

Behavioural addictions and the transition from DSM-IV-TR to DSM-5

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Summary

The concept of addiction, traditionally applied to psychotropic substances, has been officially extended by the DSM-5 to gambling disorder, a "behavioural addiction" (BA), in which the focus of the addiction is represented by a specific behaviour. BAs are emerging psychopathological disorders with an increased in scientific interest and socio-cultural and economic implications. In this paper, we will review the available evidence on the clinical, diagnostic and psychopathological features of BAs, with particular reference to gambling disorder, sex-addiction, compulsive buying, exercise, work, technological and love addictions. Even though each of these addictions may likely meet the requirements for classification as a separate diagnostic entity, at present, the only two disorders included in DSM-5 are gambling disorder and internet gaming disorder. The absence of specific diagnostic criteria, the present of difficulties in differ-

entiating pathological from "normal" behaviours, and blurring of demarcation lines between physiology and pathology complicate the epidemiologic investigation and diagnostic assessment of BAs. Moreover, the lack of valid screening tools and the frequent comorbidity with other mental disorders further hinder the diagnostic approach to BAs. Therefore, clear-cut and well-defined diagnostic classification needs to be established, along with a better understanding of the clinical and psychopathological features of BAs, as a fundamental prerequisite to prevention, early diagnosis and treatment.

Key words

Behavioural addictions • Psychopathology • Diagnosis • Clinical features

Introduction

The concept of addiction, for years adopted solely to indicate the use of psychotropic substances, is nowadays frequently applied to describe a heterogeneous group of syndromes known as "behavioural addictions", "no-drug addictions" or "new addictions" ¹. Prevalence rates for such conditions, taken as a whole, are amongst the highest registered for mental disorders with social, cultural and economic implications. Individual forms of BA are linked by a series of psychopathological features, thus supporting the initial proposal, subsequently rejected, to devote a chapter to these disorders in the DSM-5. These include: repetitive, persistent and dysfunctional behaviours, loss of control over behaviour in spite of the negative repercussions of the latter, compulsion to satisfy the need to implement the behaviour, initial wellbeing produced by the behaviour, craving, onset of tolerance, abstinence and, ultimately, a progressive, significant impairment of overall individual functioning ^{2,3}.

A progressive loss of control over the specific behaviour may result in a consequent neglect of interpersonal relationships, and abandonment of roles and activities pre-

viously seen as important. At the same time, negative health consequences may be manifested, including onset of sleep disorders, weight gain, functional somatic symptoms and even suicidal behaviours ¹.

For the first time, the DSM-5 chapter "substance related and addictive disorders" includes gambling disorder, previously classified as an impulse control disorder ⁴. A form of internet addiction, another BA, is listed in Section 3 of the manual as an "internet gaming disorder", among conditions requiring further investigation. However, numerous other BAs have been described in the literature: sex-addiction ⁵, compulsive buying ⁶, exercise addiction or overtraining syndrome ⁷, love addiction ⁸, work addiction or workaholism ⁹ and technological addictions ¹⁰. Bearing in mind that a vast range of routine behaviours might potentially show the characteristics of an addiction, numerous authors have raised the issue of the implied risk of over-pathologising such behaviours ^{1,11}. In fact, most BAs were omitted from the DSM-5 due to insufficient evidence, poor description of the clinical course of the behaviour and the need to establish diagnostic criteria in order to classify these behaviours as mental disorders ¹². In addition, several authors believe that BAs are largely

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manifested secondary to other mental disorders, such as mood, anxiety and personality disorders, and should not therefore be classified as separate diagnostic entities¹¹.

In view of their characteristic features, BAs have been likened to substance-related, obsessive-compulsive and impulse control disorders^{2,11}.

The idea of incorporating BAs into the area of substance-related disorders stemmed from the robust body of clinical, neurobiological, neuropsychological, biochemical and genetic findings, supporting the significant associations and similarities between the two classes of disorders, on the basis of which a common biopsychosocial component has been hypothesised^{13,14}. BAs and substance-related disorders appear to be based on an impairment of the three functional systems of motivation-reward, regulation of affect and behavioural inhibition¹³. This impairment, in turn, elicits the urge to behave in a manner capable of activating the reward circuitry or avoiding discomfort, ignoring the negative implications associated with the specific behaviour. The so-called "incentive sensitisation theory" has been purported to underlie the onset of substance use disorders and, more recently, BAs, including gambling disorder. The latter represents a drug addiction development model according to which the addictive behaviour, in the same way as the stimuli associated with dysfunctional behaviours alter the sensitivity of the mesocorticolimbic dopamine system involved in reward and reinforcement of response, produces an increased sensitivity on the repeated administration of drugs and/or repeated exposure to specific contexts and stimuli¹⁵. The associated mental and sensorial events are themselves seen as pleasurable and, thus, act as an incentive to implement the behaviour.

The scarce data available in literature on the longitudinal course of BAs tend to highlight an episodic rather than a continuous course, compared to that observed with traditional substance-related addictions¹. Although subjects rarely tend to seek help for their problems, individuals who do so tend to refer to healthcare professionals, possibly as they realise they are suffering from a medical problem, rather than merely attributing their problems to an inappropriate lifestyle¹.

Given the increasing interest in the field, the aim of this paper was to review the available literature related to the clinical-diagnostic and psychopathological features of the main BAs, with particular reference to gambling disorder, sex-addiction, compulsive buying, exercise addiction, work addiction, technological addictions and love addiction.

The increasing scientific focus on these disorders dictates the need for a clear-cut and well-defined diagnostic classification and a better understanding of the psychopathological features, representing a fundamental prerequisite in prevention, early diagnosis and treatment.

Methods

A systematic review of the PubMed database was conducted using the following keywords: "behavioral addictions", "gambling" "sex-addiction", "compulsive buying", "exercise addiction", "work addiction", "internet addiction", "technological addiction" and "love addiction". Studies published in English or Italian up until July 2015 were evaluated, and studies focusing mainly on psychopathological and clinical-diagnostic aspects were selected. Each condition is herein briefly presented and its main psychopathological and diagnostic features summarised.

Compulsive buying

Compulsive buying (CB) or compulsive shopping is a disorder first described at the end of the 19th century by Kraepelin as "oniomania". Despite the large quantity of data available in literature, there is still need for further understanding and recognition of CB, frequently neglected in the clinic in spite of the high prevalence observed, particularly in the young, and largely female, population^{3,6,16-18}. In the absence of formal diagnostic criteria, diagnosis of CB is based on a careful clinical assessment of buying habits, feelings and associated thinking. The disorder is manifested with a recurrent and irresistible compulsion to purchase useless or superfluous items that go far beyond the financial possibilities of the buyer. Thought content is polarised on buying, with an uncontrollable urge to implement the behaviour and a tendency to lose control. A condition of extreme pleasure and well-being is described as the subject completes the purchase, whilst tension rises if the transaction is not completed. This consequently results over time in a feeling of guilt and shame, as the subject recognizes the implications associated with the behaviour. The feeling of pleasure is achieved by purchasing, selecting and ordering the item, rather than through using it. It should be taken into account that the majority of subjects subsequently casts aside, donates or discards the items purchased^{17,18}. The urge to buy tends to be repeated with a frequency ranging from hours to weeks or months. In almost all cases the disorder has serious repercussions on the subject's social and family life and finances¹⁸. CB as a primary disorder should be distinguished from the excessive spending manifested in the context of other psychiatric disorders, including bipolar disorders, anxiety disorders, psychosis or dementia³. CB should, moreover, be distinguished from the impulse to buy manifested as an occasional loss of control in the presence of an overwhelming desire for a particular item^{17,18}. Women tend to buy items of clothing, cosmetics and jewellery, whilst men opt for electronic gadgets or car accessories³. In some cases,

the subject diversifies the type of purchase, while in others focuses largely on the same type of product. Some prefer to buy on the Internet, from the TV or in shopping malls, while others prefer exclusive boutiques; some buy for themselves, others tend to buy gifts for relatives and friends¹⁸. CB is frequently manifested in comorbidity with other mental disorders, including anxiety disorders, compulsive hoarding, obsessive-compulsive disorder, substance abuse, intermittent explosive disorder, pathological gambling, exercise dependence, pathological internet use, binge eating disorder, bulimia and personality disorders^{6,18}.

The initial symptoms of the disorder are generally manifested between the ages of 20 and 30 years, frequently in subjects with low self-esteem, perfectionists or narcissists, while associated problems are often manifested later, following the accumulation of debts, family conflicts and other psychosocial consequences correlated with this inappropriate behaviour^{6,18}.

Sex-addiction

Sex addiction (SA) or impulsive-compulsive sexual behaviours are characterised by a prominent role of sex in the everyday life of affected patients. They feel a compulsion to satisfy their sexual urges and lose control, overlooking the serious consequences produced on their personal health, on the toll it takes on relationships, and at times even legal issues^{3,5,17,19}. Over the years, a series of authors has proposed specific diagnostic criteria to reliably identify SA²⁰. However, the proposal to include hypersexual disorder in DSM-5 was rejected due to the paucity of data available in support of a specific diagnosis.

Sex addicts are on the constant lookout for exciting situations, or situations capable of providing an opportunity of no-strings sexual encounter, frequenting multiple sexual partners or engaging in compulsive masturbation. Sexual activity is partly aimed at attenuating the condition of distress that precedes the behaviour, and is subsequently replaced by a sense of guilt and shame. As a result of these feelings, the subject becomes increasingly introverted, ultimately manifesting an impaired functioning and lower quality of life, that merely serves to perpetuate and reinforce the addiction, the consequences of which are frequently underestimated. The time spent in seeking, undertaking and recovering from sexual encounters induces the subject to neglect all other activities. Tolerance and abstinence may be present, accompanied by emotional lability and irritability if subjects are not able to satisfy their sexual needs. The term impulsive-compulsive sexual behaviour has been used in referring to SA, as an impulsive component (pleasure, excitement, or reward) is involved at the start of the cycle, and a compulsive com-

ponent perpetuates the behaviour^{5,19}. Comorbidity with other mood disorders, anxiety disorders and substance abuse has been reported¹⁹.

Work addiction

Work addiction (WA) or “workaholicism” was first identified in 1971 when Oates used the term “workaholic” to refer to a subject who experiences a compulsion or uncontrollable need to work unrelentingly. As we live in a society in which an excessive commitment to work is viewed as a positive quality, this disorder is frequently under-diagnosed. A workaholic should, however, be distinguished from a normal, work-engaged individual: the former is driven to work compulsively, with disastrous consequences for his/her physical and mental health; the latter is a highly motivated individual who obtains deep satisfaction from his/her work. Accordingly, the difficulty of defining the WA construct clearly emerges, particularly due to the numerous definitions provided, a lack of full understanding of the phenomenon, and the difficulty to establish a boundary between normality and a pathological condition⁹. Similar to previous editions, DSM-5 fails to mention this disorder, considering it merely a symptom of an obsessive-compulsive personality disorder in which the individual manifests an excessive commitment to work and productivity, even forsaking leisure activities and friendships⁴. With this form of addiction, the individual tends to seek an indirect pleasure from work. Indeed, it would seem to be the social implications, power and success rather than the working activities *per se*, to produce pleasure and addiction, thus being sought after by the subject in an attempt to improve his/her public image and increase his/her self-esteem. Work addicts experience a strong urge to devote their life and time to work, which ultimately takes over every minute of the day, causing them to neglect or abandon their family and personal life, with heavy repercussions on social functioning⁹. On non-work days, such as the weekend or bank holidays, when patients are unable to carry out working activities, they are generally pervaded by a sense of anguish, emptiness, boredom, irritability and anxiety³. Non-work activities, or activities unrelated to the individual’s work, are avoided and scorned. Thought content is dominated by work-related issues, relationships and potential mistakes, both real and imaginary. The most significant and frequent short-term implications are related to family life and relationships with colleagues⁹. In the previous contexts, the individual displays an authoritarian manner, aggressiveness, continued tension, excessive self-confidence, poor tolerance to criticism, bluntness, lack of affectivity and cognitive rigidity³. In the long-term, additional mental and physical disorders, such as

cardiovascular diseases, may be manifested. Over time, the individual's professional standing may be negatively affected due to a loss of efficiency and productivity.

Love addiction

Love addiction (LA) is characterised by a pattern of maladaptive romantic relationship issues that results in a significant impairment of functioning and/or a state of marked distress⁸. LA can be distinguished from love passion, as the desire for the other person represents a compulsive need, with pain taking the place of pleasure, and the individual choosing to continue with the relationship although fully aware of the negative consequences this may entail⁸. The partner represents one of the main reasons for existing, and his or her absence, even on a temporary basis, determines an intense sense of emptiness and anguish³. Love addicts are completely devoted to the partner, privileging his or her wellbeing over their own, often neglecting social and family relationships, work and leisure activities⁸. In many cases, the partners are difficult individuals affected by mood swings, pathological addictions and impulse control disorders, who frequently lack respect, have different needs and are devoid of life projects³. Affected subjects may occasionally admit their relationship problems, but they are incapable of escaping from them, at times underestimating the toll the relationship is taking in an attempt to justify their actions. Anxiety, depression, feelings of guilt, hyper-reactivity, irritability, jealousy and possessiveness may be manifested, even extending to paranoid ideation, which may progress into an overt psychotic syndrome with risk of aggressive behaviours³.

Gambling disorder

Gambling disorder (GD) is characterised by persistent and maladaptive gambling behaviour, whereby individuals engage in frequent and repeated episodes of gambling despite serious adverse consequences.

The DSM-5 included GD in the diagnostic category of 'Substance-related and Addictive Disorders'⁴. Pathophysiological models for drug addiction were therefore considered to be relevant to GD and affected patients, who may benefit from therapeutic approaches used to treat SUDs²¹. There is strong evidence suggesting that similar predispositions (genetic, environmental and social) influence the development and maintenance of GD and addictive disorders. Also, like SUDs, GD presents the phenomena of tolerance, withdrawal and craving.

GD subjects have significantly more Axis I disorders than controls, with higher rates of bipolar disorder, and it has been suggested that mood and anxiety disorders

often precede gambling problems²². In addition, a recent longitudinal, prospective study found that subjects who reported past-year disordered gambling were significantly more likely to have new onset of Axis I psychiatric disorders²³. According to the *National Epidemiological Survey on Alcohol and Related Conditions*, around 70% of pathological gamblers had a lifetime alcohol use disorder²⁴. In pathological gamblers, the co-occurrence of other mental disorders increases the likelihood of treatment-seeking, though it may be the case that GD subjects are more likely to seek treatment for their comorbid disorders rather than for their gambling problems, which thus go undetected²⁵.

Urge to gamble is often associated with arousal and restlessness or with tension and anxiety. Various forms of emotional and mood disturbance are associated with divergent motivations that might represent distinct pathways into gambling behaviour²⁶. GD patients who experience hypomanic symptoms report stronger motivations to gamble as a means to regulate mood, more frequently to gain pleasure and enjoyment. Depressive symptoms are also a very common finding among pathological gamblers, and evidence suggests that they are closely related to engagement in gambling. Depressive symptoms possibly provide an impetus to console or comfort oneself through gambling, as an attempt to relieve a negative mood²⁷.

Consistent with an addiction model, it has been proposed that gamblers who experience high levels of anxiety engage in gambling activities to reduce arousal states. Furthermore, anxiety symptoms have been considered as part of withdrawal-like symptoms in GD²⁸. Moreover, specific temperamental (novelty seeking) and character (self-directedness and cooperativeness) dimensions differentiated probable pathological gamblers from both non-pathological gamblers and controls²⁹.

Impulsivity is a hallmark of GD, which is also characterised by compulsive features. Studies indicate that pathological gamblers score highly on specific measures of compulsivity, and it seems that, over time, impulsive habits may shift toward a more compulsive pattern of behaviour. Behaviours in GD patients are often repetitive and hard to suppress. Additionally, most published findings suggest heightened response perseveration in GD.

Craving phenomena, defined as the subjective urge to consume a drug or behave in a certain way, and abnormal cue reactivity are central to addictive behaviours and may promote relapse. As in all substance addictions, craving is a key symptom of GD as well. In fact, research on relapsing precipitants suggests that craving is one of the main factors to provoke and maintain episodes of gambling.

Finally, growing evidence suggests that GD patients are

characterised by significant neurocognitive impairment in a variety of domains, and it has been proposed to devise treatment strategies that specifically target cognitive symptoms. Pathological gamblers often have difficulty shifting their thoughts and behaviour away from gambling. Enhanced cue reactivity and attentional bias to gambling cues have been reported in GD, along with increased reward-seeking behaviour and lowered reward sensitivity. Pathological gamblers have difficulty filtering irrelevant information and inhibiting ongoing responses. Decision-making and executive functions were also shown to be compromised. Moreover, GD patients are characterised by deficient motor response inhibition and impaired cognitive flexibility³⁰.

Subtyping pathological gamblers based on personality domains, impulsivity, depression and anxiety comorbidity has been proposed²⁵; however, more research is needed to provide support for these models and further investigation warranted to better understand how psychopathological dimensions impact the clinical presentation and treatment outcomes of GD.

Internet addiction

Over the last decades, Internet has become an integral part of daily life for most individuals and internet users across the world have grown to over two and a half billion. The increase in Internet use has been paralleled by the emergence of psychopathological features of addiction linked to its use. This phenomenon is growing both in prevalence and within public consciousness as a pathological condition, which has been variously referred to under different terms⁵, particularly Internet addiction (IA). Extensive data clearly indicate that dysfunctional Internet use has the potential to bring about considerable psychological distress, and there has been a substantial increase in the number of IA service providers in many countries. As yet, IA remains an ill-defined and heterogeneous construct, owing to the inconsistent methodological approaches used to study it, varied use of terminology and lack of standardised diagnostic criteria. IA may be broadly defined as a use of the Internet that interferes with the individual's health and creates psychological, social, school and/or work difficulties³¹.

The diagnosis of IA does not appear in any official diagnostic system. Recently, however, the DSM-5 has singled out Internet Gaming disorder (IGD), defined as compulsive/uncontrolled gaming online that jeopardises professional and/or social functioning, and categorised it as a condition for further study (Section III)⁴.

It has been reported that 88.3% of individuals with IA have an average of two other co-occurring diagnoses³² and there is currently some debate over whether IA re-

flects a BA or is secondary to other psychiatric disorders. Some authors argue that most individuals presenting with IA are using it as a medium to fuel other addictive behaviours and that IA may be more appropriately conceptualised within existing psychiatric disorders³³. However, accruing evidence supports the notion that IA is a separate psychiatric entity, with strong parallels to existing recognised disorders. Numerous authors have, in fact, proposed it to be an impulse-control disorder or an addictive behaviour^{2,34}. In the latter view, IA is regarded as a BA, as Internet use may produce short-term reward that engenders persistent behaviour, despite knowledge of adverse consequences. IA shares some general aspects with other BAs, such as loss of control on experience, tolerance, withdrawal and the appearance of an overwhelming need, similar to craving, to repeat the experience. In line with this understanding of IA as a BA, Block³⁵ suggested 4 diagnostic criteria for IA: (1) excessive Internet use, associated with loss of sense of time or neglect of basic drives; (2) withdrawal, including feelings of anger, depression and tension when Internet is not accessible; (3) tolerance, including the need for better computer equipment, more software, or more hours of use; and (4) adverse consequences (e.g., sleep deprivation, marital difficulties, lateness for early morning appointments, neglect of occupational duties).

Young considers IA as a continuum in which Internet users progress gradually from no or modest symptoms to exhibiting extreme pathological behaviours and defines problematic non-essential Internet usage (non-business/non-academic) resulting in significant impairment or distress by the presence of five (or more) of the eight items on the Diagnostic Questionnaire³⁶.

There is growing evidence that genetic factors, neurobiological alterations and specific personality traits influence the development of IA. Structural and functional brain reorganisation is thought to contribute to the development of addictive behaviours, including IA, which, in fact, was found to be associated with abnormal interactions between brain regions³⁷. Abnormalities in serotonin transporter genes have also been correlated with IA, suggesting similar genetic traits with depressed patients³⁸. Furthermore, a growing body of neuroimaging studies shows that the prefrontal cortex plays a significant role in the development of IA³⁹, as in other addictive disorders. Personality traits of high harm avoidance, high novelty seeking, high reward dependence, low self-directedness and low cooperativeness were positively correlated with IA. Lack of perseverance was found to predict IA. Moreover, a significant association between excessive use of violent Internet video games and aggressive behaviour has also been observed⁴⁰. Recent studies have also identified moderating factors, such as coping styles and Internet ex-

pectancies that determined functional and dysfunctional Internet use among adult populations³⁹. In this view, Internet use may represent a coping strategy that takes the form of reassurance, avoidance, relief of dysphoric symptoms and compulsion in problematic use. IA can thus be conceptualised as a form of maladaptive self-regulatory strategy. Differences in automatic and controlled aspects of self-regulation have, in fact, been linked to IA³¹.

In conclusion, the study of IA is currently hampered by ambiguous definitions of the phenomenon and a diversity of diagnostic and prognostic criteria, the expansion of this area of distress and the consequent increase in clinical observations, raise issues concerning its management. Many patients refer to clinicians who do not dispose of standard clinical treatment protocols but only of limited data from case studies. Also, pharmacological and psychotherapeutic treatments specific to IA have received limited testing in large, rigorous studies⁴¹. More research is, therefore, needed on areas that remain unclear and contribute to the prognosis of IA, including the temporal relationships with comorbid disorders and the psychological changes that occur through Internet use, such as disinhibition and increased risk-taking.

Technological addictions

Technological addictions involve human-machine interaction. They can be passive (e.g., television) or active (e.g. computer games) and usually contain inducing and reinforcing features, which may contribute to the promotion of addictive tendencies. The category of technological addictions is not mutually exclusive and contains conditions that could be considered under other kinds of addiction (e.g., telephone sex addiction likely better explained as sex addiction).

Information and Communication Technologies (ICTs) are a hallmark of today's societies. The major factors that foster the ICT use to get in touch with other people are accessibility, availability, intimacy, high stimulation and anonymity. Clinical evidence of overuse in numerous subjects, in some cases with symptoms similar to those of addictive disorders, has been reported⁴². Technological addictions may be particularly relevant to adolescents, a population with great vulnerability to addiction. Indeed, teenagers have less impulse control, poorer long-term planning, and tend to minimise the risks of potentially dangerous behaviours. This is due primarily to cortical immaturity, particularly in the prefrontal cortex. Additionally, adolescence is a period during which individuals develop personal independence from adults⁴³. ICTs support this independence in that the younger generation is more comfortable with these tools, which provide access to social relationships that teenagers find particularly important.

Most technological addictions involve the Internet, mobile phones and video games. However, the accessibility of new technologies, like cell phones, which have the advantages of portability and an ever growing array of functions, makes their over-use increasingly likely. In fact, these tools are gradually more interrelated, to the extent that it is possible to connect to a social network via a mobile phone as well as play a game online.

The personality trait most consistently associated with problematic mobile phone use is low self-esteem, though extraversion is associated with more intense use. Women with low self-esteem are the most vulnerable group, and the most commonly associated psychopathological symptom was depression⁴⁴. A recent report found that materialism and impulsiveness drive both a dependence on cell phones and instant messaging⁴⁵.

Technological addictions, despite their short history, have clinical, social, and scientific support for inclusion within addictive disorders³³, although they may still require additional research before this is reflected in diagnostic manuals.

Proposed diagnostic criteria for the abuse of the Internet, mobile phones and video games are as follows: 1) tolerance: need for increased use of the technologies over time; 2) withdrawal: emotionally intense discomfort when spending an unusual length of time without using the technology or when use is disrupted; 3) greater use than intended when beginning a session; 4) desire to stop the use of the technology without being able to do so; 5) spending too much time engaged in activities related to the technologies; 6) stopping other activities in order to increase use of the Internet, mobile phones, or video-games; 7) continued use of the Internet, mobile phones, or video-games despite an awareness that such use is causing damage.

With regard to social networks, young people's exposure to social network sites such as Facebook is increasing, along with the potential for such use to complicate romantic relationships. Recently, Facebook intrusion was linked to relationship dissatisfaction, via jealous cognitions and surveillance behaviors⁴⁶.

However, ICT overuse can be a symptom of an underlying mental disorder and a way to cope with emotional distress. Risk and protective factors need to be considered to explain the vulnerability of some people. In addition, future studies would enable better understanding of the damaging effects that ICT overuse may have on social functioning in the real life.

Exercise addiction

Physical exercise and sports activity are of benefit and their regular practice may be both physically and mentally beneficial. However, when exercise becomes ex-

cessive it can lead to physical and even psychological damage. As a consequence, the loss of control renders the behaviour pathogenic and potentially addictive. A variety of expressions is used to describe this addiction as exercise dependence, obligatory exercise, compulsive exercising, exercise abuse, compulsive athleticism and anorexia athletica.

Research into highly accustomed exercise started with the study of Baekeland who, despite offering payment, faced great difficulties in recruiting committed athletes for participation in his study about exercise deprivation. In 1976, William Glasser coined the term “exercise addiction” (EA), describing the many positive benefits of exercise such as relaxation, exaltation and satisfaction (calling it “positive addiction”). De Coverley Veale subsequently proposed a differentiation between primary and secondary EA, intending the latter just like a symptom of eating disorders. High levels of obligatory physical exercise were found in the context of eating disorders, supporting the model of secondary dependence⁴⁷

Actually, the term “exercise addiction” incorporates elements of both dependence and compulsion. Subsequent studies have focused on the harmful consequences of the condition: obsessive need to increase exercise levels, overuse distress, interference with work and family life and incapacity to reduce the level of exercise⁴⁷.

In DSM-IV-TR, excessive exercise is defined as exercise that “significantly interferes with important activities, occurs at inappropriate times or in inappropriate settings, or when the individual continues to exercise despite injury or other medical complications”. As for other forms of BAs (e.g., compulsive buying, sexual addiction, ‘workaholism’), physical EA has surfaced in the medical literature in the last years, but it is not considered in the DSM-5.

On one hand, EA can be conceptualised within the obsessive-compulsive spectrum as physical activity, but it might also be an obsessive/compulsive symptom to relieve feelings of distress⁴⁸. On the other hand, it has also been highlighted that addicted exercisers show behavioural patterns as withdrawal symptoms, mood modification, tolerance, relapse, impulsivity, conflict and tendency to return to excessive activity after periods of abstinence, as well as physical, social and financial adverse consequences⁴⁹.

A definition of EA was proposed by Hausenblas and Downs⁵⁰: “a maladaptive pattern of excessive exercise behaviour that manifests in physiological, psychological and cognitive symptoms”. They described exercise addiction based on the modified version of the DSM-IV-TR criteria for substance dependence:

- *tolerance*: increasing the amount of exercise in order to feel the desired effect, being it a “buzz” or a sense of accomplishment;

- *withdrawal*: in the absence of exercise the person experiences negative effects such as anxiety, irritability, restlessness and sleep problems;
- *lack of control*: unsuccessful attempts to reduce exercise level or cease exercising for a certain period of time;
- *intention effects*: unable to stick to one’s intended routine, as evidenced by exceeding the amount of time devoted to exercise or consistently going beyond the intended amount;
- *time*: a great deal of time is spent preparing for, engaging in and recovering from exercise;
- *reduction in other activities*: as a direct result of exercise, social, occupational and/or recreational activities occur less often or are stopped;
- *continuance*: continuing to exercise despite knowing that this activity is creating or exacerbating physical, psychological and/or interpersonal problems.

There are various questionnaires assessing EA and there is a large variability to ascertain its prevalence, as a result of using different questionnaires or criteria for assessment. Studies also tend to focus on diverse and often unspecified types of physical activity.

Concerning the neurobiological mechanisms, several hypotheses have been formulated to explain physical exercise addiction: the *affect regulation hypothesis* proposes that physical activity serves as a “positive affect enhancer” and a “negative affect reducer”, registering the reduction of anxiety and depression as a purpose among runners⁵¹. The *sympathetic arousal or habituation hypothesis* is a physiological model that suggests how the habitually exercising individual is motivated to increase the level of arousal: adaptation to exercise reduces the sympathetic activity, meaning lower level of arousal. This condition may be felt as a lethargic or energy-lacking state by the subject, who increments not only the frequency but also the amount of exercise in order to increase his/her arousal⁵². The *endorphin hypothesis* suggests that there may be a relationship between the stimulation to release endorphin and endogenous opioid peptides and vigorous exercise. The exercise-induced changes in psychological function may be the result of alterations in endogenous opioid system. Moreover, induced IL-6 cytokine causes an anti-inflammatory response likely linked with the developing of exercise addiction (*cytokine hypothesis*)⁵³. Elevated levels of catecholamine have been found during and following exercise and introduce the *catecholamine hypothesis* of exercise dependence⁵⁴. As others behaviours, physical exercise may stimulate the dopamine reward system. Several lines of data, moreover, highlight the involvement of multiple common neurotransmitter systems (e.g., serotonergic, dopaminergic, noradrenergic, opioidergic, glutamatergic) in the pathophysiology of EA.

Discussion

The current knowledge and literature on BAs continue to evolve. Although a large body of literature is available for some disorder (i.e., gambling disorder), for others the available data are often quite anecdotal. The specific characteristics of each of the above mentioned disorders appear to justify their inclusion as a separate diagnostic entity, although, at present, the only two disorders included in DSM-5 are gambling disorder, in the chapter “substance related and addictive disorders”, and internet gaming disorder, in Section III of the Manual, listed among conditions that require further investigation⁴. The initial proposal to include a chapter on BAs in DSM-5 was not adopted, indicating that, at the present time, clinical data for such a step are not sufficiently robust. Nevertheless, gambling disorder was inserted as the sole BA, in the chapter of substance-related disorders. This increased openness displayed by the DSM-5 classification of gambling disorder as a BA, rather than an impulse control disorder as in DSM-IV-TR, seems to open new avenues for additional research in the field¹. Support for reclassifying gambling disorder in DSM-5 has stemmed from several studies in the field of neuroimaging and pharmacological treatment that documented specific involvement of neurotransmitters and receptors and therapeutics known to be involved in substance addictions⁵⁵. Nevertheless, the increasing scientific interest focused on other BAs dictates the need for a clear-cut and well-defined diagnostic classification and a better understanding of the psychopathological features as a prerequisite to prevention, early diagnosis and treatment. The lack of valid specific psychometric tools and frequent comorbidity with other mental disorders further hinders the diagnostic procedure, and complicates epidemiological surveys to assess the real prevalence of a specific BA across different countries and cultures. Even epidemiologic surveys may not be sufficient to support the inclusion of a potential BA in current classification systems. In the case of compulsive shopping, for instance, epidemiologic surveys over the last decade¹⁶ did not result in inclusion in the DSM-5. On one hand, the tendency to classify an increasing number of BAs, and to medicalise these behaviours, is considered by many experts particularly worrisome, such that several authors have suggested that in many cases the behaviours manifested do not represent a series of primary symptoms, but rather symptoms secondary to other mental disorders such as anxiety disorders, mood disorders, personality disorders and ADHD¹¹. On the other hand, the possibility to demonstrate that, at least for some subgroups of patients, BAs can produce measurable functional impairment and reduction of quality of life would help differentiate them from normal behaviours and support their diagnostic classification. Ac-

cordingly, an improved definition of these disorders should be established using uniform diagnostic criteria and following the development of valid screening tools to facilitate the diagnosis and understanding of the correlations between BAs and other psychiatric disorders, both in terms of differential diagnosis and analysis of the frequent comorbidity detected in these subjects. Moreover, in view of the current scarcity of clinical data for most BAs, further studies focusing on longitudinal course, gender implications, help-seeking behaviours, risk factors and protective factors, as well as response to pharmacologic and psychotherapeutic interventions, are needed¹³.

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