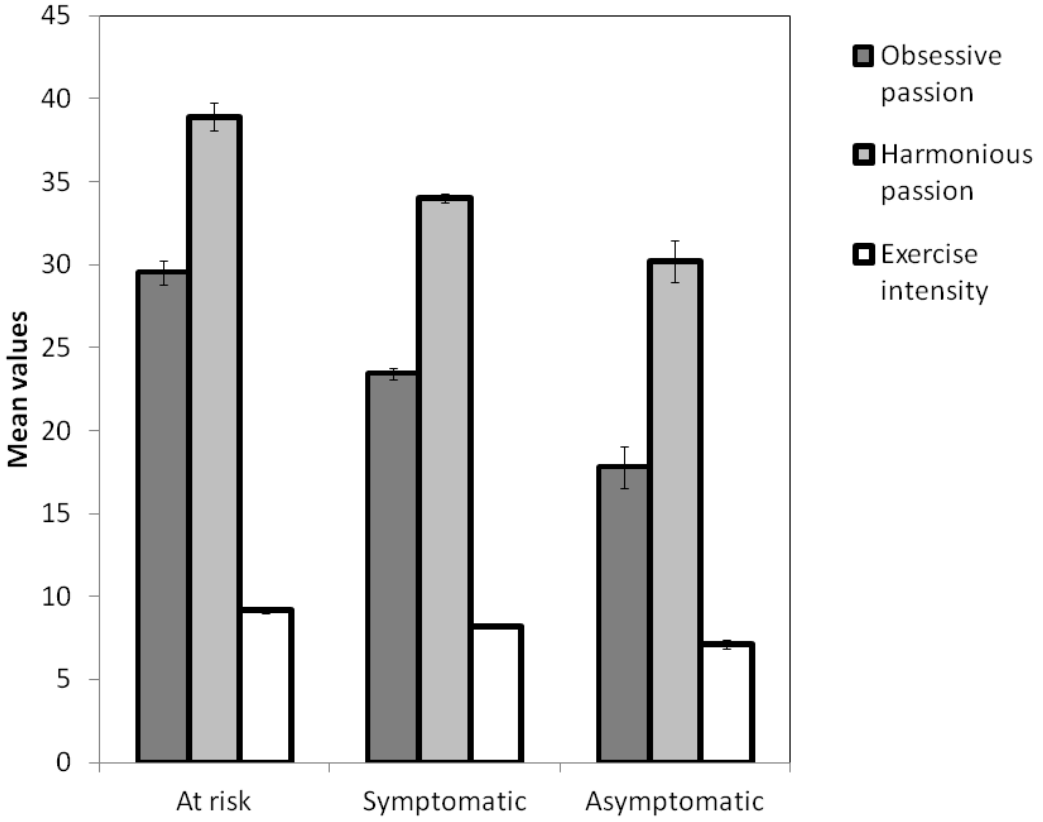
Note: *β** = Unstandardized coefficients; *SE*** = Standard Error of *β*

To test the differences between the REA levels (as based on Terry et al. 2004): (i) *at risk* (scores 24 or above; n = 15[6]), (ii) *symptomatic* (scores between 13-23; n = 281), and (iii) *asymptomatic* (scores between 6-12; n = 64)), a 3 (REA groups) by 4 (measures: obsessive passion, harmonious passion, exercise intensity, and exercise volume) MANOVA was performed. The test yielded a statistically significant multivariate main effect for the three REA groups (Pillai's Trace = .231, $F(8, 708) = 11.54$, $p < .001$, partial ETA squared (η_p^2) = .115). Univariate tests revealed that the REA groups differed from each other on three out of four dependent measures: (i) obsessive passion ($F(2, 356) = 34.16$, $p < .001$, $\eta_p^2 = .161$); (ii) harmonious passion ($F(2, 356) = 25.13$, $p < .001$, $\eta_p^2 = .124$); and (iii) exercise intensity ($F(2, 356) = 25.19$, $p < .001$, $\eta_p^2 = .124$). Bonferroni corrected post-hoc tests showed that the groups differed from each other in all the three dependent measures ($p \leq .006$; see Figure 2). The prevalence of REA in the current sample was 4.17% (15 of 360 individuals).

Figure 2. Means (bars) ± standard error: obsessive passion, harmonious passion, and exercise intensity at three levels (groups) of the risk for exercise addiction (REA): at risk (n =15), symptomatic (n = 281), and asymptomatic (n = 64). All the three dependent measures were statistically significantly different from each other ($p \leq .006$)

[6] Since this group was comprised by nine men and six women, there was insufficient power to include gender in the analysis.

in the three groups. Those at RAE scored higher on all the three measures than the symptomatic group ($p \leq .006$), who in turn scored higher than the asymptomatic group ($p \leq .001$).



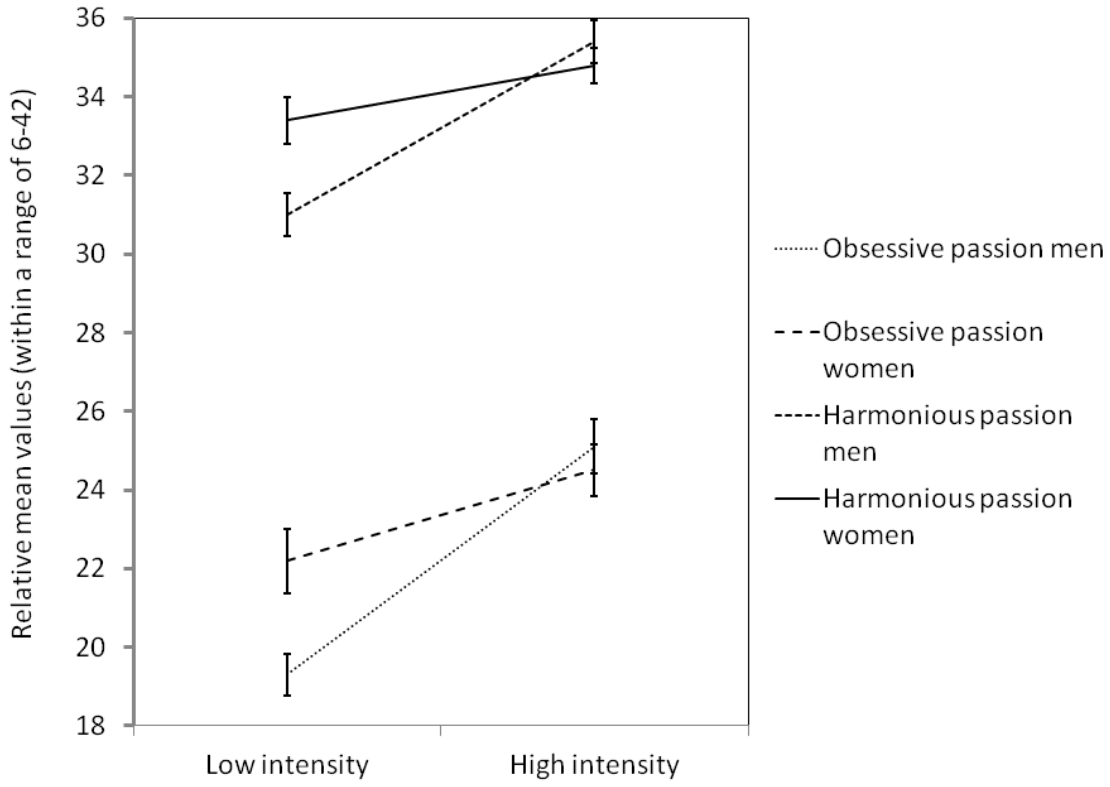
To examine whether people who exercise more show greater passion and REA than those who are exercising less, median (6 hours per week) split-based high and low exercise volume groups were formed and compared on obsessive passion, harmonious passion, exercise intensity, and REA using a 2 (group) by 2 (gender) by 4 (dependent measures) MANOVA. The test yielded a statistically significant multivariate main effect for the groups only (Pillai's Trace = .083, $F[4, 356] = 8.03$, $p < .001$, $\eta_p^2 = .083$). The univariate tests showed that the high and low exercise volume groups differed statistically significantly from each other on all the four measures ($p < .001$; see Table 7).

Table 7. Means (M), standard deviations (SD) and statistically significant differences between high (n = 202) and low (n = 158) exercise volume groups in four dependent measures (df = 1, 356).

Dependent measure	High exercise volume ($M \pm SD$)	Low exercise volume ($M \pm SD$)	F	p	η_p^2	Power ($1 - \beta$)
Obsessive passion	24.15 (6.10)	20.84 (6.46)	16.98	< .001	.046	.984
Harmonious passion	35.02 (4.31)	31.72 (5.68)	29.9	< .001	.078	1.000
Exercise intensity	8.22 (1.21)	7.77 (1.42)	4.62	= .032	.013	.572
Risk for exercise addiction (REA)	16.94 (4.09)	15.78 (4.09)	4.15	= .042	.012	.528

An identical dichotomization-based grouping was performed for exercise intensity (median = 8.1 on Borg scale) and a 2 (group) by 2 (gender) by 4 (dependent measures: obsessive passion, harmonious passion, exercise volume, and REA) MANOVA was performed. Since this test yielded a multivariate group by gender interaction (Pillai's Trace = .032, F[4, 330] = 2.69, p = .031, η_p^2 = .032), the main effects were not considered further. Univariate tests showed that the interaction was statistically significant only for obsessive passion (F(1, 333) = 6.67, p = .010, η_p^2 = .020) and harmonious passion (F[1, 333] = 7.47, p = .007, η_p^2 = .022). The interaction was due to the fact that women exercising at lower intensities (Borg scale 1-7) reported greater obsessive passion (F[1, 162] = 9.10, p = .003) and harmonious passion (F[1, 162] = 8.07, p = .005) than men exercising at the same intensities. As Figure 2 demonstrates, there were no such gender differences in those exercising at very high exercise intensities.

Figure 3. Means ± standard errors. The figure shows that women who exercise at lower intensities (low to high range, Borg scale 1-7) report higher obsessive- and harmonious scores than men exercising at similar workloads, whereas there are no statistically significant differences between men and women exercising at very high exercise intensities (Borg scale 8-10).



3.5 Discussion

The results of the study confirm and strengthen previous studies associating exercise addiction with obsessive passion (Paradis et al., 2013; Schipfer & Stoll, 2015; Stenseng et al., 2011). It also affirms the findings of De La Vega et al. (2016) and Parastatidou et al. (2014), showing that obsessive passion manifests a stronger relationship with exercise addiction than harmonious passion. In accord with the findings of the De La Vega et al. (2016), the present study demonstrated that obsessive passion was the strongest predictor of the REA, explaining nearly 32% of the variance (similar to the 39% variance found by De La Vega et al. [2016]). This small difference may be attributed to differences in the examined samples, such as athletes at two levels of competition versus leisure exercisers and the associated sporting context. While the

study by De La Vega et al. (2016) found that harmonious passion was not a predictor of the REA, in the present study it emerged as a statistically significant predictor. However, this was a weak (and arguably negligible) predictor because it accounted for less than 2% of the variance in the REA. This finding is not surprising if one considers that harmonious passion mirrors the joyful (subjective) experience in which exercise is perceived as a form of life enriching activity in harmony with other significant life activities (Vallerand et al., 2003; Vallerand, 2010).

The prevalence of REA was 4.2% in the present study and is similar to the values reported for leisure exercisers elsewhere in the literature ranging from 1.9% to 3.2% (Szabo et al., 2015). However, it is lower than that reported for athletic populations ranging between 17.0% and 41.4%. (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012). Indeed, such 'exaggerated' prevalence rates prompted Szabo et al. (2015) to question the interpretation of the EAI items by elite athletes who score unusually high on this tool and may simply reflect their passion for exercise rather than addiction. This conjecture is also supported by the present findings demonstrating that long-term, higher volume, and higher intensity exercisers report greater obsessive and harmonious passion than those who exercise fewer hours at lower intensities. These results echo the findings from previous research, showing that long-term and high-intensity exercise are related to both forms of passion (Parastatidou, et al., 2012; Vallerand et al., 2003).

A novel and unexpected finding was that women reported greater passion if they exercised under the median value of the reported range of exercise intensities than men working out at the same effort. However, the differences were no longer noticeable above the median, at the very high exercise intensities (see Figure 2). These findings are in discord with reports in the literature, which show no gender differences in passion (Philippe, Vallerand, & Lavigne, 2009; Vallerand et al., 2008). There is no obvious reason why such a difference was found in the present study and further research will be needed to establish whether the findings here are unrepresentative of studies in general or there really is a gender difference.

The finding that obsessive passion and harmonious passion increase with the levels of REA classifications (Terry et al., 2004), shows that apart from a mere correlation between passion and the REA (which emerges more strongly for obsessive than harmonious passion), passion scores paralleled those of REA. Along with perceived exercise intensity, harmonious passion is as much involved in this

relationship as is obsessive passion. Indeed examination of Figure 1 shows a parallel increase with the levels of REA. This finding may suggest that what today is conceptualized as 'risk' for exercise addiction may be a complex and yet untangled hybrid of exercise parameters and passion.

3.6 Limitations of the work

The present study is not without limitations. One obvious limitation is the lack of random sampling. Volunteers are unlikely to come from the same population as those in a random sample. Another limitation is the low sample size in the at-risk REA group, which prevented gender group analysis in this sub-group. However, based on past literature (Szabo et al., 2015), this prevalence rate was expected. A further limitation may be the self-report (subject to social desirability bias) and retrospective assessment of both exercise volume and intensity (subject to recall bias). Most individuals may easily be able to calculate their average weekly exercise but the perceived intensity may often be more important in terms of subjective expectations and outcomes than the actual exercise intensity (Szabo, 2013). Finally, dichotomization using median split has been criticized in the literature, but relatively recent evidence (Iacobucci et al., 2015a, 2015b) demonstrates that it is a reliable method to use.

3.7 Conclusion

The present study replicates recent findings in the field by demonstrating that obsessive passion is a predictor of REA, while harmonious passion has only a limited influence on REA. The present study also expands these previous findings by showing that REA, exercise intensity, and both obsessive passion and harmonious passion are higher among exercisers who work out in greater volumes. Furthermore, the study demonstrated a clear separation in the level of both obsessive passion and harmonious passion among individuals at REA and symptomatic and asymptomatic individuals. Consequently, increasing levels of REA appear to involve a growing hybrid of obsessive passion and harmonious passion that parallel the REA, further complicating the complex relationship between these concepts.

CHAPTER 4

4. When Passion Appears Exercise Addiction Disappears: Should Hundreds of Studies Not Considering Passion be Revisited?[7]

4.1 Abstract

There are approximately 1000 published articles on exercise addiction, which is characterized by exaggerated training yielding adverse effects. In contrast, there are less than 20 identified cases of exercise addiction in the literature. Recently, it was reported that there is an association between exercise addiction and passion. To test the impact of the latter on exercise addiction, we have re-analysed the combined data from two recent studies. High- and low exercise volume groups differed in exercise addiction even after controlling for age and gender ($p < .001$). However, after adding obsessive- and harmonious passion as continuous predictor variables, the statistical significance vanished, whereas both predictors emerged to be significant ($p < .001$). Further, when controlling for the effect of passion, the correlation between exercise addiction and weekly exercise volume emerged to be negative. Therefore, a conceptual confound between the presumed risk for exercise addiction and passion could render the results of several hundreds of published works questionable. The current findings send an important message to scholars in the field: Studying exercise addiction without controlling for passion could yield false results.

Keywords: athlete, compulsory exercise, exercise abuse, exercise dependence, obligatory exercise, training

4.2 Introduction

Early August 2018, there were 866 articles containing the words ’exercise addiction’ or ’exercise dependence’ in the title. It is well known that this condition, characterized by exaggerated volumes of exercise resulting in physical and psychosocial harm to the individual, because of loss of control over the behaviour (Szabo, Demetrovics, & Griffiths, 2018), is also connotated with other terms (compulsive

[7] this study was already peer reviewed and published: Szabo, A., & Kovacsik, R. (2019). When Passion Appears, Exercise Addiction Disappears. Swiss Journal of Psychology, 78(3-4), 137–142. doi:10.1024/1421-0185/a000228

exercise, exercise abuse, obligatory exercise, etc.; Szabo, 2010; Szabo, Griffiths, De La Vega, Mervó, & Demetrovics, 2015; Szabo et al., 2018). Accordingly, one could expect that to date at least 1000 scholastic articles were published in this field. Despite such research fertility in the area, there are a total of 12 cases studies reported in literature that could convincingly identify a dysfunctional form of exercise (Szabo, 2018). Therefore, research on exercise addiction outweighs the established cases of exercise addiction in an approximately 100:1 ratio. What could be the reason for the disproportion? One possible answer may be related to the inaccurate estimate of the prevalence of exercise addiction ranging from 0.3% (Mónok et al., 2012) to 42% (Lejoyeux, Avril, Richoux, Embouazza, & Nivoli, 2008), which suggests that something may be wrong in either the conceptualization and/or the measurement of the dysfunction. Another possible reason could be that the presumed risk of exercises addiction, usually measured with questionnaires, projects some other factors, such as commitment (Szabo, 2010) or passion (Szabo, 2018) associated with the exercise behaviour.

In contrast, to exercise addiction, passion for exercise mirrors the important extent to which people value their physical activity, dedicate increased time and physical effort to it, and passionately love it (Vallerand, 2015). Vallerand et al. (2003) provided a dual model of passion comprising obsessive and harmonious passion. On the one hand, obsessive passion can be observed at times when a person internalizes the beloved activity in a rigidly controlled way, which is related to negative affectivity (Stenseng, Rise, & Kraft, 2011). On the other hand, harmonious passion implies loving and dedicating time and energy to the adopted activity in a balanced way (Vallerand, 2015). It can be experienced when the activity is internalized into the self in an autonomous mode and when people undertake the activity with a flexible approach; while being inversely related to negative affect and self-compassion, harmonious passion it is directly related to positive affectivity (Stenseng et al., 2011; Vallerand et al., 2003).

Recently several studies examined obsessive and harmonious passion alongside the risk for exercise addiction in various samples (De la Vega, Parastatidou, Ruíz-Barquín, & Szabo, 2016; Kovacsik et al., 2018a; Kovacsik, Soós, De La Vega, Ruíz-Barquín, & Szabo, 2018b; Paradis, Cooke, Martin, & Hall, 2013; Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014; Szabo, 2018). In two very recent studies (Kovacsik et al., 2018a,b) regression analyses revealed that obsessive-, but less so

harmonious passion, were significant predictors of the risk for exercise addiction scores, accounting for over 38% of the variance. In the former study (Kovacsik et al., 2018a) high- and low exercise volume groups differed statistically significantly in obsessive passion and risk for exercise addiction scores, with the former group scoring higher than the latter group. Further, in the second study (Kovacsik et al., 2018b) the exercise volume was found the be a statistically significant covariate when examining the differences in passion and risk for exercise addiction between individual and team exercisers.

In the current study, we merged the data from two studies (Kovacsik et al, 2018a,b) and based on the reported weekly hours of physical activity, we formed a high- and a low exercise volume group. In doing so, we employed the median split and discarded the cases corresponding to the median value. Dichotomization using this method is often criticized in the literature, but recently compelling evidence was presented for the reliability and robustness of the method, especially in larger samples (Iacobucci, Posavac, Kardes, Schneider, & Popovich, 2015a,b).

Based on the theoretical rationale that higher exercise volumes are related to REA (Terry, Szabo, & Griffiths, 2004), we tested: 1) the differences between the groups by controlling for age and gender, and then 2) repeated the analysis by adding obsessive- and harmonious passion as continuous predictor variables (covariates) in the model. We did perform the two analyses to answer the question: What results do researchers get without- and with the consideration of passion in studying the risk for exercise addiction? This question has a notable implication if the two analyses yield incongruent results. Based on the regression analyses from the works on which the current study is based, we hypothesized that passion would be a significant covariate, even to the extent that the differences in risk for exercise addiction could be nullified.

The reason for the latter conjecture was that in the Kovacsik et al. (2018a) study, the effect size of the difference between high- and low exercise volume groups was nearly four and more than six times larger for obsessive- and harmonious passion, respectively, than the effect size for the risk for exercise addiction.

4.3 Methods

By merging the data from two studies (Kovacsik et al., 2018a,b) the total number of cases included in the current re-analysis was 591. However, after grouping

based on exercise volume, by using a median split and excluding the cases falling right on the median (*Mdn* = 6), the final sample size was 495 (277 men and 217 women). The mean age of the new sample was 23.87 ± *SD* = 6.12 years. The mean weekly hours of exercise was 6.87 ± *SD* = 4.01 hours. Participants' characteristics in the high- and low exercise volume groups are presented separately in Table 8. The instruments used for the assessment of exercise addiction, obsessive- and harmonious passion are described in detail in the original studies (Kovacsik et al., 2018a,b). Briefly, the two instruments used were: 1) the Exercise Addiction Inventory (EAI; Demetrovics, & Kurimay, 2008; Terry et al., 2004) and 2) the Passion Scale (PS; Marsh et al. 2013; Orosz, Vallerand, Bőthe, Tóth-Király, & Paskuj, 2016). The procedure included merging data from two studies, calculating the median (*Mdn*) the forming high and low exercise volume groups to be compared on EAI scores, first without considering passion and then by including obsessive and harmonious passion as continuous predictor variables. The tests were performed by using bootstrapped analysis of covariance (ANCOVA).

Table 8. Participants Characteristics in the high- and low exercise volume groups.

	High exercise volume	Low exercise volume
Sample size (n)	233 (men = 100; woman = 133)	262 (men = 177; woman = 85)
Age (years)	*M* ¯ 23.28 ± *SD*¯*6.31*	*M* ¯ 21.39 ± *SD*¯*5.88*
Weekly hours of exercise	*M* = 10.14 ± *SD=3.66*	*M* = 3.97 ± *SD=0.79*

The very first test, comparing the difference in the weekly hours of exercise between the high and low exercise volume groups, was carried out for manipulation check to ensure that the two groups differed indeed in their weekly exercise volume. The assumption was confirmed by an analysis of variance (ANOVA) that yielded statistically significant results ($F_{1,493} = 709.44$, $p < .001$, effect size (Cohen's *d*) = 2.33, Table 8). Another ANOVA comparing the high- and low exercise volume groups showed that those in the former group were younger (Table 8) than the participants in the low exercise volume group ($F_{1,492} = 4.13$, $p = .04$, $d = 0.18_1$). Further, a chi-square test revealed that the gender distribution was unequal in the two exercise volume groups

(χ^2_1 = 30.38, p < .001, Table 8). Based on these group differences, it was clear that we need to control for age and gender differences within the main analyses.

The first bootstrapped ANCOVA compared high- and low exercise volume groups on their risk for exercise addiction scores, using age and gender as covariates, was statistically significant (F1,494 = 19.67, p < .001, effect size [partial Eta squared η^2_p] = .039) and the gender (F1,494 = 4.42, p = .036, η^2_p = .009), as well as age (F1,494 = 11.63, p = .001, η^2_p = .023), were significant covariates. Another bootstrapped ANCOVA, only differing from the first in that obsessive- and harmonious passion were added as continuous predictor variables (covariates), was no longer statistically significant for the risk for exercise addiction scores (F1,494 = 0.20, p > .05, η^2_p < .001) and gender and age were no longer significant covariates. However, obsessive passion (F1,494 = 61.68, p < .001, η^2_p = .112), as well as harmonious passion (F1,494 = 22.66, p < .001, η^2_p = .044) emerged to be statistically significantly different between the high- and low exercise intensity groups (Table 9). Using the data of the whole sample, the correlation between the risk for exercise addiction scores and weekly hours of exercise yielded a weak statistically significant correlation (r = .146, r^2 = .021, p = .001), but when controlling for obsessive- and harmonious passion, by using partial correlation, the strength of the relationship not only decreased, but turned into a negative correlation (r = -.087, r^2 = .007, p = .053).

Table 9. Result of two Bootstrap (1000 Bootstrap samples) ANCOVAs for the risk of exercise addiction scores comparing high- and low exercise volume groups. In the upper part (A) obsessive- and harmonious passion are taken into consideration, while in the lower part (B) they are used as continuous predictor variables (covariances)

					Bootstrap Confidence Intervals (95%)	
	Statistic		Bias	Standard Error	Lower	Upper
A. Covariantes: age, gender						
High exercise volume group	Mean	18.78	-.003	.297	18.16	19.37
	SD	4.44	-.014	.203	4.01	4.83
Low exercise volume group	Mean	1.68	.011	.266	16.18	17.24
	SD	4.24	-.010	.176	3.88	4.56
Covariantes are: age, gender, obsessive passion, harmonious passion						
High exercise volume group	Mean	18.78	.0012	.297	18.19	19.36
	SD	4.44	-.021	.203	4.01	4.81
Low exercise volume group	Mean	1.68	.011	.263	16.14	17.17
	SD	4.24	-.016	.172	3.87	4.55

4.4 Discussion

The current study results show that if passion for exercise is not taken into consideration, researchers obtain significant differences in the *presumed* risk for exercise addiction between those who spend around 10 hours exercising each week versus those who exercise less than half of that amount. Such results prompt scholars to conclude that higher volumes of exercise are linked to increased risk for exercise addiction, which is in line with the basic conceptualization of exercise addiction (Lichtenstein, Larsen, Christiansen, Støving, & Bredahl, 2014; Terry et al., 2004), but it is in discord with theories proposing a revolutionary (reaction to major life stress), rather than the evolutionary (progressive), model for exercise addiction (Egorov & Szabo, 2013). We use the word 'presumed' because if questionnaire-based data would

reflect actual risk, the 100 to less than one ratio of publications to case reports would likely be higher. Indeed, a recent case study showed that despite self-claimed exercise addiction and high risk based on certain quantitative measures, the interviewed person did not manifest dysfunctional exercise behaviour (Szabo, 2018). In fact, we wonder how many (if any) individuals classified at high risk for exercise addiction, based on questionnaire scores, will eventually develop a clinically significant morbidity? In lack of longitudinal work in this area, the answer to this could only be speculated. One prominent finding of the current work is that by adding obsessive- and harmonious passion as covariates to the model, the statistical significance of the difference in the risk scores for exercise addiction between high- and low exercise volume groups disappears. However, the two covariates emerged as statistically significant predictor variables even after controlling for gender and age. These results imply that not exercise addiction but obsessive and harmonious passion were responsible for the differences between high and low exercise volume groups. There was a weak, but statistically significant, *positive* correlation between the weekly hours of exercise and the risk scores for exercise addiction, which is in line with earlier reports in the literature reporting a positive association between exercise volume and exercise addiction (Allegre, Therme, & Griffiths, 2007; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2013; Terry et al., 2004). However, when controlling for obsessive- and harmonious passion, by using a partial correlation, the strength of the association not only decreased but turned in a negative direction. Although statistically barely significant and the coefficient of determination (the *r2*) revealed that the shared variance between the two measures was less than one percent, to the best of our knowledge, this is the first study to show a negative correlation between the risk for exercise addiction and exercise volume. If more exercise is associated with a lower risk for exercise addiction when controlling for passion, one can imply the higher scores in the direct (uncontrolled) correlation reflects the impact of passion. This relationship fully agrees with the results of the main analysis demonstrating that differences in the REA between high- and low exercise volume groups cease to exist when passion is used as a continuous predictor variable. Passion, however, differentiates between high- and low exercise volume groups, suggesting that those who exercise longer hours have a greater passion for exercise. These findings agree with the conjecture that training volume does not reflect addiction to exercise (Szabo et al., 2015).

4.5 Limitations of the work

The current study has limitations too. One is the '*posteriori'* group formation, which was due to the post-factum formulation of the research question after becoming aware of the results of the two studies from which the current data originate. The direct testing of the hypothesis that passion is more closely linked to exercise volume than exercise addiction is warranted by preselecting high- and low volume exercisers, preferably by using systematic randomization. Another limitation of the study is the conceptualization of exercise volume in terms of weekly hours of exercise. A well-controlled study should estimate exercise intensity and frequency as well since these are components of a more accurate estimate of the weekly exercise volume.

4.6 Conclusion

This study looked at high- and low exercise volume groups' risk for exercise addiction using two analyses, one without and one with considering passion as a covariate. Different results emerged that afford different interpretations. More precisely, higher volumes of exercise are more closely associated with passion than addiction, but when passion is not assessed, more exercise would be linked to a greater risk for exercise addiction. Further, to my best knowledge, this is the first study that showed an inverse relationship between the risk for exercise addiction and exercise volume, which only emerged if the effects of obsessive and harmonious passion were controlled via a partial correlation. This result further strengthens the need for considering passion for exercise in research examining the risk for exercise addiction. The findings, despite certain limitations, should provide an incentive for systematic testing of the relationship and in the interim warn scholars in the field that studying exercise addiction begs for the consideration of passion as well, or otherwise their results may be futile.

CHAPTER 5

5. Obsessive and harmonious passion in physically active Spanish and Hungarian men and women: A brief report on cultural and gender differences[8]

5.1 Abstarct

Increased research on passion in exercise calls for direct examination of possible moderating variables, such as culture and gender, that could influence the interpretation of the research results. This study using a nation by gender between-participants design, examined differences in obsessive- and harmonious passion in Spanish and Hungarian physically active individuals. Participants (*n*=1002) completed the Passion Scale, reported their gender, age, and weekly hours of physical activity. Multivariate analysis of covariance revealed that the experiencing of physical activity-related obsessive- and harmonious passion differed between the two countries, and Hungarian women scored significantly higher on harmonious and obsessive passion than Spanish women. However, Hungarian men scored significantly higher on obsessive passion, but not harmonious passion than Spanish men. These results suggest that gender and cultural differences are likely to affect the interpretation and generalisation of research on passion and exercise.

Keywords: Cross-cultural study; Exercise; Gender; Physical training; Sport psychology.

5.2 Introduction

Passion for a sport or exercise reflects the significant extent to which individuals value that activity, dedicate substantial time and energy to it and love it (Vallerand, 2015). Earlier, Vallerand et al. (2003) provided a dual model of passion comprising obsessive and harmonious passion. Obsessive passion surfaces at times when an individual internalises the beloved activity in a rigidly controlled way, which is then positively related to negative affect (Stenseng, Rise, & Kraft, 2011). Harmonious passion means

[8] this study was already peer reviewed and published: Szabo, A., Griffiths, M. D., Demetrovics, Z., Veg a, R., Ruíz-Barquín, R., Soós, I., & Kovacsik, R. (2018). Obsessive and harmonious passion in physically active Spanish and Hungarian men and women: A brief report on cultural and gender differences. Internat ional Journal of Psychology, 54(5), 598–603. doi:10.1002/ijop.12517

loving and dedicating time and energy to the activity in a well-balanced way (Vallerand, 2015). It surfaces when the activity is internalised into the self in an autonomous mode; when the individual engages in the activity with flexibility. It is positively related to positive affect while being inversely associated with negative affect and self-compassion (Stenseng et al., 2011; Vallerand et al., 2003). The role of passion in sports and exercise has received increasing research attention. For example, it was shown that harmonious passion towards exercise is positively associated with one's perceived autonomy support, identified regulation, intrinsic motivation, needs for autonomy, competence and relatedness, while obsessive passion was strongly and positively associated with introjected regulation for one's exercise participation (Parastatidou, Doganis, Theodorakis, &Vlachopoulos, 2012). However, cross-cultural studies have been lacking. It is important to study cultural differences since they may affect the results of research in this area and have implications for both past and future research interpretations. Currently, most studies on passion and exercise originate from a few nations like Canada, United States, United Kingdom, Greece, and Spain. In the interpretation of the findings from these and future studies, knowledge about the effects of culture on the passion and exercise relationship is important. Further, not independent from cultural reasons, gender roles and gender schema vary among men and women and across nations too. Thus gender, as a possible moderating factor in passion for exercise, also merits explicit attention (Seguin Levesque et al., 2003). Office for Europe, 2016a, 2016b). It was reported that Italian football fans exhibited higher levels of obsessive passion and harmonious passion than the French supporters (Vallerand et al., 2008), but these results cannot be generalised to individuals' physical activity. Therefore, based on research evidence and the Collective Constructionist Theory. The cultural differences in passion concerning physical activity as speculated by other researchers (Philippe, Vallerand, & Lavigne, 2009). To these authors' best knowledge, no previous study has examined obsessive and harmonious passion in physical activity in a cross-cultural context, which is important, because it could moderate the interpretation of the research results on passion for exercise.

5.3 Methods

5.3.1 Participants

Physically active participants aged 18 years or over were recruited via advertisements in fitness and sport centres around the greater metropolitan areas of

Madrid and Budapest. A sample comprising 1002 consenting volunteer participants was recruited for the study. Participants' socio-demographic characteristics, weekly physical activity and passion scores are shown in Table 1. The study received ethical approval from the Research Ethics Boards of two large universities in Spain and Hungary.

5.3.2 Materials

Apart from demographic questions concerning age, gender, and hours of weekly physical activity, the revised Passion Scale (Marsh et al., 2013) was the main instrument used in the study. This 12-item scale includes items such as: "*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 the present study is related to an individual's physical activity. The scale assesses harmonious passion and obsessive passion on two 6-item subscales, which are rated on a 7-point Likert scale, ranging from *"not agree at all"* to *"very strongly agree"*. The internal reliabilities of the two subscales for the overall sample in the present study (Cronbach's α) were .86 and .83, respectively, which is higher than the value reported for the original scale (.80 for both obsessive and harmonious subscales). The values for harmonious and obsessive passion were lower but acceptable (.79 and .77 for the Hungarian subsample and .70 and .77 for the Spanish subsample). The present study used the psychometrically validated Spanish version of the Passion Scale (Chamarro et al., 2015) and the Hungarian version adapted by Orosz, Vallerand, B″othe, Toth-Kiraly, and Paskuj (2016).

5.3.3 Procedure and data analyses

After consenting to participate, respondents answered the demographic questions and completed the Passion Scale. Data were inputted in SPSS (Statistical Package for Social Sciences) data file and analysed using the same software using both multivariate analysis of variance (MANOVA) as well as multivariate analysis of covariance (MANCOVA) when a linear correlation between the dependent variables and the covariates was established.

5.4 Results

Inspection of the skewness (.114 and−.798) and kurtosis (−.543 and .654) indices for obsessive and harmonious passion confirmed the normality of the data. First in a preliminary test, the age and physical activity volumes of the two samples from the two countries were compared. The 2 (countries: Spain and Hungary) by 2 (gender: men

and women) MANOVA resulted in a statistically significant multivariate main effect for country (Pillai's Trace=.183, $F(2, 990)=110.77$, $p<.001$, $\eta p\ 2 =.183$) and gender (Pillai's Trace=.008, $F(2, 990)=4.01$, $p=.018$, $\eta p\ 2 =.008$), as well as a statistically significant multivariate interaction (Pillai's Trace=.029, $F(2, 990)=15.04$, $p<.001$, $\eta p\ 2 =.029$; see Table 10).

Table 10. Participant characteristics (N=1002), means and standard deviatons (SD) in brackets.

	Spain		Hungary	
Gender	Male	Female	Male	Female
Number (n)	204	109	396	293
Age (years)[a,b]	31.11 (10.01)	28.60 (7.39)	24.23 (5.13)	23.89 (7.10)
Hours of weekly physical activity[c,d,e]	9.02 (3.93)	7.90 (4.66)	5.38 (3.51)	6.91 (4.07)
Obsessive passion[f]	18.16 (6.74)	17.27 (8.14)	21.87 (6.40)	23.27 (6.22)
Harmonious passion[g]	32.23 (35.07)	30.03 (6.46)	32.73 (5.48)	34.00 (4.95)

[a] Woman in the study were younger than the man (p=.005). [b] The Spanish sample was older than the Hungarian sample (p < .001). [c] The Spanish sample reported more hours of weekly physical activity than the Hungarian sample (p < .001). d Hungarian woman exercised more than Hungarian man (p < .001). [e] Spanish man exercised more than the Spanish woman (p = .025). f There was a country by gender intercation in harmonious passion (Results section Figure 4)

These results, and the statistically significant correlations between obsessive- and harmonious passion with age and weekly hours of exercise (Table 11), indicated that age and weekly hours of physical activity should be used as covariates in the principal analysis determining the cultural and gender differences in passion for exercise.

Table 11. Sperman's rho (p) correlation between age, weekly hours of exercise and the two dependent measures, obsessive passion and harmonious passion.

Dependent measure	Age	Weekly hours of exercise
Obsessive passion	-. 315, p < .001	.236, p <.001
Harmonious passion	-. 180, p < .001	.310, p <.001

The main analysis consisted of a 2 (country) by 2 (gender) MANCOVA of obsessive and harmonious passion, using age and the weekly hours of physical activity as covariates. While the impact of both covariates were significant (p<.001), the test still yielded a statistically significant country by gender multivariate interaction (Pillai's Trace=.013, $F(2, 988)=6.46$, p=.002, ηp^2 =.013). The interaction was followed up with Bonferroni-corrected analyses of variances (ANOVAs), in which the adjusted alpha was .007 (.05/8=.00625, rounded to .007). Accordingly, Spanish women scored lower on both harmonious passion and obsessive passion compared to Hungarian women (p<.001), while Spanish men scored lower on obsessive passion (p<.001), but not on harmonious passion compared to Hungarian men. The Spanish men scored higher on harmonious passion than Spanish women (p=.001), but there were no significant differences in obsessive passion. Hungarian women scored higher on both obsessive passion (p=.003) and harmonious passion (p=.002) in contrast to Hungarian men. These results are illustrated in Figures 4 and 5.

Figure 4. Cultural and gender differences in obsessive passion

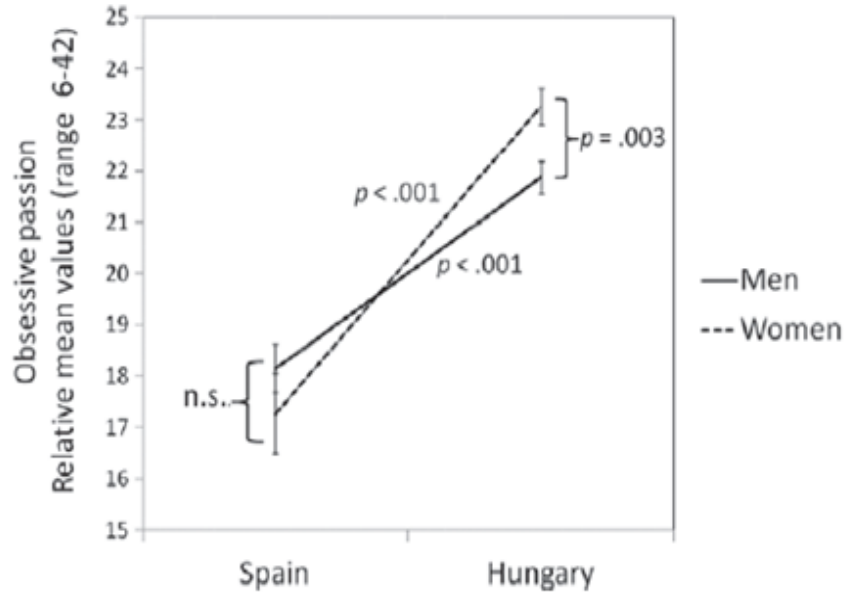
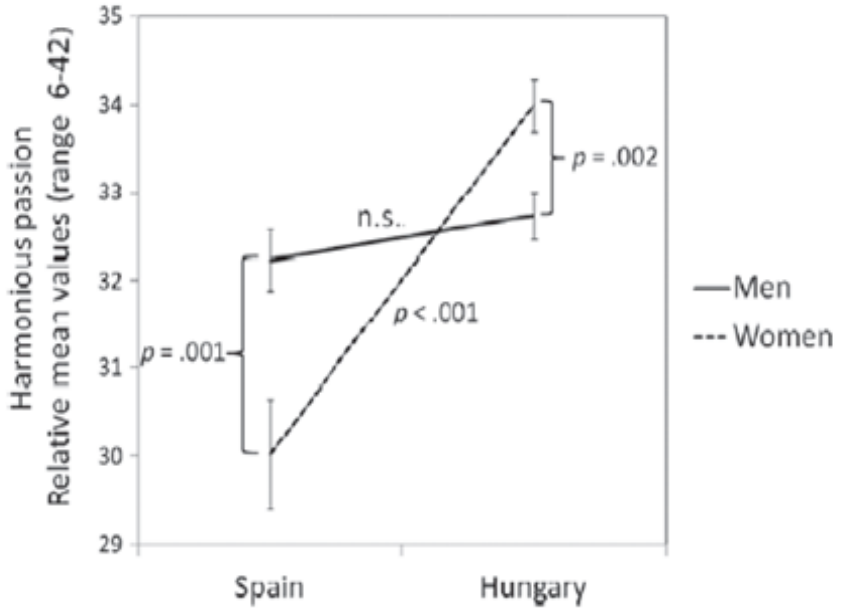


Figure 5. Cultural and gender differences in harmoniuous passion



5.5 Discussion

The present study suggests that there are cultural and gender differences related to passion in physically active people. Although cultural differences in obsessive- and harmonious passion were not examined in the context of physical activity, such differences may be expected since passion is not independent of the social–cultural environment (Aaker et al., 2001; Burke et al., 2015). In the present study, physically active Hungarian women and men scored higher on obsessive passion than their Spanish counterparts (Figure 4). In relation to harmonious passion, men from the two countries did not differ, whereas Hungarian women scored higher on harmonious passion than their Spanish counterparts. While further research is needed to identify what cultural aspects are responsible for the here observed differences,it appears that passion for exercise is different in the two compared nations, except harmonious passion in men, which did not differ between the Spanish and the Hungarians.These findings seem to indicate that Hungarian women, in general, are more passionate about their sport and exercise than their Spanish counterparts, while Hungarian men only exhibit greater obsessive passion than Spanish men. Such differences reveal the importance of studying passion with a view on the possible moderating role of culture,even though the constituents could not be identified in this preliminary investigation.

These cultural differences can be interpreted in light of the Collective Constructionist Theory (Kitayamaet al., 1997), which predicts that different social norms,values, and acts between Spanish and Hungarians are internalised and mirror individuals' actions and attitudes. A plausible theory explaining how unique cultural features are subject to internalisation is the schema theory (McVee, Dunsmore, & Gavelek, 2005). A schema is a mental representation of aspects of physical, social and emotional entourage of the person, which is expected to differ between the ex-communist and currently globalisation-resisting Hungary and the more liberal Spain. Such schemas govern the attitudes towards certain actions, like the practice of physical activity, which justifies the examination of the culturally generated psychological schemas, in an attempt to account for differences in passion.

However, aspects of Social Learning Theory (SLT; Bandura, 1965) should also be included in the better understanding of the cultural effects. Considering SLT, people internalise behaviours observed in their social environment, which then also leads to

cultural differences in attitudes towards and practices of physical activity. Such differences, established between the two nations examined in the present study (Gelfand et al., 2011;World Health Organization Regional Office for Europe, 2016a, 2016b), could be the result, or the cause, of the observed differences in passion. However, future studies need to determine whether such differences are activity-specific, or cross-cultural in general. Therefore, the use of a physically inactive control group may expand and clarify the findings of the present study.

The present study also revealed gender differences in both obsessive- and harmonious passion. Hungarians scored higher than the Spanish, which finding may not be explained by the difference between the two populations' exercise patterns (World Health Organization Regional Office for Europe, 2016a, 2016b), because in the current sample the Spanish exercised more than the Hungarians. Although this may sound contradictory to population exercise patterns, it is possible that those who exercise do it more intensely in Spain than in Hungary. However, the difference may rather be due to the age difference between the Spanish (who were older) and Hungarian samples, as based on the inverse relationship between age and both forms of passion (refer to Table 11).

Hungarian women scored higher than Hungarian men on both forms of passion, while Spanish men scored higher on harmonious, but not obsessive passion than Spanish women. These findings may be due to the fact that Hungarian women reported more weekly exercise than Hungarian men (refer to Table 10). While Spanish men also exercised more than Spanish women, differences were only noted in harmonious passion, even though a trend was apparent in obsessive passion too (refer to Figure 4). These opposite findings in the two nations may be related to the volume of exercise, which is positively correlated with both forms of passion (refer to Table 5).

The present findings concur with those of Philippe et al. (2009) who also showed gender differences between the age groups. These authors were the first to recognise the possible moderating role of gender and culture in the passion for exercise. The results of the present study show that such research is warranted among physically active people, and that studies on passion should further examine cultural and gender differences.

5.6 Limitations of the work

The present study is not without limitations. Three limitations, that could reduce the interpretation of the results to the studied sample are: (1) lack of random sampling, (2) reliance on self-report (subject to social desirability bias) and (3) retrospective assessment of the weekly hours of physical activity. Further, Hungarians were over-represented in the sample (2.2 to 1.0 ratio) that deterred testing of the psychometric structure of whether the Passion Scale is equivalent (invariant) across the two cultures. Future cross-cultural studies with more equal sample sizes would help establish the invariance of the scale.

5.7 Overall impact

Overall, the present study suggests that there may be cultural and gender differences in obsessive and harmonious passion among regularly physically active people. Hence, scholars should not generalise the findings from studies emerging from only one nation. Knowing that some people tend to be more passionate or experience more harmonious or obsessive passion for exercise could shed light on motivational aspects and adherence in exercise, and provide insight into the aetiology of exercise dependence. However, given the potential limitations of the study, the findings should be replicated in future research before definitive conclusions can be drawn. In the interim, research findings on passion for exercise should be interpreted with caution by keeping in perspective the possible moderating roles of culture and gender.

CHAPTER 6

6. Development of Exercise Addiction and Passion in Newly Adopted Sports: A Longitudinal Investigation[9]

6.1 Abstract

There are few cases of exercise addiction reported in the literature. However, this subject receives substantial attention in the field of sports and exercise psychology. Recent research suggests that the risk for exercise addiction (REA) is largely predicted by passion, which is associated with the motivation of the individual. The objective of this 12-week longitudinal study was to examine the temporal changes in these variables in women and men (N=149) who started a new sport activity. Latent growth modeling showed that REA and passion were high at baseline and showed a slight increase over the 12 weeks. Motivational factors predicted passion, whereas REA was predicted by gender, team sport participation, exercise intensity, and identified motivation. These findings show that the development of passion and REA over time, both partially mediated by motivation, manifest independent patterns. Consequently, despite the reported relationship between the two, they appear to be independent constructs.

Keywords: athletics; harmonious passion; obsessive passion; physical activity; sport

6.2 Introduction

An active lifestyle has many health benefits (Bellocco et al., 2010; Lee et al., 2011). Regular physical activity and sport are also connected to better mental health (Clow & Edmunds, 2013). Based on mass-media information, many people engage in physical activities or play sports to manage the challenges of daily life (Berczik et al., 2012). Paradoxically, sports and exercise could also become sources of stress (Stevens et al., 2013). The need to exercise in increasingly higher volumes could turn into an urge which culminates in loss of control over the activity. This transformation results in

[9] this study was already peer reviewed and published: Kovácsik, R., Tóth-Király, I., Egorov, A., & Szabo, A. (2020). A Longitudinal Study of Exercise Addiction and Passion in New Sport Activities: the Impact of Motivational Factors. International Journal of Mental Health and Addiction. doi:10.1007/s11469-020-00241-z

a dysfunctional behavior known as "exercise addiction" in the literature (Szabo, 2010; Szabo, Griffiths, Marcos, Mervó, & Demetrovics, 2015). Other synonyms used in the literature are: "exercise dependence" (Adams, 2009), "compulsory exercise" (Murray et al., 2012), "obligatory exercise" (Thome & Espelage, 2007), and/or "exercise abuse" (Calogero & Pedrotty, 2004).

Currently, apart from the studies in this dissertation, there is limited empirical evidence connecting exercise addiction and passion. However, OP was reported to be positively associated with the risk of exercise addiction (REA) in endurance sports and other leisure physical activities (Schipfer & Stoll, 2015). It was revealed that OP is related to all dimensions of the REA (time, reduction in other activities, tolerance, withdrawal, continuance, intention effects, and lack of control), which was different from HP that was merely related to time and tolerance (Paradis, Cooke, Martin, & Hall, 2013). Further, it was shown that exercisers with HP can increase the time spent on exercise without jeopardizing the time spent on other important life activities, which was not true for exercisers with OP who spent an exaggerated time on exercise, while sacrificing the time spent with other important life activities (Paradis et al., 2013). The key points of these findings were strengthened by another study revealing that OP has a stronger relationship to exercise addiction than HP (Parastatidou, Doganis, Theodorakis, & Vlachopoulos, 2014).

The link between the REA and passion in athletes was explored in a study examining a sample of low- and high-level competitive athletes and a group of non-competitive recreational exercisers (De la Vega, Parastatidou, Ruíz-Barquín, & Szabo, 2016). The results of the work revealed that OP was a strong predictor of the REA, accounting for 37% of the total variance in the latter. However, HP was not a significant predictor in the model. While athletes scored higher than leisure exercisers on all the measures, no differences were found in the REA and passion between athletes competing at low- and high-levels. De La Vega et al. (2016) also showed that athletes in team sports might report greater HP as well as OP than those taking part in individual sports. These findings were later expanded in another study which also revealed that OP accounted for half (25% versus 50%) of the total variance in REA in team-sports compared to individual sports, while HP added little to the shared variance (1-4%) with the REA (Kovacsik et al., 2018a; Kovacsik, Soós, De La Vega, Ruíz-Barquín, & Szabo, 2018b). Therefore, new research results show that there is a substantial overlap (communality) between the REA and passion, especially OP (Szabo, 2018). Similar

findings were reported in non-sports contexts too, such as in the field of Facebook use (Orosz, Tóth-Király, & Bőthe, 2016), gambling (MacKillop, Anderson, Castelda, Mattson, & Donovick, 2006), and work (Birkeland & Buch, 2015).

One possible means of untangling the two is the examination of the aetiology of the REA and passion over time in people who start up a new, or previously not regularly practiced, sports activity. The interactional model of exercise addiction (Egorov & Szabo, 2013) conjectures that despite the REA, dysfunctional exercise behaviour (i.e., actual exercise addiction) surfaces in a "revolutionary', rather than 'evolutionary' fashion because of major trauma or life-stress which is dealt with through an unhealthy pattern of self-harming exercise regimen. Accordingly, if the REA and passion show dissimilar evolutionary patterns, the two concepts, despite the positive relationship between the two, might be considered relatively independent. However, if the REA and passion show a similar aetiology (change) over the time then they are not only related, but also encompass each other. Prior studies focusing on the development of passion reported moderate-to-high levels of stability over the course of various periods (e.g., Carbonneau et al., 2008; Tóth-Király, Bőthe, Jánvári, Rigó, & Orosz, 2018), suggesting that passion remains relatively stable once it is developed. Still, based on a past study (Schellenberg & Bailis, 2015), it is possible that passion might increase when individuals engage in newly adopted sport activity. No comparable previous studies are available for the changes in REA over time, which underscores the importance of the present study.

6.2.1 Predictors of the Risk for Exercise Addiction and Passion

Motivational factors were associated with the REA too. In an earlier work it was reported that introjected regulation, and to a lesser extent identified regulation, predicted the REA, while external regulation and intrinsic motivation were either weak or non-significant predictors (Hamer, Karageorghis, & Vlachopoulos, 2002). This research also revealed that the total variance in REA explained by motivation was about 15%. A later work revealed that REA was predicted through ego-involving climate and perceived competence in a directly mediated way via introjected, integrated and external regulation (González-Cutre & Sicilia, 2012). In accord with these findings, it was proposed that integrated- and identified-regulation are predictors of exercise behaviour in general (Duncan, Hall, Wilson, & Jenny, 2010). Subsequently, in a study of youth it

was revealed that integrated and introjected regulation are determinants of REA for both genders, whereas external regulation is a predictor of REA only for boys (Downs, Savage, & DiNallo, 2013). Therefore, a handful of research suggest that motivational factors may be connected to REA begging for the clarification of this relationship possibly in a developmental aspect via resorting to a longitudinal design allowing the tracking of the dynamics of both REA and motivation.

So far, there have only been some studies (Lafrenière, Vallerand, Mageau, & Charest, 2014 cited by Vallerand et al., 2006) that examined how autonomous and controlled functioning predicted HP and OP. These studies reported that autonomous functioning predicted HP, while controlled functioning predicted OP. Similar findings have been revealed in relation to work (Curran, Appleton, Hill, & Hall, 2011) and sports (Houlfort, Philippe, Vallerand, & Ménard, 2014). Moreover, a recent meta-analysis (Curran, Hill, Appleton, Vallerand, & Standage, 2015) also reported autonomous motivations to be more strongly related to HP, while controlled motivations more strongly related to OP. Based on these studies, we expected the more autonomous motivations of intrinsic, integrated, and identified regulation to be related to HP and the more controlled motivations of introjected, external, and amotivation regulations to be related to OP. However, one advantage of the present study, contrary to the previous ones, is that the full range of motivations was used instead of the more generalized and simplified representations which have been recently criticized (e.g., Wang, Morin, Ryan, & Liu, 2016).

The objective of the current 12-week longitudinal study was to investigate the pattern of changes over time in the REA and passion, and the role of motivation in the relationship between the two, in individuals starting up a new sport. Based on the reported relationship between REA and passion, and passion and motivation, we predicted that REA and passion would show similar, but not completely identical patterns of changes over time. In addition, we also expected the more autonomous motivations to predict HP, while the more controlled motivations to predict OP. As integrated and introjected regulation has relatively consistently been shown to predict exercise behaviors, we expected both to predict REA.

6.3 Method

6.3.1 Participants

The research was conducted at a large university's athletic club[10] incorporating nine organized sports (aerobics, badminton, basketball, cheerleading, futsal, kettleball, running, tennis, and volleyball). Systematic randomization was used in soliciting beginners starting up one of the nine extracurricular sport activity. In total 149 eligible volunteers (53 men and 96 women; mean age = 21.08, SD = 2.98 years) completed the study. The only criterion for participation was the completion of the study which included physical presence and completion of questionnaires at three different training occasions. Accordingly, data from those volunteers who completed the questionnaires only once or twice were not considered. All sporting activities were performed only once a week for an identical duration of 90 minutes. All the participants came from an identical social and cultural background.[1] Ethical permission for the work was granted by the Research Ethics Committee at a large urban university[1], which ensured that the study was conducted in accord with the ethical principles for research with human participants of the Helsinki Declaration (World Medical Association, 2013).

6.3.2 Materials

At the beginning of the study, a demographic questionnaire assessed the age, gender and perceived exercise intensity of the participants. Three psychometrically validated questionnaires, described below, were completed three times during the 12-week long study.

The Exercise Addiction Inventory (Terry, Szabo, & Griffiths, 2004). This instrument was adopted for measuring the risk for exercise addiction (REA). Sample items include: *"If I have to miss an exercise session I feel moody and irritable*." or "*Exercise is the most important thing in my life*." This 6-item questionnaire is rated on a 5-point Likert scale ranging from *"strongly disagree"* to *"strongly agree"*. The EAI comes with good psychometric properties (Griffiths et al., 2015; Terry et al., 2004).

Passion Scale (Marsh et al., 2013). Another paper and pencil instrument employed was the revised Passion Scale which assesses harmonious passion (HP), obsessive passion (OP), and passion criteria (PC) with three subscales that are rated on a 7-point Likert scale, ranging from *"not agree at all"* to *"very strongly agree"*. Sample

[10] *Information withdrawn for anonymity.*

items include: "*If I could, I would only do my activity.*" for HP or "*This activity is in harmony with the other activities in my life*." for OP. The psychometric properties of the Passion Scale are excellent (Marsh et al., 2013).

Sport Motivation Scale II (SMS-II; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). Motivation for exercise was measured with the SMS-II, which consists of six subscales that measure amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation. Each subscale has three items which are rated on a 7-point Likert scale ranging from 1 (not true at all) to 7 (very true). Sample items include answers to why one is motivated to participate in sport, such as: "*Because participating in sports is an integral part of my life.*" or "*Because I feel better about myself when I do."* The psychometric properties of the scale are excellent (Pelletier et al., 2013).

6.3.3 Procedure

At the start of the study, hereafter referred to as *baseline*, participants read and signed the written informed consent form, answered the demographic questions, and completed the three questionnaires in their natural training environments before their scheduled training. Four and 12 weeks later they completed again the three questionnaires. Names were replaced with codes which were used for electronic recording of the data. One experimenter entered and verified the data and another experimenter re-verified them again before subjecting them to statistical analyses.

6.3.4 Statistical Analyses

Preliminary data analyses were conducted in SPSS 22 to investigate the demographics of the participants as well as internal consistency indices, factor means, standard deviations and inter-factor correlations. Subsequent analyses were performed in Mplus 8 (Muthén & Muthén, 1998-2017) using the robust maximum-likelihood estimator that provides standard errors and model fit statistics that are robust to the non-normality of the data. To test our hypotheses, latent growth modeling (LGM; Bollen & Curran, 2006) was performed in a two-step approach. First, an unconditional model was estimated, with two growth factors, following common specifications (Geiser, 2012): an intercept factor (set to one for all time-points) representing the initial mean value of variables and a linear slope factor (set to 0-4-12 to reflect weekly intervals between the

repeated measures) representing changes over time. Second, a conditional LGM model was constructed where time-invariant predictors were then incorporated into the final models to assess their effects on the growth factors. Models were estimated separately for HP, OP, PC and REA using manifest scores to avoid unnecessary model complexity relative to the sample size.

For model evaluation, commonly used goodness-of-fit indices were interpreted: the comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the root mean square error of approximation (RMSEA) with its 90% confidence interval. According to various interpretation guidelines (e.g., Marsh, Hau, & Grayson, 2005), for CFI and TLI, values higher than .90 and .95 are considered adequate and excellent, respectively. As for RMSEA, values smaller than .08 or .06 indicate acceptable and excellent model fit, respectively. However, given that RMSEA can be inflated in modest sample sizes (Bollen & Ting, 2000; Garland, Geschwind, Peeters, & Wichers, 2015), we put less emphasis on this indicator and simply report it for the sake of transparency. As an alternative, the standardized root mean square residual (SRMR) is considered with values below .08 being acceptable.

6.4 Results

Internal consistency indices, descriptive statistics, and inter-factor are reported in Table 1, goodness-of-fit indices for the models are reported in Table 2. Findings were similar across the four variables in the unconditional models: the intercept factors were statistically significant, suggesting that respondents had elevated levels of HP (M = 20.919, SE = .475, p < .001), OP (M = 31.085, SE = .473, p < .001), PC (M = 26.670, SE = .458, p < .001) and REA (M = 15.598, SE = .290, p < .001) at Time 1. The slope factor was also positive and statistically significant in all four models (HP: M = 0.139, SE = .032, p < .001; OP: M = 0.103, SE = .029, p < .001; PC: M = 0.088, SE = .028, p = .002; REA: M = 0.271, SE = .024, p < .001), suggesting that, on average, there was a slight increase in scores over time (see Figure 1 for a graphical representation of the trajectories). Finally, the correlation between the intercept and the slope factors was statistically significant and negative in all four models (HP: r = -0.266, SE = .106, p = .012; OP: r = -0.247, SE = .119, p = .038; PC: r = -0.425, SE = .084, p < .001; REA: r = -0.332, SE = .144, p = .021), indicating that respondents with larger initial values tended to have smaller slope factor values than respondents with smaller initial values.

Table 12. Descriptive statistics, internal consistency indices, and inter-factor correlations

Variables	M	SD	α	1	2	3	4	5	6	7	8	9	10	11	12
1. HP (T1)	21.01	5.85	.83	—											
2. HP (T2)	20.87	6.22	.82	.83**	—										
3. HP (T3)	22.58	6.33	.85	.68**	.77**	—									
4. OP (T1)	31.36	5.87	.73	.60**	.61**	.57**	—								
5. OP (T2)	30.87	5.93	.76	.56**	.67**	.62**	.82**	—							
6. OP (T3)	32.32	5.76	.80	.49**	.57**	.73**	.74**	.82**	—						
7. CP (T1)	26.70	5.63	.85	.66**	.62**	.52**	.84**	.75**	.63**	—					
8. CP (T2)	26.91	5.42	.82	.64**	.68**	.62**	.78**	.87**	.74**	.87**	—				
9. CP (T3)	27.72	5.17	.82	.50**	.53**	.70**	.70**	.72**	.84**	.72**	.80**	—			
10. REA (T1)	15.78	3.95	.64	.55**	.53**	.42**	.52**	.41**	.35**	.54**	.50**	.39**	—		
11. REA (T2)	16.54	3.47	.58	.55**	.62**	.50**	.50**	.55**	.51**	.45**	.61**	.47**	.68**	—	
12. REA (T3)	18.91	3.65	.65	.45**	.45**	.56**	.43**	.46**	.60**	.40**	.49**	.58**	.54**	.67**	—
13. Gender	1.64	0.48	—	-.04	-.07	.05	.02	.13	.17*	-.07	.05	.08	.12	.14	.28**
14. Age	21.09	2.98	—	-.13	-.19*	-.12	-.14	-.08	-.06	-.04	-.05	-.01	-.03	-.03	.00
15. Sport form	1.68	0.47	—	.08	.08	.19*	.08	-.00	.12	.10	.09	.17*	-.05	-.07	.01
16. Intensity (T1)	74.51	15.37	—	.19*	.16*	.17*	.41**	.24**	.30**	.37**	.31**	.29**	.29**	.26**	.13
17. Intrinsic (T1)	13.79	4.07	.90	.41**	.40**	.43**	.48**	.42**	.39**	.45**	.40**	.38**	.38**	.22**	.17*
18. Integrated (T1)	8.93	3.01	.82	.41**	.39**	.44**	.56**	.54**	.51**	.59**	.55**	.53**	.33**	.27**	.27**
19. Identified (T1)	14.72	3.96	.82	.46**	.43**	.38**	.46**	.42**	.33**	.45**	.42**	.35**	.42**	.29**	.17*
20. Introjected (T1)	10.36	2.49	.57	.32**	.30**	.21*	.43**	.32**	.26**	.40**	.32**	.25**	.36**	.23**	.09
21. External (T1)	4.95	2.69	.72	.23**	.13	.10	.07	-.03	.06	.07	.01	.04	.10	.06	-.04
22. Amotivation (T1)	5.54	3.25	.74	.12	.11	.07	-.00	-.02	.01	.03	.01	.00	.01	.05	.06

Table 12 (continued)

Variables	M	SD	α	13	14	15	16	17	18	19	20	21	22
13. Gender	—	—	—	—									
14. Age	—	—	—	.08	—								
15. Sport form	—	—	—	-.35**	-.08	—							
16. Intensity (T1)	—	—	—	.03	-.12	.12	—						
17. Intrinsic (T1)	—	—	—	.12	-.03	.06	.23**	—					
18. Integrated (T1)	—	—	—	.08	.06	.00	.23**	.47**	—				
19. Identified (T1)	—	—	—	.12	-.00	-.02	.23**	.64**	.62**	—			
20. Introjected (T1)	—	—	—	.04	-.00	-.04	.31**	.47**	.40**	.54**	—		
21. External (T1)	—	—	—	-.37**	-.06	.27**	-.02	.18**	.18**	.20*	.16	—	
22. Amotivation	—	—	—	-.35**	-.09	.16*	-.17*	-.09	.01	-.03	-.20*	.32**	—

(T1)

Note. HP: harmonious passion; OP: obsessive passion; CP: passion criteria; REA: risk of exercise addiction; T1: Time 1; T2: Time 2; T3: Time 3; M: mean; SD: standard deviation; α: Cronbach's alpha; Gender was coded as 0 = male and 1 = female; Sport form was coded as 0 = individual sport and 1 = team sport.; *p<.05; **p<.01

Table 13. Goodness-of-Fit Statistics for the Estimated Models.

	χ^2	df	CFI	TLI	RMSEA	90% CI of RMSEA	SRMR
Unconditional Latent Growth Models							
Harmonious passion	8.555*	2	.969	.954	.148	.057-.257	.036
Obsessive passion	10.313*	2	.960	.939	.167	.077-.274	.042
Passion criteria	0.449	1	1.000	1.010	.000	.000-.188	.006
Risk of exercise addiction	2.042	1	.990	.969	.084	.000-.252	.022
Conditional Latent Growth Models							
Harmonious passion	16.978	12	.986	.961	.053	.000-.106	.025
Obsessive passion	30.702*	12	.953	.870	.102	.058-.148	.030
Passion criteria	8.392	12	1.000	1.025	.000	.000-.060	.025
Risk of exercise addiction	8.340	11	1.000	1.039	.000	.000-.068	.027

Note. χ^2: Robust chi-square test of exact fit; df: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean square error of approximation; 90% CI: 90% confidence interval of the RMSEA; SRMR: standardized root mean square residual; The Time 3 error terms of the unconditional harmonious and obsessive passion models as well as the conditional passion criteria model were fixed to zero to achieve an identifiable solution without misspecification.; *p < .05.

In the second step, we added the predictors into the unconditional LGM models to examine whether they would explain the two growth factors (see standardized parameter estimates in Table 14). The intercept factor of HP was predicted by integrated and identified regulation, while the slope factor was predicted by integrated regulation and doing team sports. The intercept factor of OP was predicted by age, intensity, intrinsic and integrated motivations, whereas the slope factor was predicted by being

female and doing team sports. The intercept factor of PC was predicted by being female, sport intensity as well as intrinsic, integrated and external motivations, while the slope was predicted by being female and doing team sports. Finally, the intercept factor of REA was predicted by sport intensity, whereas the slope was predicted by being female, doing team sports and having high identified motivations.

Table 14. Standardized regression coefficients (with standard errors) between the predictors and the growth factors.

Predictors	Harmonious passion		Obsessive passion	
	Initial	Slope	Initial	Slope
Age	-.125 (.070)	-.009 (.074)	-.128 (.064)*	.090 (.080)
Gender	-.027 (.088)	.140 (.093)	-.041 (.073)	.381 (.101)**
Sport form	.009 (.070)	.250 (.078)**	.025 (.068)	.195 (.083)*
Intensity T1	.046 (.088)	-.031 (.095)	.201 (.078)*	-.070 (.098)
Intrinsic T1	.161 (.096)	.169 (.106)	.227 (.090)*	-.059 (.089)
Integrated T1	.172 (.079)*	.223 (.104)*	.417 (.083)**	.071 (.108)
Identified T1	.216 (.103)*	-.211 (.113)	.001 (.113)	-.203 (.113)
Introjected T1	.083 (.108)	-.155 (.115)	.144 (.079)	-.142 (.108)
External T1	.047 (.074)	-.142 (.117)	-.144 (.082)	.161 (.096)
Amotivation T1	.134 (.087)	-.030 (.099)	.087 (.093)	.035 (.116)
Predictors	Passion criteria		Risk of exercise addiction	
	Initial	Slope	Initial	Slope
Age	-.028 (.072)	.029 (.059)	-.006 (.087)	-.007 (.091)
Gender	-.147 (.072)*	.311 (.085)**	.085 (.099)	.384 (.135)**
Sport form	.042 (.074)	.181 (.080)*	-.117 (.087)	.281 (.113)*
Intensity T1	.187 (.083)*	-.082 (.093)	.269 (.080)**	-.221 (.128)
Intrinsic T1	.191 (.082)*	-.048 (.076)	.105 (.115)	-.076 (.136)
Integrated T1	.463 (.075)**	-.042 (.098)	.043 (.118)	.283 (.172)
Identified T1	-.016 (.113)	-.062 (.113)	.215 (.129)	-.366 (.174)*
Introjected T1	.135 (.092)	-.175 (.108)	.147 (.112)	-.165 (.148)
External T1	-.164 (.071)*	.098 (.084)	.050 (.083)	-.116 (.107)
Amotivation T1	.093 (.065)	-.046 (.077)	.151 (.123)	.082 (.104)

Note. Gender was coded as 1 = male and 2 = female.; Sport form was coded as 1 = individual sport and 2 = team sport.; *$p < .05$; **$p < .01$.

6.5 Discussion

Starting a new sport could provide new experiences and opportunities for athletes that might, in turn, lead to potential increases or decreases in passion for sport and in REA. Therefore, it is essential to examine the development of passion and REA in an initial period of exposure to a sport activity to better understand their nature and their temporal changes. The main finding in the current work is that after adopting a new sport, with a very low frequency (only once a week) involvement, a small but significant change can be observed in HP, OP and passion in general as well as REA, showing that people became more passionate and had elevated REA over the course of the relatively short 12 weeks. While OP and REA showed similar growth trends, these trends were not identical and the two variables were predicted by different motivations, suggesting that these two concepts are overlapping, but not to the extent that they would be redundant. These findings lead to a number of important implications.

6.5.1 Trajectories of the Risk for Exercise Addiction and Passion

To the best of these authors' knowledge, this is the first longitudinal study on REA integrating motivation into the examination of the changes over a short period of time after starting up a new sport activity. The REA showed a small, yet significant increase over a 12-week period, indicating that athletes' risk for exercise addiction has elevated marginally. These results are in contrast with a similar earlier work showing that obligatory exercise (assumed to be a similar concept to REA) was not predicted by exercise-related imagery over time (Rodgers, Hall, Blanchard, & Munroe, 2001). These authors did not observe a change in obligatory exercise scores over a 10-week period. However, Rodgers et al.'s participants already exercised between 6 months to 14 years, and 93% of them reported exercising twice or more per week, in contrast to our participants who were beginners of a new sport activity participating only once a week.

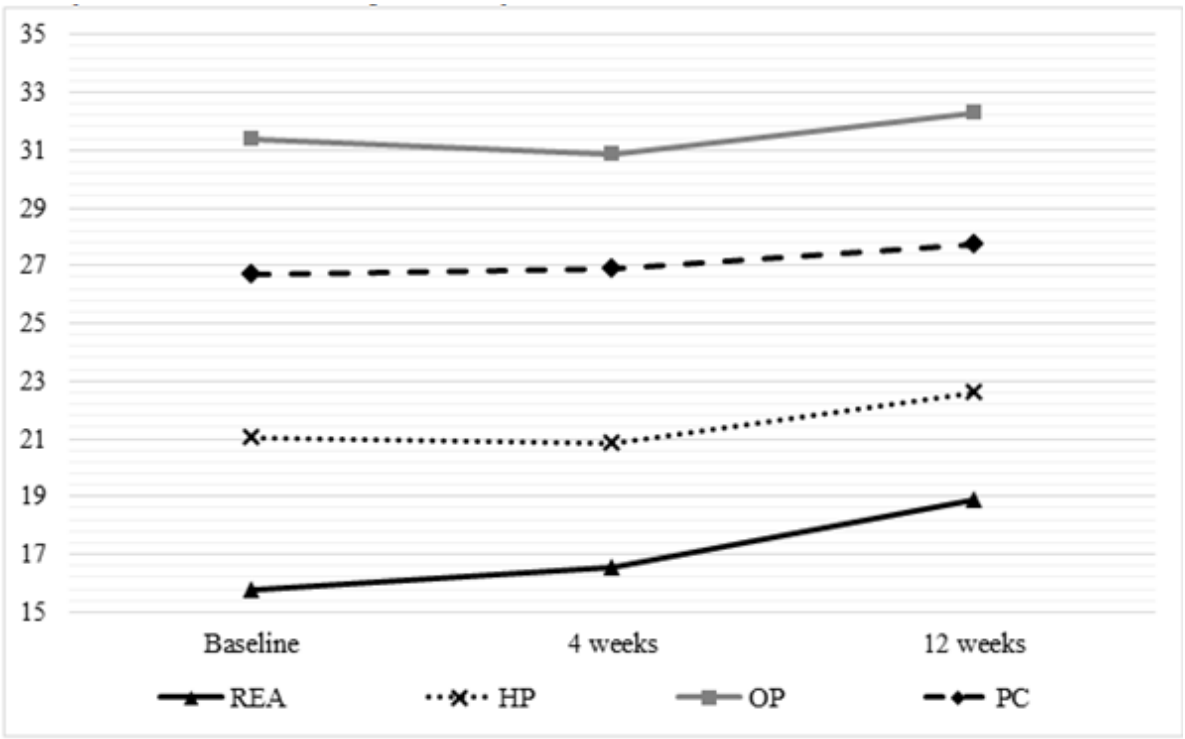
Similar to REA, our findings also show that all three measures of passion were elevated at baseline, suggesting that participants were highly passionate for the sports they adopted. Further, all slopes were statistically significant, indicating that passion for sports increased over the 12-week period. Our results agree with those of Schellenberg and Bailis (2015) who examined passion for academic subject over the course of five months and only reported small changes for a subsample of the students, while passion was highly stable for the majority of the participants. The common point between

Schellenberg's and Bailis's (2015) and the present work is that both focused on passion in the initial (adoption) period. Even though athletes only exercised once a week, their passion for sports still increased, underscoring the importance and the changes in the initial periods of adoption. It could be conjectured that greater frequency of training might have resulted in greater increases in passion, which is a hypothesis for future investigations.

The trajectories of REA and OP are particularly important as previous studies (De La Vega et al., 2016; Kovacsik et al., 2018b) demonstrated a strong positive relationship between the two. In this study the relationship was also strong, but not as strong as in these earlier works. In the past research, about one third to nearly half of the variance in REA was predicted by OP (De la Vega et al., 2016; Kovacsik et al., 2018a,b). The lower relationship in the current work may be due, at least in part, to the lower exercise frequency, but within-sport/exercise activity differences may also negate this finding. For example, it was shown that the REA-OP relationship is twice as high in individual exercisers than in team exercisers (Kovacsik et al., 2018b).

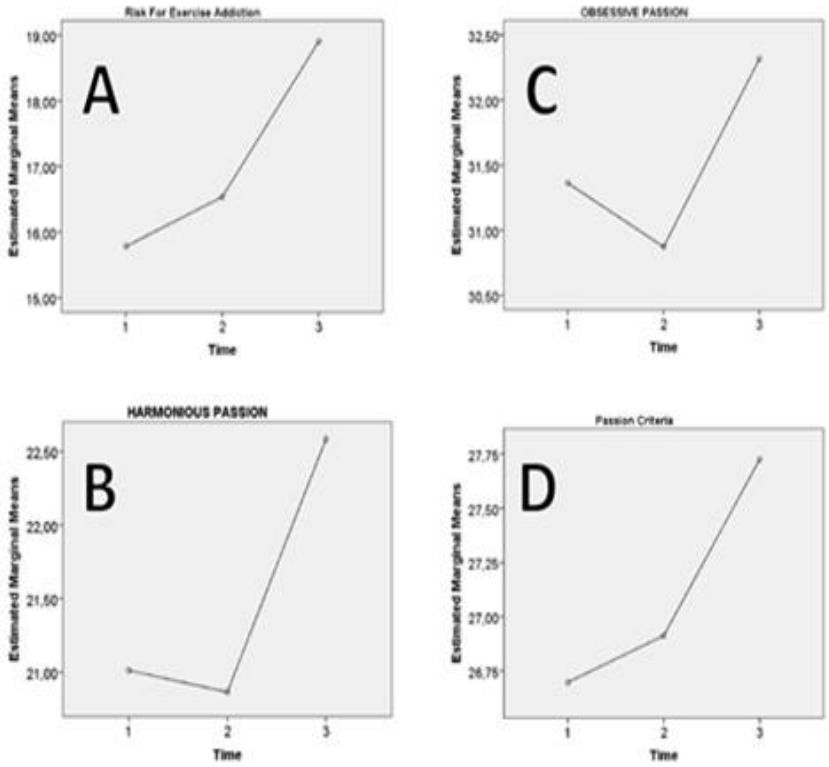
More importantly, although the trajectories of OP and REA were similar, they were not mirror opposites of one another (see Figure 6), further supporting their theoretical distinctiveness. Accumulating evidence on OP and problematic behaviors suggests that OP (which could also be interpreted as high engagement) only fulfills the so-called peripheral criteria of addictions, namely euphoria and cognitive salience (Ferguson, Coulson, & Barnett, 2011). Empirical studies within the online gaming literature (Brunborg et al., 2013; Charlton & Danforth, 2007) supported the distinction of high engagement and addiction with the latter including additional components such as withdrawal symptoms that manifest when the individual cannot engage in the given activity. In addition, while addiction is often associated with negative outcomes, this is not necessarily the case for high engagement (e.g., Deleuze, Long, Liu, Maurage, & Billieux, 2018; Gillet, Morin, Sandrin, & Houle, 2018). For these reasons, OP might be considered as a potential precursor of addiction.

Figure 6. Risk of exercise addiction and passion trajectors



Note. Numbers on the vertical axis represent the range of answer options for the scales which ranged from 6 to 30 for the risk of exercise addiction scores, from 6 to 42 for harmonious and absessive passion, and from 5 to 35 for the passion criteria scores. Models were estimated separately, but are depicated on the same figure for the sake of simplicity. All intercept and slope values were significant, suggesting minor increases for all four factors.

Figure 7. Risk of exercise addiction And passion trajectors



Note. Numbers on vertical represent the reliative means. the range of answer options for the scales ranged from 6 to 30 for the risk of exercise addiction (A) scores from 6 to 42 for harmonious (B) and obssessive passion (C), and from 5 to 35 for the passion criteria (D). All intercept and slope values were statistically significant.

6.5.2 Predictors of Risk for Exercise Addiction and Passion Changes

As change does not happen in a vacuum, the current longitudinal data provide information about the etiology of REA and passion in function of motivation. Initial values of REA were predicted by higher sport intensity at baseline; that is, the more intensively athletes trained the higher the initial REA scores were. This result is in line with a prior work (Kovacsik et al, 2018a) showing that higher exercise intensity is associated with greater REA, but it is a modest predictor (less than 5% common variance) of the REA. Increases in the REA were positively predicted by gender (being female) and by type of sport (doing team sports). For gender, these finding do not agree with previous studies (Modoio et al., 2011; Szabo, De La Vega, Ruiz-Barquín, &

Rivera, 2013) and a recent literature review (Dumitru, Dumitru, & Maher, 2018). However, Weik and Hale (2009) showed that depending on the instruments used, either men or women may score higher on REA. Since none of the earlier findings examined the development of REA in the sport or exercise adoption phase, it is possible that women show a stronger affinity for their new activity in the early stage, which can mirror in greater REA scores. Further examination of this possible explanation is warranted. Similarly, the finding that team sport participation is a predictor of REA is also inconsistent with past reports that showed no difference in REA between team and individual exercisers (De La Vega et al., 2016; Lichtenstein, Larsen, Christiansen, Støving, & Bredahl, 2014). Therefore, in accord with a study a conceptual limitations of measuring exercise addiction (Szabo et al., 2015), it is possible that interaction in team sports manifests as a greater affinity for the practice that translates into greater overall scores of REA. Again, this explanation is speculative, because no previous research examined REA in team and individual sports in the adoption period in a longitudinal design.

Among the motivational factors, only identified regulation predicted the slope of REA which is in contrast to prior studies (e.g., González-Cutre & Sicilia, 2012). That is, the higher their identified regulation was, the smaller the change was in REA scores. Identified regulation entails that athletes perceive doing sports as personally significant for them and as an activity that can have valuable benefits associated with it (e.g., improved health). It is logical to hypothesize that athletes predominantly motivated by identified regulation see the benefits and the drawbacks of doing sports as well which might help them in avoiding REA. Still, the results also suggest that other factors might could influence REA.

Following previous studies on passion and motivation (Curran et al., 2011; Vallerand et al., 2006), it was expected that more autonomous motivational (intrinsic, identified and integrated motivations) forms would predict HP, while more controlled motivations (introjected, external and amotivation) would predict OP. Strictly speaking, this was not the case in the present study. All three passion factors were positively predicted by integrated regulation which refers to the notion that doing sports is in line with personal goals, objectives and values. Doing sports is still extrinsically regulated and is not done out of enjoyment and satisfaction (i.e., intrinsic motivation), but it is an important aspect of how people perceive themselves. Thus, when they perceive themselves as “athletes”, they might become more passionate about sports.

In addition to integrated regulation, there were some unique predictive effects as well. HP was further predicted by identified regulation, suggesting that when athletes consider sports to be important for its inherent positive characteristics, they are more likely to become harmoniously passionate and engage in sports in a mindful and willful manner. By the same token, apart from integrated regulation, OP and PC were predicted by intrinsic motivation. People with intrinsic motivation might find sports so enjoyable, satisfying, and stimulating that they might become more and more passionate about it (i.e., PC), or they might start to lose control over the activity (i.e., OP). Inherent activity enjoyment appears to be important in relation to these two factors. This proposition is in line with the theoretical model of Grubbs and colleagues (2019), which underlies the importance of pleasure-seeking in problematic pornography use. While OP is not problematic per se, it might lead to problematic behaviors (i.e., REA) on the long run. Finally, PC was negatively predicted by external regulation, indicating that when athletes are forced to do sports (i.e., to obtain a reward or to avoid punishment), they are less likely to develop a passion for it. Overall, it appears that the relation between passion and motivation might not be as straightforward as it has been suggested in previous studies, encouraging future studies for a more thorough understanding of the relationship.

Returning to the comparison of OP and REA as a final note, it should be mentioned that the two constructs were differentially predicted by the underlying sport motivations: only the slope of REA was predicted by identified regulation, whereas the initial values of OP were predicted by the more autonomous motivational forms. These findings, coupled with the similar growth trajectories, are indicative and supportive of the notion that OP and REA are similar, yet unique (or independent) constructs at the same time.

6.6 Limitations and Future Studies

Despite the promising findings, the present study also has some limitations that need to be mentioned. A convenience sample was recruited and the sample size was also modest. This is a general problem in multiple repeated measures within-subjects study designs. Future large-scale studies are needed to support the generalizability of the findings. A larger sample might also provide an opportunity to use latent variables that are naturally corrected for measurement error. Recruiting a large sample would also

allow one to conduct growth mixture analysis that could be useful identifying subgroups of participants who are characterized by distinct growth trajectories. Some of the fit indices for the conditional OP model were less than satisfactory and, therefore, the corresponding results should be interpreted cautiously. Self-reported questionnaires were administered, which might be prone to biases (e.g., social desirability bias); multi-informant assessment might be used to address this issue, including trainers and teammates. Future studies should also aim to examine a wider time period (e.g., one year or possibly more).

As for the predictors, bi-directional paths might equally be possible; future studies should investigate these potentially reciprocal effects. The fact that the current sample only practiced the new sport once a week may be the reason for the more modest relationship between OP and REA in contrast to past research. Exaggerated exercise volume is one of the features of the REA (Szabo, 2010), and seeing REA along OP increase in participants who only exercise once a week over a relatively short 12-week period may point to the addictive nature of exercise behavior, or alternatively that the current conceptualization of REA - in evolutionary perspective - may be inadequate, in accord with the interactional model of exercise addiction (Egorov & Szabo, 2013), which predicts that the morbidity is 'revolutionary' and not 'evolutionary' . Finally, apart from the here studied predictors, other variables might also affect passion and REA trajectories and future studies should strive to include a more variables that might influence passion and REA.

6.7 Conclusion

The current study shows that a single weekly session of 90 minutes of training results in a modest, but statistically significant increase in passion and the risk for exercise addiction (REA). Motivation is a partial mediator in the observed effects. While the rise in passion is theoretically sound, the rise in REA could reflect a conceptual misinterpretation of the items and responses on the assessment tools and not merely the rise in obsessive passion (OP), which shares a relatively large proportion of the variance with the REA in committed or long-term exercisers, but less so in beginners, as shown in the current work. This longitudinal inquiry shows that OP and REA are independent constructs in the early stage of exercise. The disputed 'evolutionary' aspect of REA (Egorov & Szabo, 2013) gains support in the current work. It is unlikely that a single session of weekly training increases the REA, despite the fact

that this is the message of the current results. This dilemma raises an important question for the many scholars working in the field concerning the conceptualization of the REA and the internal validity of the assessment tools (Szabo, 2018).

CHAPTER 7

7. General Discussion

In this chapter, I would like to summarize the results I obtained during the studies and how they affected the direction of my subsequent research, during which I reached the final dissertation. Part of these studies yield future directions which have research revelance for future studies on passion and the risk of exercise addiction.

7.1 Passion and Exercise Addiction

The first key finding emerging from the current dissertation is that obsessive passion (OP) is a significant component of exercise addiction, especially in individual sports. Athletes in organized team sports report greater harmonious passion (HP) than athletes in individual sports. The results of this dissertation also demonstrate that the weekly amount of exercise needs to be taken into account when examining the link between passion and exercise in organized sports. The shared variance is relatively high (15%) and there is no distinction when comparing participants in team sports with participants in individual sports.

The dissertation replicates the recently obtained results by De La Vega et al. (2016). Similar to their findings, my results show that OP is a significant component of exercise addiction scores as determined by the Exercise Addiction Inventory (EAI) (Terry et al., 2004). In fact, OP 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 (OP) to exercise addiction (Paradis et al., 2013; Schipfer & Stoll, 2015; Stenseng et al., 2011). They also agree with the results obtained by Parastatidou et al. (2014), which show that OP demonstrates a more substantial relationship to exercise addiction than HP. Indeed, in the De La Vega et al. study, HP was not a significant predictor of exercise addiction. In the current dissertation, despite statistical significance, it accounted for only 3% of the variance in the dependent variable. Therefore, while OP and exercise addiction overlap to a large extent, the latter is relatively independent of HP. In this dissertation the results showed that OP predicted the risk of Exercise Addiction. Therefore, it is very important to use the Passion Scale (to determine passion) when examining the risk of exercise addiction.

7.2 Passion and the Risk of Exercise Addiction

In this dissertation it was found that OP and HP increase along with the levels of REA classifications (Terry et al., 2004). This finding shows that apart from a mere correlation between passion and the REA (which occurs stronger for OP than for HP), passion scores parallelthe REA. These findings may suggest that what today is conceptualized as 'risk' for exercise addiction may be a complex yet untangled hybrid of exercise parameters and passion.

The results of my dissertation confirm previous studies associating exercise addiction with OP (Paradis et al., 2013; Schipfer & Stoll, 2015; Stenseng et al., 2011). It also affirms the findings of De La Vega et al. (2016) and Parastatidou et al. (2014), showing that OP manifests a stronger relationship with exercise addiction than HP. In accordance with the findings of De La Vega et al. (2016), this dissertation demonstrated that OP was the strongest predictor of the REA, explaining nearly 32% of the variance (similar to the 39% variance found by De La Vega et al. [2016]). While the study by De La Vega et al. (2016) found that HP was not a predictor of the REA, in my dissertation, it emerged as a statistically significant predictor. However, it was a negligible predictor since it accounted for less than 2% of the variance in the REA. The finding is not surprising if HP mirrors the joyful (subjective) experience in which exercise is perceived as a form of life enrichment activity in harmony with other significant life enrichment activity Vallerand et al., 2003; Vallerand, 2010).

7.3 Long term, Intensity and the Risk of Exercise Addiction

The prevalence of REA in my work was 4.2% and this value is similar to the values reported elsewhere in the literature for leisure exercisers ranging from 1.9% to 3.2% (Szabo et al., 2015). However, it is lower than that reported for athletic populations ranging between 17.0% and 41.4%. (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012). My results echo the findings from previous research, showing that long-term and high-intensity exercise are related to both forms of passion (Parastatidou, et al., 2012; Vallerand et al., 2003). In my dissertation, I have found that exercise intensity has different relationship with HP and OP in individuals who have a long-term exercise history.

7.4 Exercise Volume, weekly hours and Risk of Exercise Addiction

In my dissertation, in the first study, the weekly hours of exercise correlated with all psychological measures. The second study I have seen that more sport, higher OP, HP Exercise Intesity, REA. In my third study the high and low exercise volume groups differed in EAI after controlling for age and gender. The fourth study shows that if passion for exercise is not taken into consideration, researchers obtain significant differences in the *presumed* REA between those who spend about 10 hours exercising each week versus those who exercise less than half of that. Such results prompt scholars to conclude that higher-volume exercise is linked to increased REA, which is in line with the basic conceptualization of exercise addiction (Lichtenstein, Larsen, Christiansen, Støving, & Bredahl, 2014; Terry et al., 2004), but it contradicts the theories that propose a revolutionary, rather than an evolutionary model for exercise addiction (Egorov & Szabo, 2013). There was a slight but statistically significant *positive* correlation between the weekly hours of exercise and the risk scores for exercise addiction, which is in line with earlier reports in the literature reporting a positive association between exercise volume and exercise addiction in my dissertation. (Allegre, Therme, & Griffiths, 2007; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; Terry et al., 2004). If more exercise is associated with a lower REA when controlling for passion, one can simply conclused that the higher scores in the direct (uncontrolled) correlation reflect the impact of passion. This correspondence fully agrees with the results of the main analysis demonstrating that differences in the REA between high and low exercise volume groups exist, when passion is used as a continuous predictor variable. Passion, however, differentiates between high and low exercise volume groups, suggesting that those who exercise longer hours have a greater passion for exercise. These findings agree with the conjecture that training volume does not reflect addiction to exercise (Szabo et al., 2015). Indeed, I have seen this connection in my dissertation's third study, in which the relationship between the REA and weekly exercise volume emerged to be a negative.

7.5 Team and Individual Sport

The present findings extend those reported by De La Vega et al. (2016) by showing that the commonality between exercise addiction and OP is much stronger in individual sports than in team sports. In the former, OP accounted for nearly half (47%) of the total variance in exercise addiction, while in the latter, for less than half of that

(21%) in individual sports. While these are novel findings concerning the differences between team and individual sports, it should be mentioned that the relationship between OP and exercise addiction appears to be mediated via an introjected regulation (Parastatidou et al., 2014) that is a component of external motivation (Pelletier et al., 1995).

My dissertation reveals that HP is higher in athletes taking part in team sports than in those involved in individual sports. This finding replicates the results of De La Vega et al. (2016) and also agrees with the results reported by Vallerand et al. (2003), which demonstrated that HP was greater in athletes in team sports in contrast to individual sports. A possible, however speculative, explanation for this finding is that in addition to the physical and mental aspects of the athletic activity found in individual sports, team sports also carry an important social context that may affect HP characterized by a positive effect. Indeed, factors such as collective motivation, shared success and successful cooperation may be associated with greater HP in team sports since in individual sports, these components may be absent. Furthermore, the level of socialization (the extent of social life) appears to be more intense in athletes participating in team sports, vis-à-vis to those involved in individual sports (Devecioglu, Sahan, Yildiz, Tekin, & Sim, 2012), and this may also contribute to greater HP. Future inquiries should examine the relationship between passion and types of sports and also examining the social and psychological components that distinguish the two sports environments.

7.6 Competitive and Leisure Athletes

The prevalence of the risk of exercise addiction (REA) emerged to be relatively high in the dissertation in both team and individual sports. However, the figure obtained here (15%) is lower than those reported for athletes in organized or competitive sports (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012; Szabo et al., 2013), which range from 17.0%% to 41.4%. Nevertheless, it is high in contrast to the prevalence among leisure athletes, which ranges from 1.9% and 3.2% (Szabo et al., 2015). It is argued that the nearly fivefold discrepancy in the prevalence of exercise addiction between those in organized/competitive sports and leisure exercisers is due to different interpretations of the items on the Exercise Addiction Inventory (Terry at al., 2004) in the two populations (Szabo et al., 2015).

7.7 Cultural and gender differences related to passion

A novel and unexpected finding in the dissertation was that women reported greater passion when they exercised below the median value of the reported range of exercise intensities than men exercising the same intensity. These findings contradict reports in the literature that show no gender differences in passion (Philippe, Vallerand, & Lavigne, 2009; Vallerand et al., 2008). There is no obvious reason why such a difference was found in the present study.

My finding in the dissertation is that by adding OP and HP as covariates to the model, the statistical significance of the difference in the risk scores for exercise addiction between high and low exercise volume groups disappears. However, the two covariates emerged as statistically significant predictor variables even after gender and age control.

The cultural and gender differences were related to passion in physically active people. Although cultural differences in OP and HP have not been examined in the context of physical activity, I expected such differences since passion depends on the socio-cultural environment (Aaker et al., 2001; Burke et al., 2015). In the dissertation's results, physically active Hungarian women and men scored higher on OP than their Spanish counterparts. In terms of HP, men from the two countries did not differ from each other, whereas Hungarian women scored higher on HP than their Spanish counterparts. While further research is required to determine which cultural aspects are responsible for the differences observed here, passion for exercise appears to be different in the two nations compared, except for HP in men, which did not differ between the Spanish and the Hungarians. In my dissertation seem to indicate that Hungarian women, in general, are more passionate about sport and exercise than their Spanish counterparts, while Hungarian men exhibit only greater OP than Spanish men.

I can interpret these cultural differences in light of the Collective Constructionist Theory (Kitayamaet al., 1997), which predicts that different social norms, values, and acts between Spanish and Hungarians are internalized and reflect the actions and attitudes of individuals. A plausible theory that explains how unique cultural features are subject to internalization is called the schema theory (McVee, Dunsmore, & Gavelek, 2005). The schema is a mental representation of a person's aspects of the physical, social, and emotional environment, which is expected to differ (to vary) between the ex-communist and currently globalization-resistant Hungary and the more liberal Spain. Such schemas govern the attitudes towards certain actions, such as the

practice of physical activity, which justifies the examination of the culturally generated psychological schemas in an attempt to account for differences in passion. However, aspects of Social Learning Theory (SLT; Bandura, 1965) should also be included for a better understanding of the cultural effects. Considering SLT, people internalize behaviours observed in their social environment, which subsequently leads to cultural differences in attitudes and practices towards physical activity. Such differences were established between the two nations examined in my dissertation (Gelfand et al., 2011; World Health Organization Regional Office for Europe, 2016a, 2016b).

Furthermore, the results revealed gender differences in both OP and HP. Hungarians scored higher than the Spanish, this finding cannot be explained by the difference in exercise patterns between the two populations (World Health Organization Regional Office for Europe, 2016a, 2016b), since in the current example, the Spanish exercised more than Hungarians. Although this may sound contradictory to population exercise patterns, it is plausible that those who exercise do it more intensely in Spain than in Hungary. However, the difference is more likely due to the age difference between the Spanish (who were older) and Hungarian sample, as based on the inverse relationship between age and both forms of passion.

7.8 Longitudinal Study

Starting a new sport could provide athletes new experiences and opportunities, which in turn might lead to a potential increase or decrease in passion for sport and in REA. Therefore, it is essential to examine the development of passion and REA in an initial period of sports activity in order to better understand their nature and their temporal changes. In my dissertation is that after adopting a new sport, with a very low frequency involvement (only once a week), a small but significant change can be observed in HP, OP, and passion in general as well as in REA, showing that people became more passionate and had elevated REA over the course of the relatively short 12 weeks. While OP and REA showed similar growth trends, these were not identical, and the two variables were predicted by different motivations, suggesting that these two concepts overlap, but not to the extent that they would be redundant. These findings lead to a number of key implications.

To the best of my knowledge, this was the first longitudinal study on REA that integrates motivation into the examination of the changes over a short period of time

after starting a new sport activity. The REA showed a small, yet significant increase over a 12-week period, indicating that athletes' REA increased marginally. These results contrast with a similar previous work, which shows that obligatory exercise was not predicted by exercise-related imagery over time (Rodgers, Hall, Blanchard, & Munroe, 2001). However, Rodgers et al.'s participants have already been exercising between 6 months to 14 years, and 93% of them reported exercising twice or more per week, in contrast to my participants who were beginners of a new sport activity exercising only once a week.

Similar to REA, my findings also show that all three measurements of passion were elevated at baseline, suggesting that participants were highly passionate about the sport they adopted. Furthermore, all slopes were statistically significant, indicating that passion for sports increased over the 12-week period. My results concur with those of Schellenberg and Bailis (2015), who examined passion for academic subjects over the course of five months and reported only minor changes in some students, while passion was highly stable for the majority of the participants. The common point between Schellenberg's and Bailis' (2015) and my dissertation is that both focused on passion in the initial (adoption) period. Despite the fact that athletes only exercised once a week, their passion for sports still increased, underscoring the importance and the changes in the initial periods of adoption.

The trajectories of OP and REA were similar.Accumulating evidence on OP and problematic behaviors suggest that OP only fulfills the so-called peripheral criteria of addictions, namely euphoria and cognitive salience (Ferguson, Coulson, & Barnett, 2011). Empirical studies in the online gaming literature (Brunborg et al., 2013; Charlton & Danforth, 2007) have supported the distinction between high engagement and addiction, the latter including additional components such as withdrawal symptoms that manifest when the individual is unable to engage in the given activity. In addition, while addiction is often associated with negative outcomes, this is not necessarily the case with high engagement (e.g., Deleuze, Long, Liu, Maurage, & Billieux, 2018; Gillet, Morin, Sandrin, & Houle, 2018). For these reasons, OP might be considered as a potential precursor of addiction.

In my dissertation, the longitudinal data provide information on the etiology of REA and on passion in the function of motivation. The initial values of REA were predicted by a higher sport intensity at baseline; that is, the more intensely athletes trained, the higher the initial REA scores were. This result is in line with my second

study showing that higher exercise intensity is associated with higher REA, but this is a modest predictor (less than 5% common variance) of the REA. Increases in the REA were positively predicted by gender (being female) and by the type of sport (doing team sports). In the case of gender, my findings do not agree with third studies (Modoio et al., 2011; Szabo, De La Vega, Ruiz-Barquín, & Rivera, 2013) and with the recent literature review (Dumitru, Dumitru, & Maher, 2018). However, Weik and Hale (2009) showed that depending on the instruments used, either men or women may score higher on REA. Since none of my dissertation examined the development of REA in the adoption phase of sport or exercise, it is possible that women show a stronger affinity for their new activity in the early stages, which can reflect in greater REA scores. Further examination of this plausible explanation is warranted. Similarly, the finding that team sport participation is a predictor of REA is also inconsistent with past reports that showed no difference in REA between team and individual exercisers (De La Vega et al., 2016; Lichtenstein, Larsen, Christiansen, Støving, & Bredahl, 2014).

CHAPTER 8

8. General Limitations and Conclusion

8.1 General Limitations

Different interpretations

In both team and individual sports, the prevalence of the risk of exercise addiction was found to be reasonably high in the study. However, the published figures for athletes in organized or competitive sports (Blaydon & Lindner, 2002; Costa, Hausenblas, Oliva, Cuzzocrea, & Larcan, 2015; McNamara & McCabe, 2012; Szabo et al., 2013) range from 17.0 % to 41.4 %. Nonetheless, it is high in comparison to the prevalence of recreational athletes, which varies between 1.9 and 3.2 percent (Szabo et al., 2015). The approximately fivefold difference in the prevalence of exercise addiction between those in organized/competitive sports and recreational exercisers is argued to be due to different interpretations of the Exercise Addiction Inventory (Terry at al., 2004) products in the two populations. (Szabo et al., 2015). To better understand the understanding of exercise addiction in organized sports, future research should use more than one instrument to assess exercise addiction or supplement questionnaire data with interviews.

Random sampling

In my studies the obvious limitation is the lack of random sampling. Volunteers are unlikely to come from the same population as those in a random sample. Another limitation is the small sample size in the at-risk (REA) group, which prevented gender group analysis in this subgroup. However, based on past literature (Szabo et al., 2015) this prevalence rate was expected. A further limitation may be self-reporting (which is susceptible to social desirability bias) and retrospective assessment of exercise volume and intensity (subject to recall bias). Although most individuals can easily calculate their average weekly exercise, the perceived intensity may often be more important in terms of subjective expectations and outcomes than the actual exercise intensity (Szabo, 2013). Finally, while dichotomization using median split has been criticized in the

literature, relatively recent evidence (Iacobucci et al., 2015a, 2015b) demonstrates that it is a reliable method to use.

Despite certain limitations, the findings should provide an incentive for systematic testing of the relationship and, in the interim, should serve as a warning to scholars in the field that the study of exercise addiction requires the consideration of passion as well, or otherwise their results may be futile. These limitations are the '*posteriori'* category, which was due to post-factum formulation of the research question after becoming aware of the results of the two studies from which the current data originates. Pre-selection of high and low-volume exercisers allows for direct testing of the hypothesis that passion is more closely linked to exercise volume than exercise addiction, preferably by systematic randomization. Another limitation is that exercise volume is described in terms of weekly hours of exercise. A well-controlled study should also estimate exercise intensity and frequency since these factors are components of a more accurate estimate of the weekly exercise volume.

Culture and gender

The fourth study given potential limitations, the findings should be replicated in future research before definitive conclusions can be drawn. In the meantime, research results on passion for exercise should be interpreted with caution, bearing in mind the potential moderating roles of culture and gender. The three limitations, which could restrict the interpretation of the results to the studied sample are: (1) lack of random sampling, (2) reliance on self-report (subject to social desirability bias) and (3) retrospective assessment of the weekly hours of physical activity. Furthermore, Hungarians were over-represented in the sample (2.2 to 1.0 ratio) and that deterred testing of the psychometric structure of whether the Passion Scale is equivalent (invariant) across the two cultures. Future cross-cultural studies with more equal sample sizes could help establish the invariance of the scale.

Small sample size

The limitation of this finding of the study fifth is that a convenience sample was used, and the sample size was also small. This is a general problem/ common issue in multiple repeated measures within-subjects study designs. Future large-scale studies are needed to support the generalizability of the findings. A larger sample size might also provide an opportunity to use latent variables that are naturally adjusted for

measurement error. Recruiting a large/broad sample would also allow for growth mixture analysis, which could be useful identifying subgroups of participants with distinct growth trajectories. Future studies should also aim to examine a broader time period/ span (e.g., one year or possibly more). As for predictors, bi-directional pathways may be equally possible; future studies should examine these potentially reciprocal effects. The fact that candidates in the current sample only participated in the new sport once a week may be the reason why the relationship between OP and REA is more modest in comparison to previous research. Finally, apart from the predictors examined here, other variables might also affect passion and REA trajectories, and future studies should aim to include more variables that may influence passion and REA.

8.2 Genaral Conclusion

In the conclusion I would like to present how the findings of my dissertation have helped to explore areas that may be of interest in the case of exercise addiction, and how these explorations put this area of addiction in a new perspective. Since this area is still under-researched, there remain further questions and areas that need further. However, the current findings also highlight the importance of this field.

The first important discovery in my dissertation some studies shows that obsessive passion is a significant part, or component, of exercise addiction scores determined with the Exercise Addiction Inventory. In fact, obsessive passion determines more than one-third of the variance (37% in De La Vega et al. and 36% in my first study) in exercise addiction. Consequently, while obsessive passion and exercise addiction overlap to a large extent, the latter is relatively independent of harmonious passion.

The second significant finding in my work shows that harmonious passion (HP) is a strong predictor of the REA, while HP has a limited association (3-4%) with the latter. The work also extends previous reports by showing that the connection between HP and the REA is twice as high in individual sports as in team sports. Consequently, exercise addiction may be re-conceptualized as a hybrid of HP and addiction, especially in individual sports.

To best of my knowledge, this was the first work (in this dissertation) to show an inverse relationship between the REA and exercise volume, which emerged only when the effects of OP and HP were controlled via a partial correlation. The results emphasize the importance of considering passion for exercise in research examining the REA.

I propose that there may be cultural and gender differences in OP and HP among people who are physically active on a regular basis. In my dissertation, I also revealed gender differences in both obsessive- and harmonious passion. Hence, scholars should not generalize the findings of studies emerging from a single nation. Knowing that some people tend to be more passionate or experience more HP or OP for exercise could shed light on motivational aspects and adherence to exercise, as well as provide insight into the aetiology of exercise dependence.

In my dissertation I have unvailed that leisure atheletes and elite atheletes might have different interpretations about the EAI, and REA. More precisely, higher volumes of exercise are more closely associated with passion than addiction, but when passion is not assessed, more exercise would be linked to a greater risk for exercise addiction

I showed that a single weekly 90-minute training session results in a minor but statistically significant increase in passion and REA. Motivation is a partial mediator in the observed effects. While the increase in passion is theoretically sound, the increase in REA could reflect a conceptual misinterpretation of assessment tool items and responses, rather than just the rise in OP, which shares a relatively large proportion of the variance with the REA in dedicated or long-term exercisers but less so in beginners, as shown in my dissertation. I demonstrate that OP and REA are independent constructs in the early stages of exercise.

All these findings have significant additions to the field of study concerning exercise addiction. Since there is inconclusive evidence for the dysfunction, these findings aid in the generation of clinically significant data concerning the exeistence iof exercise addiction. In the same time, my research program shows that the REA is overlapping with passion and labelling a passionate person as being an addict may be unfair and erroneous. Therefore, a clearer untangling between passion and exercise addiction is necessary. Factors such as team or individual sports, elite or leisure exercise, gender, and exercise characteristics should all be considered because, to a smaller or larger extent, they all influence the REA. Further, other factors not investigated in this dissertation, such as personality traits like perfectionism (Çakın et al., 2021 e) should alos be mpirically tested.

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APPENDIX

Borg-scale

6	**No exertion at all**
7	Extremely light
8	…
9	Very light
10	…
11	Light
12	…
13	Somewhat hard
14	…
15	Hard (heavy)
16	…
17	Very hard
18	…

19 Extremely hard

20 **Maximal exertion**

source: (The Borg RPE 6-20 scale". Adopted by Borg, 1998)

Borg-skála

Mutasson rá a megfelelő válaszra vagy mondja a válasz számát!

Milyen erőfeszítéssel edz, vagy sportol ebben a pillanatban?

(Csak önmagához viszonyítson, és ne vegye figyelembe a környezetbeli terhelést! A „…” melletti szám megjelölése a két egymást követő válasz közötti állapotot jelenti!)

6	**Erőfeszítés nélkül**
7	A legkevesebb erőfeszítéssel
8	…
9	Nagyon kevés erőfeszítéssel
10	…
11	Kevés erőfeszítéssel
12	…
13	Valamelyest nagy erőfeszítéssel
14	…
15	Nagy erőfeszítéssel

16 …

17 Nagyon nagy erőfeszítéssel

18 …

19 Rendkívüli erőfeszítéssel

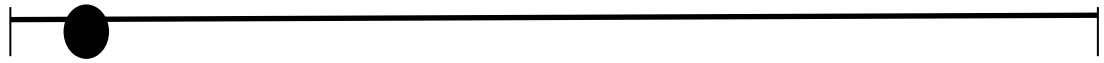
20 **Maximális erőfeszítéssel**

source: (The Borg RPE 6-20 scale". Adopted by Borg, 1998)

Borg-skála

Jelölje 0-100-ig a csúszka segítségével

Milyen erőfeszítéssel edz, vagy sportol ebben a pillanatban?



source: Kovacsik, R., Griffiths, M. D., Pontes, H. M., Soós, I., de la Vega, R., Ruíz-Barquín, R., Demetrovics, Z., & Szabo, A. (2019). The role of passion in exercise addiction, exercise Vol., and exercise intensity in long-term exercisers. *International Journal of Mental Health and Addiction, 17*(6), 1389–1400. doi.org/10.1007/s11469-018-9880-1

Exercise Addiction Inventory

1. Exercise is the most important thing in my life.

1 2 3 4 5

2. Conflicts have arisen between me and my family and/or my partner about the amount of exercise I do.

1 2 3 4 5

3. I use exercise as a way of changing my mood. (e.g. to get a buzz, to escape etc.)

1 2 3 4 5

4.Over time I have increased the amount of exercise I do in a day.

1 2 3 4 5

5.If I have to miss an exercise session I feel moody and irritable

1 2 3 4 5

6. If I cut down the amount of exercise I do, and then start again, I always and up exercising as often as I did before.

1 2 3 4 5

source: (Terry, Szabo and Griffiths, 2004)

Exercise Addiction Inventory/Testedzésfüggőséget vizsgáló kérdőív

1. A testedzés a legfontosabb dolog az életemben.

1 2 3 4 5

2. Konfliktusok adódnak köztem és a családom és/vagy a partnerem között amiatt, hogy mennyit edzek.

1 2 3 4 5

3. A testedzést arra használom, hogy a hangulatomon változtassak. (pl. hogy kellemesebben érezzem magam, vagy hogy ne kelljen a problémámmal foglalkoznom.)

1 2 3 4 5

4. Az elmúlt időszak során növeltem a napi edzésmennyiségemet.

1 2 3 4 5

5. Ha ki kell hagynom egy edzést rosszkedvű és ideges leszek.

1 2 3 4 5

6. Ha lecsökkentem a szokásos edzésmennyiségemet, akkor, amikor újra elkezdem az edzést, addig folytatom, amíg z eredeti mennyiséget el nem érem.

1 2 3 4 5

source: (Terry, Szabo and Griffiths, 2004)

Passion in sport/exercise

While thinking of your sport/exercise activity and using the scale below, please indicate your level of agreement with each item.

Not Agree at All	Very Slightly Agree	Slightly Agree	Moderately Agree	Mostly Agree	Strongly Agree	Very Strongly Agree
1	2	3	4	5	6	7

1. My sport/exercise is in harmony with the other activities in my life.

1 2 3 4 5 6 7

2.I have difficulties controlling my urge to do my sport/exercise.

1 2 3 4 5 6 7

3.The new things that I discover with my sport/exercise allow me to appreciate it even more.

1 2 3 4 5 6 7

4.I have almost an obsessive feeling for my sport/exercise.

1 2 3 4 5 6 7

5.My sport/exercise reflects the qualities I like about myself.

1 2 3 4 5 6 7

6.My sport/exercise allows me to live a variety of experiences.

1 2 3 4 5 6 7

7.My sport/exercise is the only thing that really turns me on.

1 2 3 4 5 6 7

8.My sport/exercise is well integrated in my life.

1 2 3 4 5 6 7

9.If I could, I would only do my sport/exercise.

1 2 3 4 5 6 7

10. My sport/exercise is in harmony with other things that are part of me.

1 2 3 4 5 6 7

11. My sport/exercise is so exciting that I sometimes lose control over it.

1 2 3 4 5 6 7

12. I have the impression that my sport/exercise controls me.

1 2 3 4 5 6 7

13. I spend a lot of time doing my sport/exercise.

1 2 3 4 5 6 7

14. I like my sport/exercise.

1 2 3 4 5 6 7

15. My sport/exercise is important for me.

1 2 3 4 5 6 7

16. My sport/exercise is a passion for me.

1 2 3 4 5 6 7

17. My sport/exercise is part of who I am.

1 2 3 4 5 6 7

CODING

# 2, 4, 7, 9, 11, 12	**Obsessive Passion**
# 1, 3, 5, 6, 8, 10	**Harmonious Passion**
# 13 à 17	**Passion Criteria (Commitment)**

source: (Marsh et al., 2013)

Szenvedély Skála

Egyáltalán nem értek egyet	Nem értek egyet	Inkább nem értek egyet	Egyet értek, meg nem is	Inkább egyetértek	Egyetértek	Teljes mértékben egyetértek
1	2	3	4	5	6	7

1. A sport/edzés összhangban van az életem egyéb elfoglaltságaival.

1 2 3 4 5 6 7

2.Nehezen tudom befolyásolni a sportra/edzésre irányuló késztető, sürgető vágyamat.

1 2 3 4 5 6 7

3.Annak köszönhetően, hogy a sport/edzés által új dolgokat fedezek fel, még inkább értékelem azt.1 2 3 4 5 6 7

4. Szinte megszállott vagyok a sporttal/edzéssel kapcsolatban.

1 2 3 4 5 6 7

5.A sport/edzés segít kifejezni azokat a tulajdonságokat, amelyeket önmagamban szeretek.

1 2 3 4 5 6 7

6.A sport/edzés lehetőséget ad arra, hogy sokféle élményt szerezzek

1 2 3 4 5 6 7

7.A sport/edzés az egyetlen, ami igazán felpörget.

1 2 3 4 5 6 7

8.A sport/edzés szerves részévé vált az életemnek

1 2 3 4 5 6 7

9.Ha tehetném, kizárólag a sporttal/edzéssel foglalkoznék.

1 2 3 4 5 6 7

10. A sport/edzés összhangban van életem többi részével.

1 2 3 4 5 6 7

11. A sport/edzés annyira izgalmas, hogy néha elvesztem az irányításomat felette.

1 2 3 4 5 6 7

12. Az a benyomásom, hogy a sport/edzés irányít engem.

1 2 3 4 5 6 7

13. Sok időt töltök sporttal/edzéssel.

1 2 3 4 5 6 7

14. Szeretem a sportot/edzést.

1 2 3 4 5 6 7

15. A sport/edzés fontos nekem.

1 2 3 4 5 6 7

16. A sport/edzés számomra egy szenvedély.

1 2 3 4 5 6 7

17. A sport/edzés része annak, aki vagyok..

1 2 3 4 5 6 7

Értékelés

# 2, 4, 7, 9, 11, 12	**Obszesszív szenvedély**
# 1, 3, 5, 6, 8, 10	**Harmónikus szenvedély**
# 13 - 17	**Elkötelezettség**

source: (Marsh et al., 2013)

SMS II. Scale

Why do you practice your sport?

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.

Does not correspondent et all	Corresponds a little	Corresponds moderately	Corresponds a lot	Corresponds exactly
1	**2**	**3**	**4**	**5**	**6**	**7**

1.Because I would feel bad about myself if I did not take the time to do it.

1 2 3 4 5 6 7

2.I used to have good reasons for doing sports, but now I am asking myself if I should continue.

1 2 3 4 5 6 7

3.Because it gives me pleasure to learn more about my sport.

1 2 3 4 5 6 7

4.Because practicing sports reflects the essence of whom I am.

1 2 3 4 5 6 7

5.Because people I care about would be upset with me if I did not.

1 2 3 4 5 6 7

6.Because it is one of th ebest ways I have chosen to develop other aspects of myself.

1 2 3 4 5 6 7

7.Beacuse it is very intresting to learn how I can improve.

1 2 3 4 5 6 7

8.Because people around me reward me when I do.

1 2 3 4 5 6 7

9.Because I find it enjoyable to discover new performance strategies.

1 2 3 4 5 6 7

10.I don't know anymore; I have the impression that I am incapable of succeeding in this sport.

1 2 3 4 5 6 7

11.Because trough sport, I am living in line with my deepest principles.

1 2 3 4 5 6 7

12.Because I have chosen this sport as a way to develop myself.

1 2 3 4 5 6 7

13.Because participating in sport is an integral part of my life.

1 2 3 4 5 6 7

14.Because I feel better about myself when I do.

1 2 3 4 5 6 7

15.Because I think others would disapprove of me if I did not.

1 2 3 4 5 6 7

16.Because I would not feel worthwhile if I did not.

1 2 3 4 5 6 7

17.It is not clear to me anymore; I don't really think my place is in sport.

1 2 3 4 5 6 7

18.Because I found it is a good way to develop aspects of myself that I value.

1 2 3 4 5 6 7

Intrinzik szabályozás	Integrált szabályozás	Identifikált szabályozás	Introjektált szabályozás	Külső szabályozás	Amotiváció
3,9,7	4,11,13	6,12,18	1,14,16	5,8,15	2,10,17

source: (Pelletier et al. 2013)

H-SMS II. Skála kérdései

Miért űzi a választott sportágát?

Kérjük gondoljon arra, hogy miért űzi az Ön számára elsődlegesen választott sportágat. Az alábbi skála segítségével, kérjük jelölje meg, mennyire igazak önre az egyes állítások azzal kapcsolatban, hogy jelenleg miért is űzi kifejezetten ezt a sportágat vagy végzi ezt a sporttevékenységet.

Egyáltalán nem igaz rám	Egészen kis mértékben igaz rám	Valamennyire igaz rám	Közepes mértékben igaz rám	Inkább igaz rám	Nagy mértékben igaz rám	Teljes mértékben igaz rám
1	**2**	**3**	**4**	**5**	**6**	**7**

1.Mert rosszul érezném magam, ha nem fordítanék rá időt.

1 2 3 4 5 6 7

2.Gyakran kérdezem én is magamtól, hogy miért csinálom még, mert már nem látom, hogy elérném a céljaimat, amiket kitűztem magam elé.

1 2 3 4 5 6 7

3.A nehéz mozgáskombinációk elvégzése közben érzett örömért.

1 2 3 4 5 6 7

4.Mert kifejezi a belső értékeimet.

1 2 3 4 5 6 7

5.Mert a számomra fontos embereket bosszantaná, ha nem csinálnám.

1 2 3 4 5 6 7

6.Mert az egyik legjobb módja annak, hogy fejlesszem személyiségem más oldalait is.

1 2 3 4 5 6 7

7.Mert örömöt okoz, hogy többet tanulok a sportágamról.

1 2 3 4 5 6 7

8.Mert a környezetemben lévő emberek megjutalmaznak érte.

1 2 3 4 5 6 7

9.Az eddig ismeretlen edzéstechnikák elsajátításakor érzett öröm miatt.

1 2 3 4 5 6 7

10.Olyan érzésem van, hogy már nem tudok sikeres lenni ebben a sportágban.

1 2 3 4 5 6 7

11. nagyon érdekes megtanulnom, hogy miként fejlődhetek.

1 2 3 4 5 6 7

12.Mert ez a sport az önfejlesztésem egyik módja.

1 2 3 4 5 6 7

13.Mert azonos a belső értékrendemmel.

1 2 3 4 5 6 7

14.Mert élvezek új technikai elemeket megtanulni.

1 2 3 4 5 6 7

Mert mások nem helyeselnék, ha nem csinálnám.

1 2 3 4 5 6 7

15.Mert jobb érzésem van magammal kapcsolatban, amikor csinálom.

1 2 3 4 5 6 7

16.Már nem is egyértelmű számomra, hogy miért sportolok, nem hiszem, hogy van helyem ebben a sportban

1 2 3 4 5 6 7

17. úgy gondolom ez egy jó módja a személyiségem értékes részeinek fejlesztésére.

1 2 3 4 5 6 7

18.Mert élvezem, ha új módszereket ismerhetek meg a teljesítményem növelésére.

1 2 3 4 5 6 7

Intrinzik szabályozás		Integrált szabályozás	Identifikált szabályozás	Introjektált szabályozás	Külső szabályozás	Amotiváció
Effektív Intrinzi	Kognitív	4,13	6,12,18	1,16	5,8,15	2,10,17

k	intrinzik					
3,9,14	7,11,19					

source: (Paic és mtsai 2018)