

Can Exercise Be An Addiction? The Evolution of ‘Fitspiration’ in Society

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Abstract

This work provides an overview of the evolution of Exercise Addiction (EA) in society since the 70's. It reviews the existing literature in terms of typical symptoms, classifications, aetiology and assessment, while highlighting its potential links with other behavioral addictions and its increasing relevance in behavioural and addiction studies. It suggests a relation between the ‘Fitspiration’ phenomenon and the development of eating disorders and the misuse of ‘Performance and Image Enhancing Drugs’ (PIEDs), or simply ‘Lifestyle Drugs’. It concludes by emphasising the need to inform healthcare professionals about the risks associated to this phenomenon as well as developing innovative prevention responses to safeguard public health and promoting further research in this growing field of study.

Introduction

As known, physical exercise has a variety of health-related benefits. It can enhance quality of life, body functioning, muscular strength and endurance and also decrease resistance to fatigue, incidence of cardiovascular disease, Type 2 Diabetes (DM2) and the risk of depression (1, 2, 3, 4).

Although the benefits are extensively recognised, a growing amount of evidence is showing that exercise can also become an addiction (5, 6, 7, 8).

Since the 'fitness-boom' in 70's more people have become physically active (9). Such a new trend has been soon related to the emergence of both physical (e.g. injuries) and psychological issues, such as feelings of irritability, depression and dependence (10, 9). Over time excessive exercising has been defined in various ways, such as: (a) *exercise dependence* (11, 12); (b) *obligatory exercising* (13); (c) *exercise abuse* (14) and (d) *compulsive exercise* (15). For clarity reason, we prefer to use here the term 'Exercise Addiction' (EA) as it comprehensively incorporates both dependence and compulsion (16).

The rapid diffusion of EA is part of a wider phenomenon, which includes a number of other behavioral addictions, including pathological gambling, compulsive shopping, Internet and social media addiction, workaholism, addiction to sex ('sex addiction') and emotional relationships ('love addiction') (17, 18). These problematic behaviors have not yet been covered in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), which only includes gambling as a 'Non-Substance-Related Disorder' (19). This new classification has a great significance as it reflects the increasing interest around this topic and the shift towards a new perspective in which the presence of a psychoactive substance is not a prerequisite to addictive disorders. As argued by Martinotti and colleagues (2014) such a tendency connects tightly with the diffusion of Performance and Image Enhancing Drugs (PIEDs), or simply "life style drugs", which include a wide range of products used to improve physical appearance and/or boost performance (20). As increasingly documented in the literature (21, 22, 23, 24), those affected by EA might be inclined to purchase this type of products as attracted by the idea to experience an immediate enhancement of their physical abilities. PIEDs are mainly sold online, via illicit pharmacies, and their level of safety, composition, and legal status are mostly unknown (25, 26, 27). The Internet plays also an important role as a major source of inspiration and information for the consumption of fitness products, which can be easily purchased online without any medical supervision or prescription (23, 24).

Exercise Addiction: Symptoms and Classification

Overtime both positive and negative connotations were associated to EA. The concept of 'positive addiction' was first described by Gassler in 1976 as beneficial to health such as in the case of jogging or meditation which are able to facilitate what he defined a 'transcendental state'. Although typical symptoms of withdrawal were commonly reported among his patients (e.g. mental discomfort, feelings of guilt connected with the impossibility to exercise), he thought that these were "less harmful than chemical dependence" (28). Few years later, Morgan (1979) heavily criticized Gassler and introduced the concept of 'negative addiction', which could lead to strong withdrawal symptoms, like restlessness, insomnia, fatigue, tics, muscle tension and soreness, decreased appetite and irregularity of bowel movements (29).

Veale (1995) further classified the concept of Exercise Addiction by proposing four diagnostic criteria for what he called 'primary exercise addiction': (1) preoccupation with exercise that has

become stereotyped and routine; (2) significant withdrawal symptoms in the absence of exercise (e.g. mood swings, irritability and insomnia); (3) the preoccupation causes clinically significant distress or impairment in their physical, social, occupational or other areas of functioning; (4) the preoccupation with exercise is not better accounted for by another mental disorder (e.g. means of losing weight or controlling calorie intake as in an eating disorder). Therefore, according to Veale (1995), primary exercise addiction is related only to personal satisfaction, while 'secondary exercise addiction' manifests itself in presence of anorexia and/or bulimia nervosa (30).

A number of later studies investigated the concept of *secondary exercise addiction* by looking at the overlap between Eating Disorders (ED) and EA (31). EA has been recognized as significant in the aetiology, development, and maintenance of EDs (32, 33, 34, 35) and is generally associated with more severe (15, 36, 37) and enduring ED pathology (38). In fact, a 3-year in-patient hospital records analysis found that eating disorder patients, who were also compulsive exercisers, required a longer length of hospitalisation than non-compulsive exercisers (39). A 10-year follow up study of 95 patients with anorexia nervosa found that increased exercise not only significantly predicted a shorter time to relapse, but was associated with a chronic outcome (38). This comorbidity also appears to be strongly associated with suicidal behavior (40). The largest studies investigating the presence of EA among adults with Eating Disorders showed an average of 36–45%, varying depending on diagnostic subgroup and EA definitions (36, 41). A recent study was carried out on adolescents revealing similar figures: EA prevalence in girls is 44%, while in boys is 38%. Initial EA does not seem influential on 1-year outcome, although cessation is associated with remission (42). However, the scientific literature in terms of other psychiatric disorders remain limited and secondary EA might well be related to anxiety, bipolar and/or cluster B personality disorders.

Exploring the Causes: the Aetiology of Exercise Addiction

Physiological Theories

One of the most controversial and well-known theory is the "*Runner's High Hypothesis*". Numerous runners and exercise addicted revealed a sensation of strong euphoria after intense exercising (43, 28). The human body, in response to physical activity, produces endorphins, endogenous substances that can cause dependence (44). The intensity and the duration of exercise are crucial factors in increasing peripheral beta-endorphin concentration. Indeed, exercise needs to be performed at above 60% of the individual's maximal oxygen uptake (45) and it needs to be sustained for at least 3 minutes to detect changes in beta-endorphin levels (46). High levels of beta-endorphins were observed in plasma after intense exercising. However, because of its chemical structure, beta-endorphins cannot cross the blood–brain barrier (BBB), meaning that changes in plasma levels may not be accompanied by simultaneous changes in the brain. Unfortunately, direct measurement of changes in brain beta-endorphins are impossible to conduct on human being. Studies with rats though revealed an increase in the opioid receptor-binding sites after physical activities (47). Nevertheless, the evidence for the runners' high hypothesis remains to this day inconclusive (16).

Similarly, the "*Catecholaminergic Hypothesis*" described increased levels of circulating catecholamines after exercise (48). Considering that central catecholamine levels are involved in

regulating mood and affect and additionally play an important role in the reward system, the changes in brain catecholamine levels following exercise is an attractive explanation for the addictive nature of exercise. Unfortunately, just like the endorphins, the dynamics of changes in brain catecholamine levels during exercise in humans are unknown, because direct measurement in the human brain is not possible.

The “Sympathetic Arousal Hypothesis” (49) is a physiological model suggesting how adaptation of the organisms to habitual exercise may lead to addiction. The authors argue that regular exercise, if performed for a sustained period, results in a lower sympathetic activity that (at rest) means lower level of arousal. This new baseline or resting level of arousal may be experienced as a lethargic or energy-lacking state. This feeling prompts the person to do something about it, or to increase her/his arousal. For avid exercisers, the obvious way to increase the arousal level is via exercise. However, the effects of exercise in increasing arousal are only temporary and, therefore, more and more bouts of exercise may be needed to trigger an optimal state of arousal. Further, not only the frequency but also the volume of exercise may need to be increased due to training effect. Such an increase accounts for the tolerance in the addiction process. The main dilemma with this model is that sympathetic adaptation to exercise is universal, so it occurs in everyone, but only about 3% of the regular exercisers may become addicted to the behavior (31).

Finally, the “Thermogenic Regulation Hypothesis” is based on the physiological fact that intense physical activity increases body temperature and the pleasant sensation of warmth reduces anxiety and promote relaxation (50, 51). This can act as positive reinforcement or motivational incentives for the continuation of the pathological behavior. Therefore people can be prone to exercise whenever they experience anxiety and this can bring, in stressful situations, to increase frequency, duration and intensity of exercising.

Psychological Theories

The Psychological Theories are more widely accepted and they focus on the link between exercise addicts and their motivation for exercise, which is strongly related to personality traits (52, 53, 54, 11). Pre-existing mental issues were postulated since the first studies about EA. In his early works Little stated that: “these individuals probably had mood disorders before they began their athletic activities, but were able to cope through exercising. Efforts to deal with mental and emotional strain by identifying too strongly with a particular sport or physical activity may cause exercise addicts to lose control” (55).

This observation were included and complemented by Szabo in his “Cognitive Appraisal Hypothesis” (5). According to this theory, the habitual exerciser uses exercise as coping mechanism to relieve anxiety and stress. The individual is convinced that exercise is a healthy habit and uses rationalization to explain the exaggerated amounts of exercise, which slowly but progressively takes its toll on other obligations and normal daily activities. If unforeseen events prevent the person from exercising or require the person to reduce the amount of daily exercise, negative feelings can emerge like irritability, guilt, anxiousness and sluggishness. Loss of exercise also means the loss of the coping mechanism. Consequently, the exerciser loses control, which generates greater vulnerability to stress by further amplifying the negative feelings associated with the lack of exercise; in this situation the problem could be resolved only through resuming the previous pattern of exercise often at the expense of the other obligations in the daily life.

Sharon Stolaroff (2003) stated that exercise addiction is the result of one's character for this reason hard-driven and perfectionist-type individuals are more prone to develop this condition (56). Moreover, Berczik and colleagues (2012) described exercise addiction as a "dysfunction of personality" (16), and Asp (1999) affirmed that people with obsessive-compulsive disorder might be at greater risk for developing addictive exercise habits (57). Obsessive individuals are more likely to lose sight of their original 'purpose' for exercising (like losing weight or gaining a toned and healthy body), and begin focusing on the mere 'act' of working out (58).

Those who are 'primary' exercise addicted are motivated by the enjoyment derived from physical activity. In contrast, 'secondary' exercise addiction is characterized by the use of exercise as a means to accomplish some other objective such as weight loss (59). Many authors underlined how EA is more likely to develop in those who demonstrate excessive concern over body image and exercise to transform their appearance and/or body shape (60, 61). In this context exercise also can help those affected to maintain a stability that is often lacking in some areas of their life (62). Evidence shows that those who are not satisfied about work or their family life, perceive exercise as a primary measure of personal success: they identify their self-worth by the amount of exercise they do and the results that they see. Typically, a person is attempting to fill an emptiness, which leads to exercise and eating compulsions (63). Indeed, those most predisposed to developing exercise addiction lack a strong sense of self-identity and subsequently use physical activity as a coping mechanism for low self-esteem or emotional distress (64).

Lastly, the behaviorist perspective postulate that all human behavior can be explained through reinforcement and punishment so, paradoxically, exercise addiction can be described as self-punishing behavior because it requires substantial physical effort and stubborn willpower (5). These patients may be motivated to exercise to avoid withdrawal symptoms (negative reinforcement), or to enjoy the act of exercising (positive reinforcement). Usually an exercise addict tries to avoid the unpleasant symptoms of abstinence. As asserted by Duncan (1974): "In these situations, the person involved *has* to do it as opposed to *wants* to do it" (65). He suggested that people addicted to exercise desperately look for a temporary escape from an ongoing state of stress and, in this way, this addiction is almost identical with drug abuse. Avoidance is deeply-rooted in their behaviors and even when they appear to have been finally eliminated, they often reoccur spontaneously. For this reason, the relapse rate in addictions is high.

How to Recognise Exercise Addiction? Assessment and Epidemiology

Several instruments have been developed and adopted for the assessment of EA, most of them are no longer used because of theoretical and methodological shortcomings. At the moment among the psychometrically tested instruments the "Exercise Dependence Scale" (EDS; 66, 67) and the "Exercise Addiction Inventory" (EAI; 58) are the most used and reliable questionnaire. The EDS conceptualizes compulsive exercise basing on the DSM-IV criteria for substance abuse or addiction (68) and empirical research shows that it is able to differentiate between at-risk, dependent and nondependent athletes, and also between physiological and non-physiological addiction. The EDS has seven subscales: (1) tolerance, (2) withdrawal, (3) intention effect, (4) lack of control, (5) time, (6) reduction of other activities, and (7) continuance.

The EAI is a quick and easily administrable tool for surface screening of exercise, it assesses the six common symptoms of addictive behaviors: (1) salience, (2) mood modification, (3) tolerance, (4)

withdrawal symptoms, (5) social conflict, and (6) relapse. The EAI has high internal consistency and convergent validity with the EDS (69, 58). Another instrument is the “Commitment to Exercise Scale” (CES), developed by Davis, Brewer and Ratusny in 1993. This scale examines the pathological aspects of exercising (e.g., continued training despite injuries) and compulsory activities (e.g., feeling guilty when exercise is not fulfilled) (14). This is a good instrument to analyse the general population and patients with eating disorders but does not seem to be an adequate instrument for measuring pathological exercising among competitive athletes (70).

The current prevalence of EA among population is still unknown, in the past years several incongruent results have emerged. For example, Blaydon and Lindner’s study (2002) on triathletes reported that the prevalence of exercise addiction was 52% (71). Other scholars have reported that 26% of male runners and 25% of female runners are addicted to running (72). According to some researchers, the prevalence of true exercise addiction is very rare (73, 74), while others conjecture that the prevalence rate may be very high (75, 60). The reason behind the inconsistency of these outcomes may be connected to the fact that population studied are usually very small and selected, moreover the inadequate conceptualization of the phenomenon and the heterogeneity of the instruments used in the assessment of EA through the years resulted in contradictory results (76). It has been argued that “the currently available tools only measure the risk and/or possibility of the presence of EA. Consequently, their results may be exaggerated in terms of actual cases and, indeed, only a few of the top-scoring individuals may in fact be addicted to exercise” (59). Exercise Dependence Scale and Exercise Addiction Inventory showed respectively an average prevalence of 2,5% and 3% in exercising population (77, 78), while the prevalence in general adult population is around 0.3–0.5% (79).

The difficulties in providing an accurate assessment of EA are also reflecting in the treatment. At present there are no studies reviewing or suggesting best practices in the field. This is an area that deserves further attention and future investigations.

New Challenges

As mentioned, in recent years there has been a renewal in the perspective of EA due to the unprecedented diffusion of what have been called ‘New Addictions’, which include impulse control disorders, eating disorders, specific sexual disorders, Internet addiction, online gaming, exercise addiction, and many others. These addictions are actually not a new problem but they refer to well-known disorders, which now appear in a new interpretative framework (17). The definition of addictive disorders, in fact, should not be reduced only to psychoactive-related dependencies, scientific literature on addictions has begun to deal with a growing number of phenomena, originally not classified as addictive disorders, but with important psychological and social consequences (80, 81, 82).

In parallel with this the wide diffusion of the so-called ‘lifestyle drugs’ is also cause of global concern (83, 84, 85). These substances had been used as doping drugs for a long time (86). The definition describes a variety of products including anabolic steroids, nitric oxide, growth hormones and other drugs that are able to alter the functions of the body to enhance muscle growth, reduce body fat and promote weight loss (8). The misuse of these substances has largely been associated with athletes and body builders (88, 89) and their recent availability on the

Internet has increased their diffusion in society (90). According to recent evidence (24), such a phenomenon is well correlated to exercise addiction. In 2015 a cross sectional study was carried out among gym users in the UK and revealed that 41% of participants reported use of products in order to achieve fitness goal. The most common were proteins (41%), caffeine (30%), nitric oxide (13%) and anabolic steroids (7%), a smaller number used amphetamines (3%), thyroid hormones (3%) and sibutramine (1%). A 15% of the sample resulted being “at risk” of EA according to the Exercise Addiction Inventory (EAI), where a score between 13-23 is indicative of a “vulnerability” and above 24 is considered to be “at risk”. A significant difference emerged in scores between those who used products to achieve fitness goals (20) and those who didn’t (18). The same work reported also a lower self-esteem and body satisfaction among lifestyle-drugs users. The Internet played a particularly important role in providing information and supply. Approximately 41% of individuals using products to reach fitness goals discovered them online, 41% obtained their products through online sources and fitness shops (42%) were the most common source of purchasing products for fitness goal achievement. According to this study 21% of substance users reported several side-effects like acne, palpitations, change in mood, and gastrointestinal effects (24).

Internet is not only source of information but of inspiration as well. Social networking sites such as Facebook, Instagram or Pinterest have attracted millions of users (91). A small number of correlational research demonstrated that Social Network use is associated with body dissatisfaction and disordered eating (92, 93, 94, 95). “Photo activity” is particularly related to body image concerns (96, 97) and so image-based social media platforms like Instagram may be especially influential. Holland and Tiggerman investigated in 2016 the phenomenon of “Fitspiration” (fitness and inspiration), working on a sample of women who regularly posted fitspiration images (images and text designed to inspire people to pursue a healthy lifestyle through exercise and well-eating). They scored significantly higher than a control group on drive for thinness, bulimia, drive for muscularity, and compulsive exercise. Almost a fifth (17.5%) of these women were at risk for diagnosis of a clinical eating disorder (98).

In fact, a content analysis carried out by Simpson and Mazzeo on the same year revealed that although Fitspiration might seem to encourage a healthier lifestyle, it might also negatively impact body satisfaction, eating habits and exercise behavior. The results also indicate that the most frequent motivation for achieving body image ideals are related to physical appearance instead of health. Only 25,9% of the images promoted “exercising to improve health”, most of them emphasized “exercising to look good” (30,7%), followed by “exercising to improve shape” (19,3%) and to “exercising to lose weight” (5,3%). Therefore, fitspiration might motivate young adult (especially women) to engage in regular physical activity without modifying their diet, yet if individuals do not alter their dietary behaviors they might experience frustration when they do not achieve the desired results. This is likely to cause resentment and self-loathing, and to deter continued exercise behaviors (Simpson and Mazzeo, 2016).

Conclusions

The study of EA is really complex. This article reviewed the main works about this topic trying to give a complete and historical interpretation of the evolution of this phenomenon. It analysed how the symptoms were discovered and classified and how different aetiological theories and possible

treatments were suggested over the years. Overall, it can be argued that the increasing diffusion of other addictions in society as well as the 'lifestyle drugs' act as reinforcers for such a problematic condition. Exercise has always been portrayed by health and educational organizations as a synonym of healthy living and exercising many hours a day is viewed as being more "normal" than engaging in a non-exercise activity (e.g., playing video games), which is viewed as "abnormal" (16). Results of our review show the need of greater awareness around this problem in order to safeguard public health: parents, teachers, health educators, coaches, fitness instructors, and other professionals involved should cooperate to identify and intervene when signs of dysfunctional exercise or eating habits are noted. Although addictive behaviors have different characteristics, addictions commonly share more similarities than differences (78). An important step would be the recognition of 'Behavioral Addiction' as a nosographic entity to help healthcare staff in planning assessments and treatment.

Living in an ever-changing society, we have to be able to detect and understand new trends and health threats. Toxicological analysis of fitness products sold online should be implemented as well as further studies about the more hidden links between the exponential increase of 'lifestyle drugs' and EA. There is still a lack of up-to-date information available for medical professionals on the effects and risks associated with the consumption of these products (100). Healthcare professionals need to be aware of the risks associated with this complex phenomenon, and prevention activities should emphasize the 'beauty' of health over appearance, while protecting vulnerable individuals against adverse consequences and misleading claims associated with media messages and increase the level of body acceptance in society.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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