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Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

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Background: Behavioral addiction research has been particularly flourishing over the last two decades. However, recent publications have suggested that nearly all daily life activities might lead to a genuine addiction. *Methods and aim:* In this article, we discuss how the use of atheoretical and confirmatory research approaches may result in the identification of an unlimited list of "new" behavioral addictions. *Results:* Both methodological and theoretical shortcomings of these studies were discussed. *Conclusions:* We suggested that studies overpathologizing daily life activities are likely to prompt a dismissive appraisal of behavioral addiction research. Consequently, we proposed several roadmaps for future research in the field, centrally highlighting the need for longer tenable behavioral addiction research that shifts from a mere criteria-based approach toward an approach focusing on the psychological processes involved.

Keywords: behavioral addictions, everyday behaviors, mental health, psychopathology, DSM, diagnosis

Imagine the following situation: DC is a 26-year-old man, currently PhD student (third year) in a prestigious university and has an outstanding track record, since he already has first-authored seven peer-reviewed articles. Yet, despite this promising profile, DC is constantly overwhelmed with intrusive and obsessive work-related thoughts. He checks his mailbox night and day, waiting for potential editorial responses about submitted papers, and constantly monitors his bibliometric performance. Since the beginning of his third year, he has been spending a huge amount of time browsing scientific professional network (e.g., ResearchGate) to compare his performance with those of his colleagues, and feels very excited each time he got new citations. When he feels sad or anxious, to get quick relief, he compulsorily overchecks his CV, last publication, and bibliometric indicators. He unsuccessfully tried to reduce these habits and to diminish his work charge due to incoming conflicts with both his family and friends (e.g., stop working on the weekend). Over the years, he lost some friends and progressively became aware that spending all his time to increase his academic CV will not help him making new ones. He wants to publish more and more, and this is the main interest in his life. Now it is rather clear that this PhD student meets the criteria for a new subtype of workaholism called "Research Addiction". No matter if he is still living alone with his father at the age of 26. No matter if he was exposed to severe psychological abuse by his mother during his entire childhood and has never been in a relationship. No matter if he is characterized by a narcissistic personality. Yes, it does definitively fit with the criteria for "Research Addiction".

Without any doubt, we assume that any mental health scholar or practitioner, irrespective of his/her clinical experience, should casually laugh in reaction to the aforementioned definition. Yet this description should not appear as totally unrealistic; there are unfortunately more than enough recent publications that created innovative yet absurd addictive disorders as we just did. The difference is that these papers did not intend to make it as a spoof. Consequently, in this article, we will discuss how the use of atheoretical and confirmatory approaches in the understanding of excessive behaviors might result in the identification of such awkward "new" behavioral addictions. As we will argue, many of these resulting constructs have neither specificity nor external and clinical validity. Just as we did through our fictive new addictive disorder, this could weaken and shatter rather than improve the understanding and the soundness of clinical directions in behavioral addiction research.

BEHAVIORAL ADDICTIONS – A PLAGUE OF OUR ERA?

In a seminal work, Isaac Marks (1990) introduced the construct of "non-chemical addictions". Since Marks' initial proposal, the addiction research field has endorsed the term "behavioral addiction", leading to the flourishing accretion of publications (see Figure 1) in key journals in the addictive behaviors research field (e.g., *Addiction, Addictive Behaviors, Psychology of Addictive Behaviors*). Likewise, since 2012, this enthusiasm has culminated through the enactment of *Journal of Behavioral Addictions,* a peer-review journal entirely assigned to this concept.

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In 2013, a major step towards the recognition of behavioral addictions as psychiatric diagnoses has been reached when "pathological gambling", renamed "gambling disorder", was aligned alongside other addictive behaviors in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) of the American Psychiatric Association (APA, 2013). It is here important to mention that decades of empirical research have been conducted before this disorder was officially recognized as an addictive disorder in the DSM-5. Crucially, this change in the classification of gambling disorder was fostered by an accumulation of data supporting similarities with substance addictions. For instance, akin neurobiological alterations were found in gambling and substance disorders (e.g., Grant, Brewer & Potenza, 2006; Potenza, 2008). Likewise, analogous impairments in cognitive mechanisms were identified, including high-level of impulsivity, poor top-down executive control, myopia toward delayed outcomes of choices, and over-sensitivity to addiction-related cues (e.g., Clark, 2010; Goudriaan, Oosterlaan, de Beurs & van den Brink, 2006). Further ammunitions for skeptics came from the recent inclusion in DSM-5 Section III (i.e., emerging measures and models) of another type of behavioral addiction, namely "Internet Gaming Disorder". This inclusion is disputable and maybe premature, since there are several classification inconsistencies in prior studies as well as poor evidence regarding its etiology and course (Petry & O'Brien, 2013; Schimmenti, Caretti & La Barbera, 2014). However, this inclusion has already resulted in several epidemiological studies and research programs testing the fuzzy boundaries of this new addictive disorder (Ko et al., 2014; Rehbein, Kliem, Baier, Mössle & Petry, 2015).

Capitalizing upon the growing evidence that linked gambling disorder (and, to a lesser extent, Internet-related disorders) to substance use disorder, scholars have conceptualized a wide range of daily behaviors as prospective "new" behavioral addictions. Most of the time, this was based on the *observation* that excessive involvement in those activities is associated with key addiction symptoms such as *apparent* tolerance and withdrawal, loss of control, craving, cognitive salience, or mood regulation. Examples of dysfunctional conducts that are often described as behavioral addictions include (but are not limited to) hyper-sexuality, compulsive buying, binge eating, excessive work involvement ("workaholism"), or excessive physical exercise (Demetrovics & Griffiths, 2012). In fact, according to the criteria commonly used to identify behavioral addictions, it is likely that the excessive involvement in any type of activity can be considered as a psychiatric disorder (see Mihordin, 2012, for a critical discussion and an illustration applied to model railroading). This phenomenon is not anecdotic and is susceptible to result in a severe overpathologization of everyday behaviors.

HOW TO CREATE NEW DIAGNOSES BASED ON OLD RECIPES?

The principle behind the creation of new behavioral addictions diagnoses is often quite straightforward and mostly

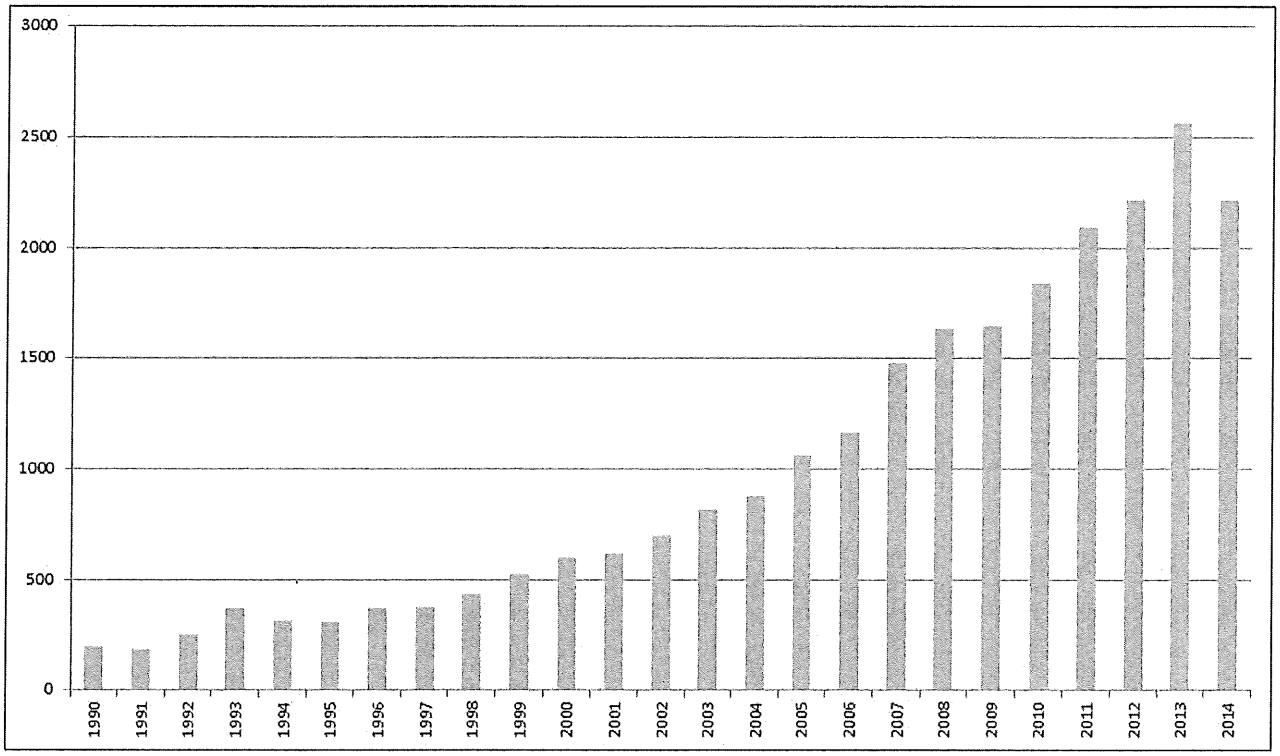

Figure 1. Behavioral addiction papers published between 1990 and 2014

Note: The research was performed on PUBMED. All articles included mentioned either "behavioral addiction" or "behavioural addiction" as keywords. The highest number of published papers was in 2013 ($n = 2563$), the year in which the DSM-5 was released. The research was performed in February 2015.

follows an atheoretical and confirmatory approach consisting in three steps. First, based on anecdotal observations, the targeted behavior is *a priori* considered as an addictive behavior. Then, screening tools are developed according to the traditional substance abuse criteria. Eventually, studies are conducted to determine whether risk factors (e.g., biological, psychosocial) known to play a role in the development and maintenance of substance addictions (e.g., impulsivity traits, attentional biases) are associated with the new addictive disorder.

Although this three-step approach can be highlighted in numerous attempts to identify and characterize new behavioral addictions (for an illustration applied to mobile phone, see Billieux, Philippot et al., 2014), we decided to rely here on a prototypical illustration provided by Targhetta, Nalpas and Perne (2013), where they proposed that the high commitment in Argentine tango can be viewed as a behavioral addiction.

The first step of the approach – i.e. the adoption of a confirmatory approach derived from an anecdotal observation – is well identified in the introduction when the authors describe the way they discovered a case of an Argentine tango addict.

"At the end of a 10-day tango festival, RT [one of the authors of the paper] noticed a dancer presented by the tango teacher as the only dancer who attended the milonga (place for the tango dancing) every night from the opening to the end of the session. RT developed a friendly relationship with this dancer and throughout their discussions RT suspected this dancer could be "addicted" to tango. Therefore, RT proposed to the dancer to conduct a complete interview, aiming to verify this hypothesis [...] (p. 179)."

Based on this initial observation, they decided to carry on an exploratory survey to determine the prevalence and characteristics of Argentine tango addiction. This last point brings us to the second step of the approach, which is the development of a screening instrument based on the hypothesis that excessive involvement in Argentine tango falls under the spectrum of addictive disorders. Here, Targhetta et al. (2013) have developed a questionnaire based on both DSM-IV criteria for substance dependence and Goodman's (1990) criteria for addictive disorders. As an illustration, Goodman's criteria E1 (cognitive salience) and E6 (giving up of recreational, occupational or social activities) were translated into the following item: "I organize my vacation in relation to tango dancing".

Although developing items assessing loss of control, negative outcomes, craving, withdrawal, or mood modification with respect to any kind of behaviors is usually pretty straightforward, it is here worth noting that the challenge is quite harder when it comes to conceptualizing and operationalizing the dimension of tolerance, one of the key features of addiction. Several unfortunate proposals can be identified in the literature. For example, in a highly cited editorial, Block (2008) proposed that tolerance, in the framework of Internet addiction, "is reflected by the need for better computer equipment, more software, or more hours of use" (p. 306). Another example is when Chóliz (2010) argued that tolerance, in the framework of mobile phone addiction, results in "a gradual increase in mobile phone use to obtain the same level of satisfaction, as well as the need to substitute operative devices with the new models that appear on the market" (p. 374). Clearly, such proposals unfortunately index the poor operationalization of these constructs that often characterizes the translation of the biomedical substance abuse into excessive behaviors. Facing the same challenge, Targhetta and colleagues (2013) assessed Argentine tango tolerance with the following item:"At the beginning of tango dancing, I needed to increase my time of dancing (excepted that devoted to learning)". Obviously, the need to increase the time spent in a specific behavior can be driven by various motives, especially at the early stages of involvement, and these motives are mostly unrelated to tolerance symptoms. For example, they might be related instead to the development of new competencies and skills, which can represent a powerful reinforcement and can increase self-efficacy and self-esteem. As an illustration, no one would argue that an adolescent boy who starts playing guitar or piano for hours and hours and finds much pleasure in doing this is developing tolerance towards the behavior and/or "music addiction". Moreover, if such behavior helps the adolescent to feel accepted by his peers, or to impress the girl he likes, no one would say that the excessive behavior is dysfunctional or testifying the development of an addiction.

The third step consists in establishing the biopsychosocial correlates of the new identified behavioral addiction by relying on available evidence in substance addiction (or more strongly established behavioral addiction like disordered gambling). Unsurprisingly, these studies almost systematically emphasized moderate to strong relationships between the targeted constructs (e.g., impulsivity traits) and the presence of addiction symptoms. Indeed, as the items assessing the targeted construct were based on the substance abuse framework, it is obvious that correlations with established risk factors for substance disorders will be found. In the case of tango addiction, it can easily be hypothesized that items such as those developed by Targhetta and colleagues (2013) will correlate with constructs such as impulsivity (e.g., items assessing loss of control), sensation seeking (e.g., items assessing hedonic aspects of tango), and neuroticism (e.g., items assessing mood regulation or stress reduction).

Today, the behavioral addiction research field is invaded by an increasing number of studies that creates new psychiatric disorders by endorsing concepts and models that were based on decades of research and were validated for other disorders (mainly substance use, gambling, and Internet gaming disorders). The intrinsic problem of such an *atheoretical* and *confirmatory* approach is that it lacks specificity. Thus, based on deductive quantitative studies, new behavioral addictions are described, along with their diagnostic criteria and prevalence in the community. Nonetheless, at the same time, we cruelly lack a theoretically sound model that can specify the unique factors and processes involved, as well as of preliminary qualitative studies that allow understanding the phenomenology and specificity of these problematic behaviors. Moreover, these studies often rely on the assumption that, because the new category they developed only concerns a small part of the whole sample, it does identify disorder. However, statistical deviance alone often fails to identify disorders. Not all disorders are rare (e.g. nicotine addiction, concerning a third of the adult population worldwide), and conversely most rare conditions (e.g., very high intelligence or a virtuosity in piano playing) are not disor-

ders (McNally, 2011). Eventually, most studies conducted to identify new behavioral addictions fail to consider two factors that are in our view mandatory to define a pathological condition, namely functional impairment (i.e. significant deleterious impact on the daily life) and stability of the dysfunctional behavior. With regard to these particular issues, a recent 5-year longitudinal study (Konkolÿ Thege, Woodin, Hodgins & Williams, 2015) shed some light on the natural course and impact of several behaviors often considered as behavioral addictions (i.e., exercising, sexual behavior, shopping, online chatting, video gaming, problem eating behaviors). This study showed that the excessive involvement in the targeted behaviors (reflected by self-reported functional impairment) tends to be fairly transient for most individuals. Importantly, such type of data supports the view that excessive behaviors are often context-dependent, and that spontaneous recovery is frequent (for similar findings in the field of gambling disorders, see Slutske, 2006).

SYNDROMES VERSUS PROCESSES – CLINICAL IMPLICATIONS

The "addiction model" is nowadays frequently applied to excessive behaviors. This phenomenon is largely explained by accumulating evidence suggesting an overlap among social, psychological and neurobiological factors involved in the etiology of substance and behavioral addictions (i.e. the third step of the approach described above). The main consequence of such an approach is that individuals who exhibit *behavioral addiction symptoms* are usually treated with standardized interventions that have been proven effective for patients presenting *substance addiction issues*. In fact, such an approach, which is diagnostic-centered, might lead to neglecting the key psychological processes (motivational, affective, cognitive, interpersonal, and social) sustaining the dysfunctional involvement in a specific conduct (Dudley, Kuyken & Padesky, 2011; Kinderman & Tai, 2007).

As an illustration, recent research supports the view that considering the *function* of multiplayer online games (MOG) is fundamental to understand their excessive use. Accordingly, identifying the various individual motives that drive online gaming is a requirement for the understanding of a dysfunctional usage and the elaboration of tailored psychological interventions (Billieux et al., 2013; Demetrovics et al., 2011; Schimmenti & Caretti, 2010). In the same vein, recent studies have evidenced that similar symptoms (e.g., loss of control over gaming or negative outcomes resulting from over-involvement) are involved in distinct online gaming motives. While dysfunctional gaming may result from a desire of game achievement (e.g., owning a powerful avatar or becoming the master of a recognized guild, see Billieux et al., 2013), it can also be conceived as an avoidance strategy to face negative life events (e.g., the loss of a job, the confrontation to a trauma) or social anxiety (Kardefelt-Winther, 2014; Schimmenti, Guglielmucci, Barbasio & Granieri, 2012). Consequently, each of these subtypes will require distinct and individualized psychological interventions (Billieux, Thorens et al., 2015). At a more global level, a decade of both qualitative and empirical research supports that problematic involvement in MOG depends on a constellation of factors that are unique to this activity and not necessarily relevant when considering other types of "Internet addictions" (for instance, cybersex or social networks problematic use; Billieux, Deleuze et al., 2014).

To conclude, we would like to emphasize that the objective of the current paper was neither to minimize the obvious negative outcomes and psychological distress that can result from the dysfunctional involvement in specific activities, nor to refute the notion that these disorders can in some cases be conceptualized (and treated) as addictive behaviors. Nonetheless, our major aim was first to emphasize how everyday life behaviors tend to be too easily overpathologized and considered as behavioral addictions. Consequently, we centrally wanted to point out the multi-faceted nature and heterogeneity of these disorders that is too often neglected in favor of a simplistic symptomatic description.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

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This commentary supports the argument that there is an increasing tendency to subsume a range of excessive daily behaviors under the rubric of non-substance related behavioral addictions. The concept of behavioral addictions gained momentum in the 1990s with the recent reclassification of pathological gambling as a non-substance behavioral addiction in DSM-5 accelerating this process. The propensity to label a host of normal behaviors carried out to excess as pathological based simply on phenomenological similarities to addictive disorders will ultimately undermine the credibility of behavioral addiction as a valid construct. From a scientific perspective, anecdotal observation followed by the subsequent modification of the wording of existing substance dependence diagnostic criteria, and then searching for biopsychosocial correlates to justify classifying an excessive behavior resulting in harm as an addiction falls far short of accepted taxonomic standards. The differentiation of normal from non-substance addictive behaviors ought to be grounded in sound conceptual, theoretical and empirical methodologies. There are other more parsimonious explanations accounting for such behaviors. Consideration needs to be given to excluding the possibility that excessive behaviors are due to situational environmental/social factors, or symptomatic of an existing affective disorder such as depression or personality traits characteristic of cluster B personalities (namely, impulsivity) rather than the advocating for the establishment of new disorders.

Keywords: behavioral addictions, mental health, DSM-5, excessive behaviors

The article "Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research" by Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) highlights the threat to the concept of 'behavioral addiction' as a valid construct posed by the propensity for researchers and clinicians to overpathologize normal daily activities carried out to excess. The observation that some individuals exhibit an affinity, propensity or devotion to repeatedly engage in appetitive behavior is not new. The classical Latin term, 'addĭctus' (*ad:* 'to'; *dictus:* 'say or declare') refers to the concept of an individual being assigned by decree, made over, bound, or devoted to another or a thing (Online Etymology Dictionary). Historically, the term evolved to define a pathological condition involving the compulsive use of a substance and characterized by impaired control, tolerance and withdrawal symptoms (American Psychiatric Association, 2013). The present challenge remains as to how best to classify excessive behaviors within a taxonomic system that takes into account implications, if any, for diagnosis and management. Classification systems are designed to operationally define criteria that allocate cases to a particular disorder based on etiological and symptomatic similarities. Differentiating one disorder from another is useful in informing which appropriate treatment interventions ought to be applied.

As Billieux, Schimmenti et al. (2015) note, Marks (1990) suggested that a range of non-chemical behaviors could be subsumed under the label of addiction given putative similarities in their presentation. However, it is important to highlight that Marks included a mix of psychiatric disorders (obsessive compulsive, kleptomania, bulimia, and paraphilias) and normal behaviors engaged to excess (compulsive spending, overeating, and hypersexuality) for consideration. Unifying these behaviors under the concept of addiction was the presence of dysregulated impulse control and self-regulation as evidenced by persistent use despite negative consequences. Although opining that repetitive behaviors as addictive syndromes offered useful heuristics in guiding therapeutic interventions, he noted that these behaviors also manifested many differences in addition to similarities, and that further research was required. That similarity exists in the overt manifestation of these behaviors does not necessarily mean that they constitute a unified set of disorders.

Nevertheless, following Marks' (1990) perspective, researchers have argued that the inherent similarities observed in the clinical course, symptoms, neuroscience, and response to treatment between substance and non-substance behaviors justify the inclusion of non-chemical behaviors under the addiction banner. In contrast, one concern related to DSM-5 (American Psychiatric Association, 2013) has been the potential implications of reclassifying pathological gambling as a non-substance behavioral addiction within the category of Addiction and Related Disorders in DSM-5 (American Psychiatric Association, 2013). This concern, now bearing justification, is that a range of repetitive appetitive behaviors carried to excess are increasingly argued to meet relevant criteria for inclusion within the behavioral addiction taxonomy. The literature is now replete with examples of activities that are carried to excess and labeled addic-

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tions; problem mobile phone use (Bianchi & Phillips, 2005; Lin et al., 2014), compulsive buying (Muller, Mitchell & de Zwaan, 2015); problematic video game play (Coeffec et al., 2015; Jap, Tiatri, Jaya & Suteja, 2013); Internet (Young, 1998); food (Schulte, Avena & Gearhardt, 2015); dance (Maraz, Urban, Griffiths & Demetrovics, 2015; Targhetta, Nalpas & Perney, 2013); fortune telling (Grall-Bonnec, Bulteau, Victorri-Vigneau, Bouju & Sauvaget, 2015), and study (Atroszko, Andreassen, Griffiths & Palleson, 2015).

Demonstrating the potential limitless boundary of such behaviors, Griffiths (2015) briefly reviewed the literature on 'water addiction' and concluded that "... it is theoretically possible for someone to become addicted to water and that there is no real difference to drug addictions in terms of conceptualization and mechanism – just that the sheer amount of water that needs to be drunk to have a negative effect is large and highly unlikely". Similarly, he describes several media reports that refer to some females exhibiting features suggesting the presence of an IVF addiction. Although extreme, these examples demonstrate the ease with which the number of identified addictive behaviors can proliferate.

Billieux, Schimmenti et al.'s article (2015) usefully highlights the potential pitfalls involved in the uncritical acceptance of labelling excessive behaviors as addictions. It becomes attractive for researchers to gain prominence by introducing a new disorder into the domain in the absence of adequate operational criteria defining symptoms, or taking into account alternative etiological and diagnostic factors. The three steps described by Billieux, Schimmenti et al. (2015) – observation, development of a screening instrument copied from other disorders, and searching for confirmatory biological correlates – are insufficient in validating the discovery of a new disorder. For example, preoccupation, tolerance and withdrawal symptoms have been described as the hallmark features of a range of behavioral addictions without any consideration given to operationally defining the distinguishing criteria for these symptoms (Billieux, Maurage, Fernandez-Lopez, Kuss, & Griffiths, 2015). The presence of these symptoms is accepted more through the process of repetition and multiple cross referencing by researchers than empirical data derived from comparative studies. For behaviors such as smartphone, Internet and video gaming, the notion of defining tolerance or preoccupation can take on absurd qualities. It is patently absurd to argue that purchasing the latest technology or multiple phones is equivalent to tolerance, or that always accessing e-mail messages on these devices reflects a preoccupation. Here, it is argued, is the failure to distinguish between popularity and absorption in an enjoyable activity, and work/recreational communication needs, with a need to increase consumption to generate the same level of excitement. To date, no studies have empirically evaluated the defining features of preoccupation, withdrawal and tolerance in Internet oriented or daily behavioral addictions. Similarly, in the more researched domain of gambling disorders only two or three methodologically flawed studies exist comparing these features with those found in substance addiction (Blaszczynski, Walker, Sharpe & Nower, 2008). How then does the absence of any empirical studies comparing these features across behaviors justify or support the validity of the use of these items in any diagnostic screening instrument?

Of course, preoccupation, tolerance and withdrawal appear not necessary for behaviors to be considered an addiction. According to Schute et al. (2015), food addiction is characterized by the presence of loss of control, persistence despite negative consequences, and inability to cut down despite the desire to do so. Similarities in biologically-based reward system dysfunctions involving dopaminergic neurotransmitters found in both patterns of eating certain foods and substance addictions further reinforce the concept of an excessive behavior as an addiction.

It is not disputed that these behaviors when taken to excess result in significant detrimental outcomes. Significant psychological and physical harms may emerge as a result of chronically consuming a diverse range of consummatory activities to extreme ends. What is questioned is the necessity to pathologize these behaviours by framing them as addictive disorders, the failure to consider alternative etiological explanations, and the implications for treatment based on taxonomy.

Pathological or gambling disorders can be used as an illustrative case. Originally classified as an impulse control disorder, comparative studies confirmed the presence of clinical and phenomenological similarities between pathological gambling and other conditions contained within that category (McElroy, Hudson, Pope, Keck & Aizley, 1992). Findings of elevated impulsivity traits consolidated the validity of its classification. McElroy et al. (1992) concluded that the conditions contained within the impulse control disorders category appeared to be related to one another and to mood, anxiety, and psychoactive substance use disorders. Ironically it seems the same arguments justifying the reclassification of gambling disorder as an addiction (similarity of features) were earlier applied to its justification as an impulse control disorder.

However, has the reclassification led to any beneficial outcomes or advantage? Setting aside the fact that relocating pathological gambling to the non-substance behavioral addiction category served to legitimize the condition and increase the potential for research funding, this reclassification has had no impact on its diagnosis, management, or outcome. With the exception of dropping the illegal act criterion and reducing the threshold from five of ten to four of nine criteria, there is no change in the diagnostic process or content of screening instruments. Further, no implications are borne for the treatment and management of the condition with the same interventions applied when classified as an impulse control disorder prior to DSM-5. Indeed, as stated by Grant and Chamberlain (2015), "... the evidence-based psychosocial treatments for gambling disorder have not aligned identically with traditional substance addiction treatment" (p. 129), although some treatments are commonly effective across both conditions: motivational interviewing, cognitive-behavioral treatment (Grant & Chamberlain, 2015).

Lesieur and Rosenthal (1991) modeled the diagnostic criteria for pathological gambling on items derived from the substance dependence category. Using this as a template, and with scant regard to conceptual, theoretical or phenomenological features, researchers are now simply substituting and/or modifying the relevant wording to define a range of non-substance related behaviors as addictions. As Billieux, Schimmenti et al. (2015) correctly note in their paper, the

field needs to take a step back and consider the direction being taken. Minimal attempts have been made to operationally define criterion items, and to distinguish behaviors that are stimulating, enjoyable and popular such that the individual prefers to pursue these accepting the opportunity costs and impact on other aspects of his/her functioning. Athletes and serious hobbyists may spend hours and money engaged in training and purchasing items at the expense of alternative options, for example, training daily with the risk of injury and no career options as a back-up, collecting expensive stamps in preference to taking holidays.

Billieux, Schimmenti et al. (2015) make an excellent contribution to the debate by questioning the validity and utility of assuming a range of daily behaviors to be pathological. The end result is a dilution of the concept of a non-substance behavioral addiction with the threat of throwing out the baby with the bathwater. What is required is more empirical research directed toward operationally defining the criteria delineating behavioral addictions and differentiating these behaviors from other disorders or situational environmental contributions.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

On functional and compulsive aspects of reinforcement pathologies

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Background: This paper is a commentary to a debate article entitled: "Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research", by Billieux et al. (2015). *Methods and aim:* This brief response focused on the necessity to better characterize psychological and related neurocognitive determinants of persistent deleterious actions associated or not with substance utilization. *Results:* A majority of addicted people could be driven by psychological functional reasons to keep using drugs, gambling or buying despite the growing number of related negative consequences. In addition, a non-negligible proportion of them would need assistance to restore profound disturbances in basic learning processes involved in compulsive actions. *Conclusions:* The distinction between psychological functionality and compulsive aspects of addictive behaviors should represent a big step towards more efficient treatments.

Keywords: substance addiction, behavioral addictions, DSM, compulsion, inflexibility, comorbidity

In their debate paper, Billieux, Schimmenti, Khazaal, Maurage & Heeren (2015) presented an interesting thought-provoking analysis of the contemporary tendency to inherently identify the excessive enactment of incentive activities (e.g. sex, shopping, social-network, work, exercise, gambling) as medical/psychiatric entities, that is, "behavioral addictions". According to the authors, "the behavioral addiction research field is invaded by an increasing number of studies that creates new psychiatric disorders by endorsing concepts and models that were based on decades of research and were validated for other disorders" (Billieux et al., 2015, p. 8). We agree with this criticism and suggest that as a result, such approach might override the determinants of the *psychological homeostasis* and/or *compulsive* aspects attached to the excessive enactment of specific behavioral patterns. Indeed, problematic involvement in behaviors depends on a constellation of factors that are unique to the specific conduct (Blaszczynski & Nower, 2002). For instance, excessive use to online games could result from the need to experience reward (positive reinforcement such as a desire of game achievement) or to cope with negative psychological states (negative reinforcement such as an avoidance strategy to face negative life events or social anxiety). In other terms, long before becoming a problem (because of unambiguous related deleterious consequences), addictive behaviors were a solution. Differently, compulsive behaviors engage action control for which past utilities are divorced from the outcomes that they predict (for a review of the distinction between goals and habits in the brain, see Dolan & Dayan, 2013). In this context, the disease conceptualization of addictive behaviors associated with an overreliance on confirmatory and atheoretical quantitative studies could limit our understanding of these problematic behaviors and could lead to standardized interventions that are likely to be inaccurate and poorly efficient.

ABOUT THE RISK OF OVERPATHOLOGIZING EVERYDAY LIFE REINFORCEMENT ACTIVITIES

In support of the *over-pathologizing* hypothesis of excessive involvement in behaviors, such as excessive exercising, sexual behavior, shopping, online chatting, video gaming, are works demonstrating that those behaviors are fairly transient for most people (Konkolÿ Thege, Woodin, Hodgins & Williams, 2015). This lack of robustness of the abnormal conduct supports the view that excessive behaviors are often context-dependent which, in turn, reinforce the relevance of a functional – process-based – approach of behavioral addictions. However, ample evidence showed that a majority of individuals with substance dependence overcame life-time ICD-10 or DSM-IV dependence without any form of professional help, a phenomenon called *self-change* or *natural recovery* (for a review, see Klingemann, Sobell & Sobell, 2010). Hence, by being "the rule rather than the exception" in both substance and non-substance addictions, natural recovery challenged a classic "disease model" of excessive behaviors viewing addiction as an irreversible and inexorably progressive process due to some inborn charac-

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teristics in certain people (Blomqvist, 2007). Noteworthy, proportions of self-recovery observed in behavioral addiction seem to be higher than those highlighted in substance addiction (Konkolÿ Thege, Woodin et al., 2015). Nevertheless, while such difference in self-recovery frequency could be a marker of a greater addiction liability for substance abuse (see also Koski-Jännes, Hirschovits & Pennonen, 2012; Konkolÿ Thege, Colman et al., 2015), it does not necessarily preclude that behavioral addictions could be underlined by comparable psychological homeostatic constraints (i.e., functional addiction) and even possible *compulsive* engagements (i.e., compulsive addiction) than those observed in addictive disorders already listed in the DSM-5 (Grant & Chamberlain, 2013; Yau & Potenza, 2015).

FROM FUNCTIONAL AND COMPULSIVE ASPECTS OF ADDICTIVE BEHAVIORS

Compulsion refers to the idea that a given behavior persists because of its enduring incentive properties despite of changes in action values (negative or punishing outcomes; el-Guebaly, Mudry, Zohar, Tavares & Potenza, 2012; Everitt & Robbins, 2005; Graybiel, 2008). Put differently, the persistence of actions could involve from action-outcome (or goal-directed) behaviors, including a valuation stage optimizing its utility (e.g. coping with negative psychological states, see for instance the self-medication hypothesis of addiction, Khantzian, 1985), to automatic and inflexible stimulus-response sequences, not including a valuation stage, thus representing a key mechanism underlying the development of compulsive (e.g.) drug seek and high vulnerability to relapse; (Belin, Jonkman, Dickinson, Robbins & Everitt, 2009). Hence, the key question here is whether excessive involvement in behavioral routines – targeted by the label "behavioral addiction" – becomes so deeply ingrained that it could resist *functional* contextual changes (i.e. compulsion).

Despite of a growing number of similarities (shared biological, psychological, social vulnerabilities for instance) found between substance and non-substance use disorders (e.g. excessive gambling; for a review, see el-Guebaly et al., 2012; Leeman & Potenza, 2012), we believe that a clear response to this question has not been provided yet. This could be due to the challenging task of operationalizing and measuring the concept of *compulsion* in humans (Everitt & Robbins, 2005; Sjoerds et al., 2013; Voon et al., 2015). For instance, in rodents, compulsive behavior was operationalized as a resistance to the degradation of the reinforcer, that is, 15–20% of rats self-administering cocaine for several weeks kept pressing the lever despite that cocaine delivery was replaced with electric shocks (Deroche-Gamonet, Belin & Piazza, 2004). Interestingly, this behavior inflexibility has been associated with a persistent impairment in synaptic plasticity in the nucleus accumbens (Kasanetz et al., 2010) and hypoactive prelimbic cortex neurons (Chen et al., 2013). Importantly, this compulsive state is associated with both increased impulsivity and novelty seeking (Belin, Mar, Dalley, Robbins & Everitt, 2008).

Based on these important findings, one could expect that individuals with compulsive addiction exhibit a massive dysexecutive syndrome including poor response inhibition. In fact, approximately one in two pathological gamblers has response inhibition deficits as measured by a stop signal task (Billieux et al., 2012) and this proportion could be similar in substance use disorders (for alcohol dependence, see Ihara, Berrios & London, 2000). Thus, possible involved mechanisms might differ greatly from two persons sharing pivotal DSM criteria of addiction disorders (e.g. diminished ability to resist an impulse to enact the [problem behavior] despite serious or adverse consequences of the [problem behavior]; American Psychiatric Association, 2013). In absence of unambiguous neurocognitive impairments affecting basic learning processes (for a discussion, see Noël, Brevers & Bechara, 2013a, 2013b), addictive behaviors remain best explained by psychological theories (e.g. the self-medication hypothesis; Khantzian, 1985). In other words, although damaging, addictive behaviors may still possess some protective aspects (addiction as a coping strategy). Because diagnoses in the field of addiction are still very descriptive (craving, tolerance, dependence, etc.) as opposed to biology-based, any conclusion regarding the nature of so-called *behavioral addictions* remains tentative.

Recent studies highlighted that cues associated with social network, cybersex, or buying addictions activate cognitive processes (e.g. automatic approach tendencies, craving, cue reactivity; Brand et al., 2011; Hormes, Kearns & Timko, 2014; Laier, Schulte & Brand, 2013; Snagowski & Brand, 2015) and the brain reward system (Georgiadis & Kringelbach, 2012; Raab, Elger, Neuner & Weber, 2011; Turel, He, Xue, Xiao & Bechara, 2014) in much the same way that a drug does. Nevertheless, while these studies deliver insightful information on automatic-incentive approach tendencies toward addiction-related cues, they did not focus on the inflexible stimulus-response aspect of compulsive behaviors. One possible direction would be to examine flexibility capacity, using both addiction and non-addiction related paradigms, in individuals scoring low or high scores on a (specific) behavioral addiction scale. For instance, Boog et al. (2014) showed that problem gamblers exhibit cognitive inflexibility during monetary-reward decision-making, but not during a task assessing cognitive flexibility without monetary reward. Lack of flexible decision and action has also been evidenced in a recent study examining the impact of proactive motor response on monetary risk-taking in low and high problem gamblers (Stevens et al., 2015). In this study, occasionally stopping a response decreased monetary risk-taking in low-problem gamblers but not in high-problem gamblers, which indicates that gambling disorder is associated with a high degree of inflexibility toward the action of gambling. Thus, the examination of inflexibility toward addiction-related behaviors should shed some light on whether "out of the norms" deviations in our daily life incentive habits could evolve into persistent "out of sync" schema of actions.

Additional descriptive and epidemiological studies are also needed in order to enhance our understanding of the phenomenology of behavioral addiction. For instance, gambling runs along with other addictions in the same families (Yau & Potenza, 2015). Retrospective (Hodgins & el-Guebaly, 2000, 2004) and prospective (Hodgins & el-Guebaly, 2004; for ongoing studies with a validated protocol, see Kushnir, Cunningham & Hodgins, 2013) studies on gambling disorder have provided insightful information on

processes responsible for driving and maintaining problem gambling, but also on factors promoting changes and recovery from gambling disorder (e.g. types of "willpower" and goal commitment strategies, reports on the psychological benefit of maintaining the state of change, moderation versus abstinence). These studies should also bring information on the ease with which behavioural routines bounce back after extinction (i.e. relapse rate, precipitants to relapse). Besides, further research is needed in order to further examine whether behavioral and substance-related conducts represent distinct addictions or whether they are different expressions of a core addiction syndrome (e.g. Blanco et al., 2015). Indeed, current scientific and empirical evidence on whether behavioral addiction could occur without comorbid addiction disorder (e.g. compulsive buying without binge eating or substance abuse; Müller, Mitchell & de Zwaan, 2015) or shared common developmental pathways (e.g. shared biological, personality and neurocognitive markers of impulsivity; Yau & Potenza, 2015) remains insufficient.

To sum up, this brief response to Billieux et al.'s paper focused on the necessity to better characterize psychological and related neurocognitive determinants of persistent deleterious actions associated or not with substance use. The distinction between psychological functionality and compulsion should represent a big step towards the clarification of core addictive action determinants (e.g. model-based versus model-free systems; Daw, Niv & Dayan, 2005). Coherently, whether a majority of addicted people could be driven by psychological functional reasons to keep using drug, gambling or buying despite the growing number of related negative consequences, a non-negligible proportion of them would need assistance to restore profound disturbances in basic learning processes (e.g. overreliance of their habit system; Sjoerds et al., 2013; Voon et al., 2015).

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

On the slippery slopes: The case of gambling addiction

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Billieux et al. (2015) propose that the recent proliferation of behavioral addictions has been driven by deficiencies in the underlying research strategy. This commentary considers how pathological gambling (now termed gambling disorder) traversed these challenges to become the first recognized behavioral addiction in the DSM-5. Ironically, many similar issues continue to exist in research on gambling disorder, including question-marks over the validity of tolerance, heterogeneity in gambling motives, and the under-specification of neuroimaging biomarkers. Nevertheless, I contend that the case for gambling disorder as a behavioral addiction has been bolstered by the existence of clear and consistent functional impairment (primarily in the form of debt), coupled with the development of a public health approach that has given emphasis to product features (i.e. the structural characteristics of gambling forms) as much as individual dispositions (the 'addictive personality').

Keywords: pathological gambling, video games, addiction, tolerance, neuroimaging, structural features

Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) articulately explain how the recent proliferation of soft behavioral addictions could arise from a circular research approach, involving 3 stages. The first step is the derivation of a screening tool, based on adapting established criteria for substance use disorders. The second step is the confirmation in epidemiological datasets that some prevalence of the putative addiction exists in the general population. The third step is the testing for neurocognitive markers in the putative addiction, when those markers are themselves derived from the same essential criteria (albeit in substance use disorders). The widespread emergence of this approach has likely been fueled by the ratification of 'behavioral addiction' via the case of gambling disorder (previously termed pathological gambling) in the DSM-5 (Petry et al., 2014).

Billieux et al. (2015) imply that this current conceptualization of gambling disorder was validated by "decades of empirical research". Reading their article, I was prompted to reconsider how (or indeed whether) gambling disorder successfully overcame these hurdles that other putative behavioral addictions now face. Certainly, similar controversy existed around the time that the DSM-III introduced the pathological gambling diagnosis in 1980 (Lesieur, 1984). Indeed, when taken in isolation, many specific lines of evidence in gambling disorder remain open to criticisms analogous to those raised by Billieux et al. (2015). I will consider three examples. First, Billieux et al. (2015) question the validity of tolerance in behavioral addictions. Tolerance is often regarded as one of the hallmarks of an addiction syndrome (Shaffer et al., 2004). In the case of gambling, individuals with gambling disorder clearly play with progressively larger sums of money over time, and many screening instruments include an item that refers to escalating bet size. However, this effect may have a distinct motivation from the phenomenon in substance use disorders, where an opponent process causes the addicted individual to require higher doses of drug to achieve the same subjective effect. In gambling disorder, it is not clear that the increasing wagers are necessary for need satisfaction; an accumulation of debt may entirely justify the need to escalate one's bet (Blaszczynski, Walker, Sharpe & Nower, 2008).

Second, Billieux et al. (2015) propose that a common symptom presentation (e.g. of multiplayer online game addiction) can arise from profoundly different psychological motives. Such heterogeneity in motives clearly also exists in gambling disorder. Factor analytic studies differentiate coping motives (gambling to escape), enhancement motives (gambling for excitement) and socializing motives (Stewart & Zack, 2008), with some dispute over the place of money as a motivating factor (Flack & Morris, 2014). Different preferred forms of gambling and mental health co-morbidities may align with these motives (Blaszczynski & Nower, 2002) with implications for treatment tailoring.

Third, the search for biomarkers for gambling disorder has entered an interesting phase. Using functional MRI, a substantial number of studies have focused attention on the 'brain reward system' (centered on the ventral striatum and medial prefrontal cortex) but the direction of group differences in these regions is inconsistent (Limbrick-Oldfield, Van Holst & Clark, 2013). A similar number of studies describe over- and under-activity in groups with gambling disorder; results tend to be interpreted with two distinct

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theoretical positions, reward deficiency versus incentive salience (Leyton & Vezina, 2013). PET data looking at brain neurochemistry are even stranger, where dopamine tracers yield little overlap in the signature of gambling disorder and substance use disorders (Boileau et al., 2014; Clark et al., 2012). One possibility is that the effects in substance use disorders are drug-induced (e.g. cocaine neurotoxicity). Another distinct possibility is that the biomedical model of addictions represent an over-simplification in the case of gambling disorder (c.f. Hall, Carter & Forlini, 2015; Nutt, Lingford-Hughes, Erritzoe & Stokes, 2015).

One salient riposte to these debates comes in the form of functional impairment. For clinicians, this point goes without saying; clients do not present to services seeking help without some form of functional impairment (this may be perceived by family or the legal system rather than directly by the individual). In the case of gambling disorder, financial debt is ubiquitous, crippling, and pernicious, drawing friends and family quickly into the spiral of harms. It is not uncommon for individuals with gambling disorder to become homeless, attempt suicide or resort to crime, as direct responses to their mounting debts (Clark & Walker, 2009; Manning et al., 2015; Sharman, Dreyer, Aitken, Clark & Bowden-Jones, 2015). These objective harms contrast with the subjective, transient and contextual distress that is often described for other putative behavioral addictions.

A public health model provides a further perspective, by emphasizing how harms arise through the interaction of individual risk factors and features of the addictive agent (Korn & Shaffer, 1999). In the specific case of gambling, this can be expressed as the interplay of the 'gambler and the game', or the 'player and the product' (Clark, 2014). The addictions framework is grounded in a biomedical model that may give disproportionate weight to individual vulnerabilities, which effectively aims to characterize the 'addictive personality' in neurobiological and psychological terms. But within this framework – and in the continued absence of clear biomarkers – any excessive behavior can be considered an addiction, and thus the slippery slope beckons. By understanding how product features act on the consumer, this may help impose some thresholds on the slippery slope. In the case of drug addiction, it is clear for example that the addictive potential of tobacco is vastly different when nicotine is administered in the form of cigarettes as opposed to chewing tobacco (Edwards, 2005). In the case of gambling games, various structural characteristics have been identified, such as speed of play (Chóliz, 2010), near-miss features (Clark, Lawrence, Astley-Jones & Gray, 2009) or illusion of control devices (Ladouceur & Sevigny, 2005). There is increasing evidence that at least some of these features are linked to the addictive potential of different forms of gambling, and modulate brain activity in the same regions affected by individual vulnerability factors.

A similar approach is proving fruitful in the case of video gaming (especially online gaming). Some features are shared across gambling games and video games (e.g. reinforcement schedules), while others are specific (e.g. advancement of the avatar in video games) (King, Delfabbro & Griffiths, 2009). In the case of 'food addiction' or binge eating, it may also be possible to relate sugar, salt or fat content of foods to behavioral models of consumption in a way that at least generates a tractable program of research and falsifiable hypotheses (Avena, Gearhardt, Gold, Wang & Potenza, 2012; Ziauddeen, Farooqi & Fletcher, 2012). It is less convincing whether or how such product features should be conceptualized for other putative behavioral addictions, such as 'work addiction' or 'tango addiction'. Thus, and in conclusion, any blueprint for behavioral addictions research would benefit from an increased emphasis on the psychological properties of addictive products.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

Can the emerging domain of behavioral addictions bring a new reflection for the field of addictions, by stressing the issue of the context of addiction development?

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Background: This paper is a commentary to the article entitled: "Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research", by Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015). *Methods and Aims:* In this manuscript, we commented on two aspects developed by the authors. Billieux et al. (2015) propose that the recent development of propositions of behavioral addiction is driven by an unwise application of an addiction model to excessive behaviors and rests on a confirmatory research strategy that does not question the psychological processes underlying the development of the conduct. They also show that applying a process driven strategy leads to a more appropriate description of the reality of the behavior and conduct, in particular by describing a variety of motivations for the excessive behavior, which is central to understanding the nature of the conduct. We believe that this new approach, which is fruitful to the emerging domain of behavioral addictions, could also apply to the domain of addictions in general. The latter is characterized by the application of a generic biological model, largely influenced by animal models, focusing on neurophysiological determinants of addiction. This approach may have decreased the attention paid to dimensions of addictions that are more specifically human. We will firstly briefly argue on the limitation of this neurophysiological addiction model for the field of excessive behavioral conducts. Secondly, we will argue for an approach centered on the differentiation of motivations and on the adaptive dimension of the behavior when it first developed and on the evocation of a transition where the conduct became independent of its original function. *Conclusions:* The emerging domain of behavioral addictions, where no animal model has been developed so far, may bring a new reflection that may apply to the domain of addictions in general, with a specific attention to human questions.

The perspective developed by Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) raises important questions that concern the domain of behavioral addictions but also the domain of addictions in general. The authors point out the current tendency to overpathologize everyday life by applying to excessive behaviors a generic reflection and clinical criteria that normally serve for the definition of substance addictions. At the end of their article, they suggest a different research strategy to understand the development of excessive behaviors, where attention is given to the psychological processes involved and that focuses on the diversity of the behaviors and motivations.

This new field of observation, in a domain where excessive behaviors (gaming, Internet) are emerging as an effect of the development of new behaviors within society, and the questions raised by the authors, is an opportunity to develop a renewed and refreshing reflection on the nature of addiction.

In the case of substance addiction, mainstream conceptualizations are mostly derived from animal models that have deeply influenced the field. The absence of an animal model so far in the domain of behavioral addiction is forcing the actors in the field to develop studies that focus on observations made in humans. It is important indeed to take distance from conceptions developed with animal studies that tend to describe the addiction as depending on a unique irreversible neurophysiological mechanism that drives the individual conducts, although we do recognize the validity of these conceptions, in particular in cases of severe dependence.

A first issue is whether behavioral addictions are totally independent of the biological processes involved in substance addictions. In the case of substance addictions, the irreversibility of the habit is related to profound modifications induced by the drug at the biological level and that are related to psychological consequences and lead to the development of a vicious circle: The interaction of the drug with brain receptors for neurotransmitters leads to an adaptation of the receptors and transduction pathways. These biological adaptations are accompanied by opponent process development, i.e. a decrease in the pleasure initially elicited by drug exposure and the development of a state of dysphoria, that in turn accentuates the drug intake to escape dysphoria, leading to this vicious circle (Ahmed & Koob, 1998; Koob & Le Moal, 2005). In the case of behavioral addictions where no drug is taken by the individuals, the biological mechanism involving receptors for neurotransmitters described above is not expected to take

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place. Nonetheless, from a phenomenological standpoint, the addicted behavior, by generating negative consequences for the individual, may lead to a vicious circle where the behavior would be a mean to escape, at least temporarily, these negative consequences. For instance, for excessive gamers, escaping in a gaming behavior may help to avoid the consequences of spending too much time on gaming. We expect, however, that the strength of the vicious circle is of less importance, as it is not supported by a biological dimension. The only dimension of the biological processes that could play a role in the development of behavioral addictions would be that of an imbalance at the level of the stress system or in inflammation that could arise from being exposed to the stresses elicited by the addiction. The stress and inflammatory systems have indeed been shown to play a role in the development of the opponent process phenomenon in substance addictions (Koob, 2015; Robinson et al., 2014), but may also occur in response to stresses unrelated to substance abuse.

A second point pertains to the function of the addiction. In their conclusion, the authors point to the importance of identifying the specific processes leading to excessive behavior in a given individual, stressing the heterogeneity and multi-faceted nature of behavioral addiction. We fully agree with that suggestion. However, in our opinion, an important aspect is still missing for the understanding of the phenomena that might be labeled by some as behavioral addiction. This aspect concerns the function of the apparently excessive behavior in a given context. Indeed, a seemingly overinvested behavior always serves (or attempts to serve) a function, and that function only operates in a given context. Hence the interaction between function and context is central in order to understand why a given behavior is overinvested by a given individual. One can speculate that the high investment in a behavior might be constructive and beneficial in context A, while the same high investment might be harmful in context B. For instance, while compulsive checking is often maladaptive in everyday life, it might be highly desirable when working on quality control in aerospatial industry. It follows that organizing the diagnosis of behavioral addiction solely on the consideration of the characteristics of the behavior and of some of its consequences, while ignoring its context dependent function, misses the core tenet of psychopathology, which is dysfunctional behavior, i.e. the maintenance of a behavior that does not serve any constructive function. The question of the context is important for distinguishing functional and dysfunctional behaviors, and may contribute to the definition of behavioral addiction by helping making the difference between excessive habits and behavioral addiction.

Two examples in the domain of behavioral excessive conducts/addiction may illustrate this point. A teenager who has moved to a town far from his home town due to a change in his parents' job and who is involved in excessive gaming and Internet activities with mates from his hometown, somehow uses these activities to maintain his integration in a social network. His habit can be considered as excessive and should be questioned by the parents but it is largely context dependent and functional. This may be different for another teenager involved in totally solitary gaming activities, where gaming is the expression of a profound difficulty in bonding with others. The behavior of the two teenagers is apparently similar but the function of the behavior may help distinguish the excessive behavior from the pathological situation. This illustrates the importance for clinicians to question the context of the emergence of excessive behaviors. The question of the context is also very important for the emergence of substance addictions. Clinicians working in the substance addiction field often meet patients that justify their addiction based on a motivation that served a function at the beginning of the addiction and that is no longer present at the time they meet a psychologist or psychiatrist, several years after the beginning of the addiction. A patient may have started excessive alcohol drinking following the loss of a close person or to help gaining comfort in social situations when he was a teenager. The context of the emergence of the addiction was in these two cases a bereavement or a social anxiety, respectively. Alcohol consumption, in both cases, served a function up to a certain level. However, years later, when patients start consulting for addiction, the context is different: The person may have resolved his bereavement or may not suffer of social anxiety anymore. They, however, keep in mind the initial context and keep the conviction that this is the reason for their drinking, while after a period of abstinence, they become aware of the fact that the addiction essentially entertained a state of dysphoria and a vicious circle, due to the opponent process evoked above. Questioning patients about the circumstances and context of the emergence of the problematic behavior is generally fruitful for patients presenting with excessive behaviors or addictions, and may help them to find whether the behavior is adapted to the context, or whether the context that justified the excessive behavior is still present. This clinical attitude have proven to be efficient in the domain of substance addictions and may likely apply to the domain of behavioral addictions.

Hence, the perspective raised by Billieux et al. (2015), on the tendency to consider addictions according to a fixed, irreversible model, largely inspired from animal studies, and their interest for diverse and specifically human motivations for excessive behaviors is a unique opportunity to take distance from the idea that an addiction is essentially or even only a process driven by fixed biological mechanisms, from which the individual would have little possibilities to escape. This biological perspective, which is probably pertinent for cases of severe addictions, may not apply to all cases. Important differences may exist in the severity of the addiction, both in the substance and behavior field.

Defining a behavior too early as a severe addiction, using the definition developed by animal models, may fix the situation and lead to pessimism in the possibility of a solution to the disorder. For the addiction field, where the success of treatment is still currently limited, we believe that we need to remain creative, and in direct contact with the phenomenology of the conducts. This may help find new solutions to this large public health problem and avoid becoming too pessimistic about the outcome of addictions or excessive behaviors.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

Problems with atheoretical and confirmatory research approaches in the study of behavioral addictions

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Background and Aims: This commentary is written in response to a paper by Billieux, Schimmenti, Khazaal, Maurage and Hereen (2015) published in the *Journal of Behavioral Addictions. Methods:* It supports and extends the arguments by Billieux, Schimmenti et al. (2015): that the study of behavioral addictions too often rests on atheoretical and confirmatory research approaches. This tends to lead to theories that lack specificity and a neglect of the underlying processes that might explain why repetitive problem behaviors occur. *Results:* In this commentary I extend the arguments by Billieux, Schimmenti et al. (2015) and argue that such research approaches might take us further away from conceptualizing psychiatric diagnoses that can be properly validated, which is already a problem in the field. Furthermore, I discuss whether the empirical support for conceptualizing repetitive problem behaviors as addictions might rest on research practices that have been methodologically biased to produce a result congruent with the proposal that substance addictions and behavioral addictions share similar traits. *Conclusions:* I conclude by presenting a number of ways of going forward, chief of which is the proposal that we might wish to go beyond *a priori* assumptions of addiction in favor of identifying the essential problem manifestations for each new potential behavioral addiction.

Keywords: behavioral addictions, mental health, Internet gaming disorder, Internet addiction, DSM, diagnosis

INTRODUCTION

In a recent paper in *Journal of Behavioral Addictions*, Billieux, Schimmenti, Khazaal, Maurage and Hereen (2015) provide a critical account of research developments in the field of behavioral addictions. They discuss how the use of atheoretical and confirmatory research approaches might contribute to overpathologizing daily life activities, which in the long run could prompt a dismissive appraisal of behavioral addiction research. As Billieux, Schimmenti et al. (2015) aptly state, the study of new behavioral addictions are often based on anecdotal observations where the target behavior is *a priori* considered an addictive behavior, which is a fundamentally atheoretical approach, followed by the development of screening tools according to traditional substance addiction criteria. These tools are then used to conduct research on whether risk factors or symptoms known to also play a role in substance addictions are associated with the newly proposed behavioral addiction, in order to confirm that the target behavior may be conceptualized as an addiction. This approach has been used most notably perhaps in recent attempts to validate Internet Gaming Disorder (IGD) as a behavioral addiction, which resulted in its inclusion in the DSM-5 research appendix (American Psychiatric Association, 2013).

I agree with Billieux, Schimmenti et al. (2015) in their assessment that such an atheoretical and confirmatory approach might lead researchers to overpathologize daily life activities and that it yields theoretical models that lack specificity. Furthermore, I argue that the atheoretical approach also takes us one step further away from conceptualizing psychiatric disorders that can be properly validated. Additionally, using both an atheoretical and a confirmatory approach together becomes methodologically problematic and might bias the results of empirical work. I will discuss these two issues further in this commentary.

PROBLEMS OF VALIDITY FOLLOWING AN ATHEORETICAL APPROACH

It is first important to consider the justifications for approaching repetitive problem behaviors through a framework originally developed for research on substance addiction. Curiously, the justification seems to revolve primarily around the claim that there is an overlap between behavioral and substance addictions in terms of their manifestations. One of the first mentions of this overlap was Marks (1990), who observed that repetitive problem behaviors seem to share some core syndromes with substance addiction. Based on this observation he argued that "it is useful heuristically to regard a wide range of repetitive behaviors as addictive syndromes, whatever their external triggers" (p. 1394). I argue that in a research context such an approach might come with enough drawbacks to outweigh the benefits.

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Approaching repetitive problem behaviors through a framework of addiction should only be done if it is somehow useful to equate disordered behaviors on the basis of shared traits. For example, Marks (1990) suggested that doing so might yield some therapeutic and preventive ideas for the new problem behavior and it is indeed possible that his suggestion has some utility, in particular for clinical practice. However, both for purposes of research and for the sake of diagnostic validity it is problematic to equate two disordered behaviors based on shared traits. According to Kendell and Jablensky (2003), validation of a proposed disorder hinges on whether one disorder can reliably be distinguished from another. In other words, demonstrable differences must exist between the defining characteristics of a disorder and those of other conditions with similar symptoms (p. 6). This suggested practice goes contrary to the tendency in behavioral addiction research, which is to equate repetitive behavior with addiction and construct diagnostic criteria based first and foremost on similarities with other addictions while not accounting for the differences. The problems that result from focusing only on similarities is evident in Internet addiction research where there is currently a lack of consensus on whether Internet addiction is a unique disorder or whether there are multiple addictive disorders related to specific Internet activities like online gaming or online gambling (e.g., Király et al., 2014). Criteria for Internet addiction and online gaming addiction are practically identical, which makes it conceptually difficult to distinguish the two proposed disorders from each other. Furthermore, some researchers suggest that a number of online addictions are only an extension of offline addictions, but this suggestion is difficult to verify in practice as online and offline addictions share the same criteria and thus cannot easily be separated. In both instances the only unique identifier is the medium through which a person engages in the activity; one might argue that online gaming addiction is easily distinguished from Internet addiction because games constitute a specific activity, or that the online gambler is different from the offline gambler because he gambles through the Internet. However, using the medium as the only distinguishing factor is not nearly as helpful when it comes to elucidating etiological processes as it would be to propose distinguishing factors based on the actual behavior and problem manifestations. This would make it easier to understand why some people might turn to online gambling rather than offline gambling, or experience problems only with the former but not the latter.

A second issue with ignoring potential differences is that it causes problems in assessment. This is the case for IGD for example, where the proposed criteria are conceptually identical to those for substance addiction even though some criteria, like tolerance, arguably lack contextual relevance or at the very least adequate phrasing (Kardefelt-Winther, 2014c, 2014e). This illustrates the difficulty of preserving validity of measurements when translating criteria from one disorder to another. Establishing construct and face validity presents a great challenge for researchers involved in IGD precisely because of questionable contextual relevance for a number of criteria which seem to be included as residuals from the substance addiction diagnosis. The *a priori* definition of addiction also impacts the content validity, as assessing content validity requires a detailed description of the content domain which, arguably, an operationalization constrained to traditional substance addiction criteria might not accommodate. However, IGD is not the only proposed behavioral addiction where this might be problematic; as Billieux, Schimmenti et al. (2015) point out, hyper-sexuality, compulsive buying, binge eating, excessive work involvement, excessive physical exercise and even excessive dancing are all framed as behavioral addictions and might be subjected to similar problems with validity and lack of contextual relevance for the proposed criteria. This is linked to the atheoretical approach described by Billieux, Schimmenti et al. (2015) because as they argue, such approaches leave us with concepts and theory that lack domain specificity. In other words, we lack theoretically sound models that can illustrate in detail the unique factors and processes involved in a particular problem behavior. This is something I also highlight in my own work (Kardefelt-Winther, 2014a, 2014d). It might be more useful for purposes of research to identify the unique symptomatology and phenomenology of each problem behavior, rather than approaching a problem behavior with the *a priori* assumption that addiction symptoms and experiences accurately represent its manifestation.

HOW DID WE CONFIRM THAT REPETITIVE PROBLEM BEHAVIORS ARE ADDICTIONS?

Beyond problems with validity and theory as reflected above, we might also ask how the atheoretical and confirmatory approach outlined by Billieux, Schimmenti et al. (2015) have impacted the fundamental proposal that repetitive problem behaviors can be conceived of as addictions. It is worth asking whether behavioral and substance addictions share symptoms and risk factors only because we use the same theoretical basis to operationalize the behaviors. Billieux, Schimmenti et al. (2015) allude to this possibility in their paper. If the criteria for a target behavior are based on a substance addiction framework – which is an atheoretical approach – it is more likely that a number of related risk factors for substance addiction will be found also in relation to the target behavior, at least on a correlational level, since the behaviors share similar surface characteristics such as persistence over time and problematic consequences. Together with a confirmatory approach to empirical work, which rarely fails to identify core symptoms of addiction in a small part of the target population, such results might seem to justify the claim that a new repetitive problem behavior is an addiction. However, this might also be seen as a self-fulfilling prophecy which reflects the theoretical and methodological choices made by the researcher rather than provides an accurate conceptualization of the problem behavior. This questions some of the empirical evidence underlying the construct of behavioral addictions. If the occurrence of shared risk-factors and syndromes constitutes the foundation for the claim that repetitive behaviors may usefully be regarded as addictions (e.g., Marks, 1990), then we might argue that the construct of behavioral addictions is also a self-fulfilling prophecy: a prophecy based on anecdotal accounts of repetitive problem behaviors, evidenced as addictions via atheoretical and confirmatory research practices which might have biased the studies to produce a result congruent with the proposal that substance addictions and behavioral addictions share similar traits.

Importantly, the point here is not to suggest that the construct of behavioral addictions is not useful, but just like the field of addiction study might benefit from a broader conceptualization of the phenomenon (Shaffer et al., 2004), so too might the study of behavioral addictions benefit from not exclusively adhering to an addiction framework in the theorization and empirical exploration of new repetitive problem behaviors. It is worth considering the extent to which alternative but relevant criteria might be ignored when the problem behavior is *a priori* defined as an addiction. As Howard Shaffer suggests, adopting a perspective of addiction can blind proponents to alternative explanations that may be equally or more useful (1986).

CONCLUSIONS

While this commentary has further problematized research on behavioral addictions in line with Billieux, Schimmenti et al. (2015) this does not imply skepticism towards research on repetitive problem behaviors. Although there seems to be an increase in the medicalization of repetitive problem behaviors, it is at the same time clear that some of these problem behaviors constitute real problems that have a detrimental impact on people's lives. The crucial point raised by Billieux, Schimmenti et al. (2015) is that the *approach* typically taken in research on repetitive problem behaviors is at times problematic, as *a priori* assumptions of addiction can hinder rather than facilitate an open-minded scientific inquiry. This is not to say that such research is not valuable, but it raises the question of what other explanations we might find for repetitive problem behaviors if the addiction framework is not always used to define the boundary for the inquiry.

To truly determine whether addiction offers a valid and useful interpretation of certain repetitive problem behaviors we might explore qualitatively why people persist in certain behaviors despite experiencing problematic outcomes, but without theoretical preconceptions of addiction. If such reports repeatedly found that the traditional components of, for example, a substance addiction framework are expressed in relation to a certain repetitive behavior an argument could be made that the behavior may be likened to an addiction and usefully explored as such. However, such an argument must rely on an in-depth understanding of the content domain which is not facilitated by confirmatory surveys of risk factors or addiction symptoms, which tend to dominate the field, but rather through interviews and dialogue with those who exhibit problem behaviors. This approach has been taken recently by researchers studying problem gambling. However, in these studies researchers found explanations for repeated problem gambling that had little to do with addiction and uncontrollable use. Rather, problem gambling was framed as a consequence of attempts to escape from real life frustrations or a desire to fulfill unmet real life needs, such as a lack of progress or achievement (e.g., Blaszczynski, Wilson & McConaghy, 1986; Lesieur, 1979; Ricketts & Macaskill, 2003, 2004; Wood & Griffiths, 2007). Some of these studies used a grounded theory approach (e.g., Lesieur, 1979; Rickets & Macaskill, 2003, 2004; Wood & Griffiths, 2007) without any preconceptions of why problem gambling occurs and yielded promising results that suggested a process driven by needs for mood-management and coping rather than addiction. Although only a few studies exist as of yet, similar findings have been reported in regards to problematic online gaming (Kardefelt-Winther, 2014b; Snodgrass et al., 2014).

Another useful approach has been proposed and empirically tested by Billieux, Thorens et al. (2015) in an earlier paper. They showed the utility of identifying unique categories of problematic gamers, where each category was theorized as having a different set of antecedents for the problem behavior. Their assumption was empirically supported and has important implications for interventions as it highlights the need for personalized, custom-made interventions that target specific psychological mechanisms. The approach of considering each category of problematic gamer as unique might be applicable in the wider research area of behavioral addictions, where each problem behavior might be conceptualized as a distinct category with its own antecedents and etiological processes, but not necessarily constrained to a certain interpretation like addiction. While the addiction framework may offer a reasonable first interpretation, its continued application in research seems to lead to a point where unique factors and processes are excluded to the detriment of diagnostic validity, construct validity, face validity and content validity, in addition to the lack of theoretical specificity mentioned by Billieux, Schimmenti et al. (2015). Therefore, we might conclude that while plenty of attention has been given to the similarities between substance addictions and behavioral addictions, a shift in focus to that which sets repetitive problem behaviors apart might be a useful way to proceed (e.g., Kardefelt-Winther, 2014a, 2014e).

I agree with Billieux, Schimmenti et al. (2015) when they state that exclusively remaining within an explanatory framework of substance addiction might lead to a neglect of the key psychological processes that sustain a dysfunctional involvement in other problem behaviors. I will even take it one step further and suggest that going beyond a framework of addiction entirely might in some cases yield more useful results. This is a statement upon which my own research rests. Going forward, this begs the question of what other explanations for repetitive problem behaviors we might find when such behaviors are not only viewed through the lens of addiction.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

Excessive behaviors are not necessarily addictive behaviors

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Background and Aims: The commentary aims to provide clarity to the article "Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research." *Methods*: We provide another viewpoint for the important issues of behavior addiction. *Result:* The course of behavior addiction should be further studied. The criteria of withdrawal and tolerance of behavior addiction are ill-defined and need to be further evaluated. *Conclusions:* The etiology, course, presentation, and functional impairment of behavior addiction should be validated by evidence-based data before being defined as a disorder.

Keywords: behavioral addiction, Internet Gaming Disorders, criteria, withdrawal, tolerance

The review has provided insight into a theoretical and confirmatory research approach to develop a "new" behavior addiction. Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) have pointed out the essential issues in defining an addictive disorder without clear objective or biological markers. These critical points should be addressed when defining an excessive behavior as an addictive disorder.

The authors suggested that the etiology and course of these excessive behaviors are essential to define them as an addictive disorder. For example, the data or evidence-based results for a chronic course of Internet gaming disorder are inadequate. However, the etiology and course are highly varied in addictive disorders, not only in behavior addiction, but also in substance use disorder. Further, to evaluate the etiology and course of these behaviors, a preliminary definition to recruit the subjects is necessary. The inclusion of Internet gaming disorder in DSM-5 section III, but not official criteria, could provide a preliminary tool to identify possible subjects to investigate *vis-à-vis* their etiology and course over the world. Nevertheless, prospective research focusing on etiology and course of behavior addictions is necessary before these factors are recruited as a definite disorder.

Billieux et al. (2015) have also pointed out another important issue: defining the tolerance and withdrawal symptoms of behavior addiction. The onset of withdrawal symptoms depends on the half-life of the substance (Petursson, 1994). The variation of withdrawal symptoms depends on the pharmacological effect of the substance. However, most behaviors vulnerable to addiction, such as gambling, online gaming, or sexuality, have no direct biological effect on the brain as substances do. It is difficult to determine withdrawal symptoms among subjects with behavioral addiction. Take Internet gaming disorder as an example: psychological symptoms of withdrawal vary in presentation, onset, and duration (Ko, 2014). Although 86.7% of Internet Gaming Disorder (IGD) subjects have declared abstinence from online gaming for two or three days intolerable (Ko et al., 2014), symptomatic presentations were varied and ill-defined. In DSM-5 (American Psychiatric Association, 2013), "is restless or irritable when attempting to cut-down or stop gambling" was used to define gambling disorder. On the other hand, since biological withdrawal symptoms of phencyclidine are not established in human subjects, it was not applied in the criteria of phencyclidine use disorder. Thus, whether the withdrawal symptoms were necessary to define a behavioral addiction should be evaluated or a consensus reached as soon as possible. However, the really important issue is to understand why subjects are unable to stop or control their problematic excessive behaviors.

The authors have also pointed out the problematic definition of the tolerance of some excessive behavior. Tolerance is based on the dosage of the substance. However, the dose of behavioral addiction is also ill-defined. Thus, tolerance is really ill-defined for behavior addiction. In DSM-5 (American Psychiatric Association, 2013), "need to gamble with increasing amounts of money in order to achieve the desired excitement" was used to define gambling disorder. A previous study refers to "feeling the need to play games for longer periods of time to experience excitement" to define tolerance of IGD (Petry et al., 2014). In our clinical experience, online gaming time usually reached a ceiling among chronic subjects of IGD. However, they presented the toler-

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ance symptoms as feeling unsatisfied even after excessive online gaming. Thus, to identify the strong, uninhibited, repeated and dysfunctional "feeling the need to extend the behavior" could be essential to define the "pathological" tolerance symptoms of excessive behaviors. In any case, the concept, presentation, definition, or biological marker of tolerance of behavior addiction could be varied and needs to be further evaluated and agreement must be reached using evidence-based data. Further, the really important issue is why subjects increased their problematic addictive behavior even while perceiving the consequences.

We agree with the viewpoint of the authors that we lack a theoretically sound model to develop the specificity of behavior addiction. We appreciate that the authors point out two important factors, functional impairment and stability of the dysfunctional behavior, to establish the specificity of behavior addiction. On the other hand, we need to identify the true subjects with behavior addiction who need treatment, but not overpathologize an excessive user with adequate function. Not only the evidence of symptoms similar to substance use disorder but the intensity, frequency, and dysfunctional presentations of symptoms should also be evaluated to contribute to specificity of behavior addiction, such as IGD (Ko, 2014). Thus, functional impairment has been suggested to be a prerequisite criterion for Internet gaming disorder (Ko, 2014).

As per substance use disorder, behavior addiction usually demonstrates a chronic and varied course vulnerable to context effect in our clinical experience. Addicts could remit spontaneously and relapse in a short time. The instability in course might not preclude the specificity of behavior addiction. However, to prospectively investigate the course of behavior addiction, criteria such as onset, remission, relapse, and their associated factors are very essential to demonstrate the specificity of behavior addiction. Based on these data, the course of excessive behaviors could be developed to determine whether they should be classified as an addictive disorder.

Some important issues, such as the core concept of addiction (Sussman & Sussman, 2011) or the possible basic brain mechanism of behavior addiction (Clark, 2014; Wang, Volkow, Thanos & Fowler, 2004) were not mentioned in this review. They could contribute to the validity of behavior addiction. Nevertheless, this review has emphasized how everyday life behaviors can become overpathologized as behavior addiction. As the authors suggested, the nature, course, and heterogeneity of these excessive behaviors should be understood before defining a behavior addiction.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

The diagnostic pitfalls of surveys: If you score positive on a test of addiction, you still have a good chance not to be addicted

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Background and Aims: Survey-based studies often fail to take into account the predictive value of a test, in other words, the probability of a person having (or not having) the disease when scoring positive (or negative) on the given screening test. *Methods:* We re-visited the theory and basic calculations of diagnostic accuracy. *Results:* In general, the lower the prevalence the worse the predictive value is. When the disorder is relatively rare, a positive test finding is typically not useful in confirming its presence given the high proportion of false positive cases. For example, using the Compulsive Buying Scale (Faber & O'Guinn, 1992) three in four people classified as having compulsive buying disorder will in fact *not* have the disorder. *Conclusions:* Screening tests are limited to serve as an early detection "gate" and only clinical (interview-based) studies are suitable to claim that a certain behaviour is truly "pathological".

Keywords: behavioural addiction, severity, diagnosis, assessment, sensitivity, specificity, positive predictive value, negative predictive value, accuracy

INTRODUCTION

We welcome the initiative of Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) in which they question the clinical validity of certain behaviours that are considered addictions. Hereby, we would like to contribute to this discussion by pointing out an important although often ignored statistical phenomenon closely related to the over-pathologising of everyday behaviours: the predictive value of screening tests.

Similar to the one carried out by Targhetta, Nalpas and Perney (2013) many studies struggle with the issue of separating "asymptomatic" and "symptomatic" (addicted or disordered) individuals performing a given behaviour. Although inventories are generally developed to provide a close estimate to a clinical test based on self-report, a screening instrument will never have diagnostic validity. But how precise can a screening instrument be compared to a clinical diagnosis?

SPECIFICITY, SENSITIVITY, POSITIVE AND NEGATIVE PREDICTIVE VALUE

Diagnostic accuracy, originally developed for the evaluation of laboratory screening instruments, is an indicator of the utility of a test (Glaros & Kline, 1988). It is measured by its agreement with a reference or "gold" standard that is the best available indicator of the presence or absence of the condition (Bossuyt et al., 2003). Accuracy is based on four concepts (see Table 1). Sensitivity and specificity provide information about the ability of the test to detect diseased and non-diseased persons correctly. For example, if sensitivity equals 80, it means that out of 100 diseased cases, the test will identify 80 as diseased. A specificity of 80, on the other hand, would mean that out of 100 non-diseased cases the test will identify 80 as negative and 20 as positive (diseased). Sensitivity and specificity are "fixed values" of the test (Streiner, 2003), which means that as long as the test is used in similar samples, these attributes remain the same. Positive and negative predictive value, on the other hand, provide information about the probability of a person having (or not having) the disease when scoring positive (or negative) on the screening test. A positive predictive value (PPV) of 80 means that out of 100 individuals scoring positive on the test, 80 are truly diseased, and 20 are not. A negative predictive value (NPV) of 80 would mean that 80 of 100 will be correctly classified as non-diseased, but 20 diseased individuals will score negative on the screening test. PPV and NPV are not "fixed values" but dependent on the prevalence of the disease in the sample where the screening test is administered (Streiner, 2003).

Ideally, the number of true positive (truly diseased cases scoring positive on the screening test) and true negative cases (non-diseased cases scoring negative on the test) are both high and the number of false positive (cases that score positive although truly non-diseased) and false negative cases (who score negative although truly diseased) are both kept to minimum. This yields the best accuracy of the screening test. When the prevalence is kept constant, then sensitivity,

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specificity, PPV and NPV values are interdependent. In general, the lower the cut-off value on a given instrument, the higher the number of true positive cases, and the higher the number of false positive cases as well. This leads to higher sensitivity but lower specificity and PPV. Another general tendency is that when the prevalence is high then the proportion of false negatives may also be high, and when the prevalence of the disease is low then the proportion of false positives tends to be high (Streiner, 2003), which is generally the case with behavioural addictions. Thus, in order to calculate the probability of the disease given a positive test result one has to consider the a priori (antecedent) probability which is the prevalence rate (for the Bayesian approach of the calculations see: Meehl & Rosen, 1955).

Table 1. Calculation of accuracy

	Diseased	**Non-diseased**	
Screened +	True positive (TP)	False positive (FP)	*All positive (AP)*
Screened –	False negative (FN)	True negative (TN)	*All negative (AN)*
	All diseased (AD)	*All non-diseased (AnD)*	

Note: Sensitivity = TP/AD, Specificity = TN/AnD, Positive Predictive Value = TP/AP, Negative Predictive Value = TN/AN, Accuracy (or Efficiency) = (TP + TN)/total

EXAMPLES

The question arises: given a positive test, what is the probability that the individual truly has the given disorder? A few examples are shown in Figure 1. Note that as the prevalence drops, so does the PPV (whereas the proportion of false positives increases).

As it appears in Figure 1, even when specificity and sensitivity are both at 99%, given a prevalence of 1%, the individual has a 50% chance of *not* having the disease when the screening is positive. But screening instruments usually have much lower sensitivity and specificity values than 99%.

One of the most widely used tests to measure compulsive buying behaviour is the Compulsive Buying Scale (CBS) by Faber and O'Guinn (1992). Using a group of self-identified compulsive buyers as the criterion group, the authors reported a sensitivity of 89.8% and specificity of 85.3% for the CBS. According to a recent meta-analysis (Maraz, Griffiths & Demetrovics, 2015) the pooled prevalence of compulsive buying is 4.9%. This means that out of those scoring negative, 99% are probably non-diseased, but of those that score positive for compulsive buying, only 24% would probably be truly diseased. Although the test is unlikely to miss a pathological case, three in four people classified as

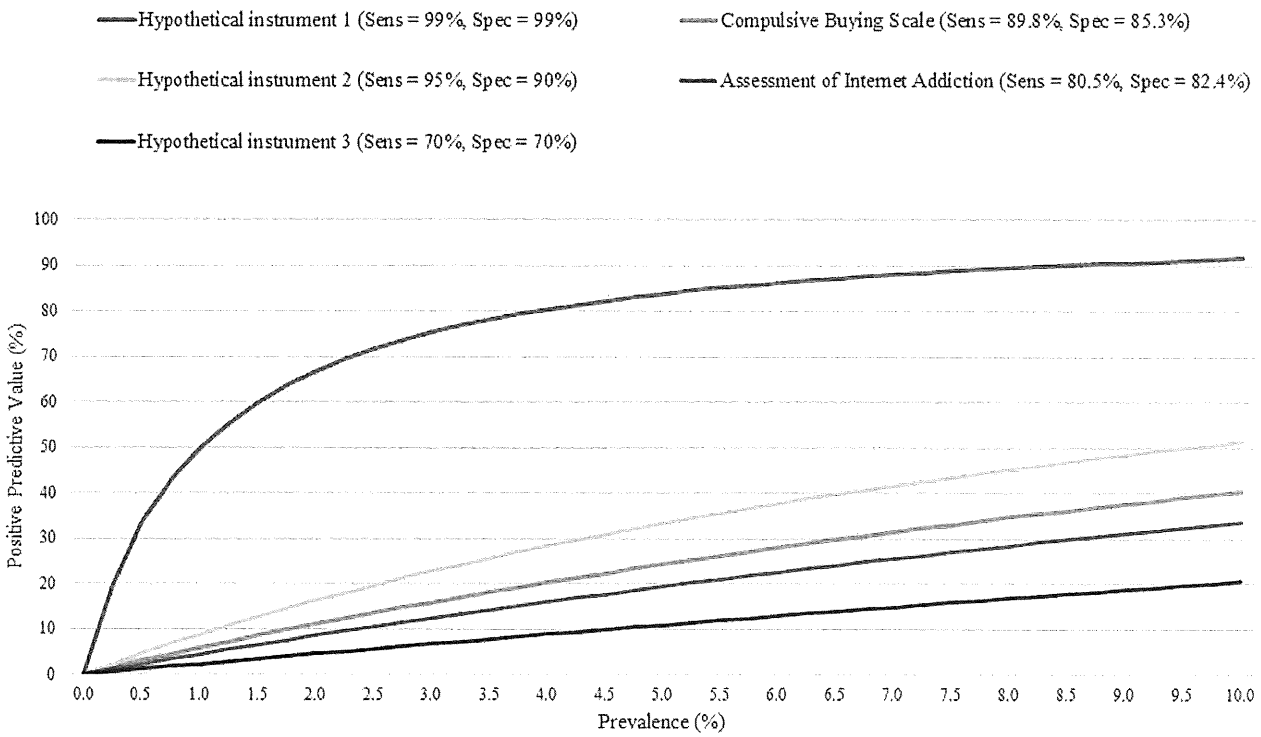

Figure 1. Positive Predictive Value of actual and hypothetical instruments depending on prevalence

Notes: Sens = sensitivity, Spec = specificity. Positive Predictive Value = the probability of a person having the disease when scoring positive on the screening test.

having compulsive buying disorder will in fact *not* have the disorder.

Other instruments have an even lower predictive value. For example, one of the few clinically validated Internet addiction measures is the Scale for the Assessment of Internet (and Computer Game) Addiction by Müller, Beutel and Wölfling (2014). This instrument was validated on a sample of 221 treatment seeking, clinically diagnosed problematic Internet users for which the authors reported a test sensitivity of 80.5% and a specificity of 82.4%. Using the same instrument, the authors conducted a population-based survey and reported a prevalence rate of 2.1% for Internet addiction (Müller, Glaesmer, Brähler, Woelfling & Beutel, 2014). Based on this prevalence rate, NPV is nearly perfect (99%), however, PPV is only 8.9% (for the exact calculations see the Appendix). This means that out of those scoring positive on the test, only 8.9% has the correct classification. Thus out of a 100 individuals screened positive for Internet addiction, only 9 will truly have the disease, and 91 will be misclassified.

FURTHER CHALLENGES

A critical point in the test accuracy is the criteria or "gold standard" that the inventory is assessed against. Technically, if the individual scores positive on the compulsive buying scale, then he or she has 24% chance of being a self-identified compulsive buyer, because this was the "gold standard" against which specificity and sensitivity were tested. Thus it is paramount to test inventories against clinical criteria to provide a sensible estimate of the extent of the given behavioural addiction.

Establishing an "external criteria" for addiction is another challenge. Unlike substance-related disorders, complete abstinence is often impossible and indicators of pathology are difficult to define. This is especially the case with the "innovative yet absurd addictive disorders" – as Billieux et al. (2015) state – such as tango addiction (Targhetta et al., 2013), tanning addiction (Kourosh, Harrington & Adinoff, 2010), study addiction (Atroszko, Andreassen, Griffiths & Pallesen, 2015) or "research addiction" from Billieux et al. (2015). From a statistical point of view, an instrument that has not been tested against a clinically valid (diagnosed) group is unsuitable to assess the disorder.

CONCLUSIONS AND FUTURE RECOMMENDATIONS

The accuracy model was initially developed for medical purposes where (1) there is usually a clear criteria of what constitutes problematic and (2) the cost of misclassification is relatively low. Classifying 100 individuals as "positive" and referring them to further tests is more reasonable than missing one person who might suffer from serious consequences if the early signs of the disease are missed. But is the same logic true for behavioural "addicts"? Even if the cost of missing a case is the same, the cost of misdiagnosing is certainly higher compared to medical conditions given the scaremongering of the media that often exaggerates the impact of high prevalence estimates by presenting certain behaviours – such as using the Internet – as inherently dangerous. As a consequence, the moral panic may create unnecessary conflicts in families.

Low PPVs contribute to overpathologising everyday behaviours because the proportion of truly diseased people is much lower than the proportion of those scoring positive on a screening test. When the disorder is relatively rare, a positive test finding is typically not useful in confirming its presence given the high proportion of false positive cases. When the prevalence is low, a test is best used to rule out a condition but not to rule it in (Streiner, 2003).

At the same time the low predictive value of a test does not imply that behavioural addictions are non-existing or that they are not pathological. It only means that the use of surveys and screening tests is limited to serve as an early detection "gate". One must always keep in mind that only clinical (interview-based) studies are suitable to claim that a certain behaviour for a given individual is truly "pathological".

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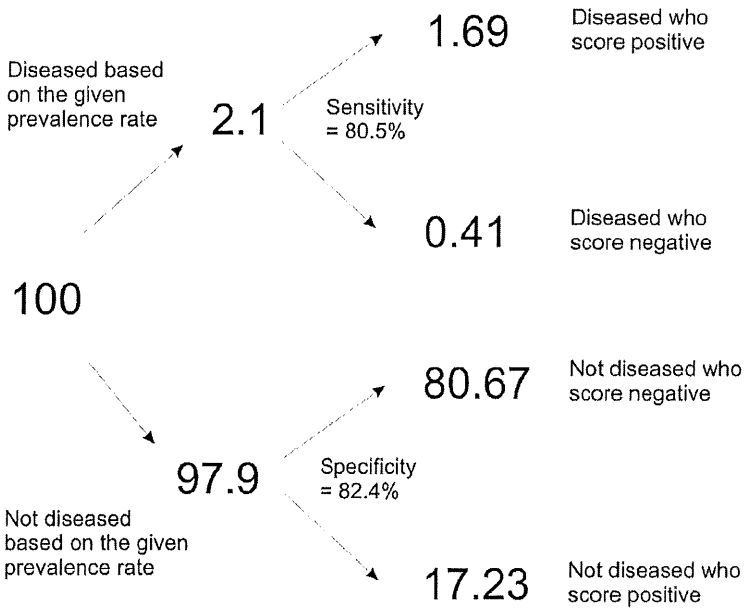
APPENDIX

The calculation of positive and negative predictive value on the example of the Scale for the Assessment of Internet and Computer game Addiction.

Internet addiction prevalence 2.1%, Sensitivity of 80.5%, Specificity of 82.4%.



$$PPV = \frac{\text{True positives}}{\text{All positives}} = \frac{1.69}{1.69 + 17.23} = 8.9\%$$

$$NPV = \frac{\text{True negatives}}{\text{All negatives}} = \frac{80.67}{0.41 + 80.67} = 99.5\%$$

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

Defining and classifying non-substance or behavioral addictions

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Multiple controversies exist currently in the field of behavioral addictions. The opinion article by Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) proposes an approach to considering which behaviors might be considered as foci for addictions. The article raises multiple important points that foster further dialog and highlight the need for additional research. Given that how specific behaviors are considered from diagnostic and classification perspectives holds significant public health implications, targeting and eliminating current knowledge gaps relating to behavioral addictions is an important undertaking.

Keywords: Internet use, gaming, gambling, food, addictions, classification

The article by Billieux, Schimmenty, Khazaal, Maurage and Heeren (2015) raises questions about how best to approach non-substance or behavioral addictions. In the article, the authors propose that recent articles have used atheoretical and confirmatory research approaches to identify a nearly limitless number of new behavioral addictions. The authors raise multiple important points including the potential negative impact of being too inclusive with respect to considering an overly wide range of behaviors as foci for addictions.

An area of current debate exists regarding how best to consider excessive and interfering levels of engagement in non-substance behaviors including gambling, gaming, Internet use, sex, shopping and eating [although this last domain may be considered substance-related with the substance being "food" or specific components thereof; e.g., individual sugars, fats, other entities or combinations of these, with an understanding of the precise impact of specific foods and their constitutive elements having possibly wide-reaching public health implications (Gearhardt, Grilo, DiLeone, Brownell & Potenza, 2011)]. Furthermore, debate exists regarding how best to demarcate normal and abnormal levels of involvement in behaviors (Cloud, 2012; Potenza, 2015).

In the article (Billieux et al., 2015), Billieux and colleagues use several presumably fictitious examples regarding proposed behavioral addictions including "research addiction." While the authors contend that scholars or practitioners "should easily laugh in reaction" to the described case and corresponding diagnostic definition, the example may be more controversial than initially intended, particularly when considered in light of some recent events. For example, in Palo Alto, California, USA, there have been multiple teen suicides that by accounts appear to be linked to intense academic pressure and related distress (NPR Staff, 2015). While the individuals who suicided may or may not have been addicted to work, one should not prematurely dismiss potential psychiatric considerations linked to excessive patterns of academic pursuits. In the example given by the authors, if distress related to doing well academically led to: 1) compulsive engagement (and "lost time") in academic activities (e.g., "overchecking" one's CV) that were enacted to reduce distress, and 2) neglect of important relations (losing friends) and potentially other opportunities, then the behavior warrants attention. In the case of the teen suicides, it would be important to consider whether academic distress may have led individuals to take their own lives, which conceivably may have been a potential concern in the case example provided by the authors. Given these considerations, there may be dangers in the premature dismissal of certain behaviors or activities as not being addictive or in other ways harmful, just as there may be potential downsides of being overly inclusive in broadening the scope of addictions.

With this in mind, it appears important to consider the core elements of addictions. Proposed core features (Potenza, 2006; Shaffer, 1999) include: 1) continued engagement in a behavior despite adverse consequences; 2) an appetitive urge or craving state that often immediately precedes behavioral engagement; 3) poor self-control over behavioral engagement; and 4) compulsive behavioral engagement. Of these, the first feature may be particularly relevant when considering the potential impact on affected individuals and those around them. Of note, perceptions of behaviors as addictive may change over time as awareness of negative consequences increases (e.g., consider the changes in perceptions of tobacco use over the past fifty years in the setting of increased knowledge of harms associated with smoking).

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In agreement with the theme of the authors' article, this author believes that a systematic approach should be undertaken when considering whether a behavior may constitute the focus of an addiction. Such an approach was taken in the re-classification of pathological gambling (now gambling disorder) from a category of "Impulse-control Disorders (ICDs) Not Elsewhere Classified" in DSM-IV-TR (APA, 2000) to one of "Substance-related and Addictive Disorders" in DSM-5 (APA, 2013; Petry, 2006; Potenza, 2006; Potenza, Koran & Pallanti, 2009). In this case, several research workgroups considered pathological gambling and other disorders characterized by impaired impulse control. Similarities with and differences from substance-use disorders (conditions well established as addictions) were reviewed, systematically considering data from epidemiological, clinical, phenomenological, psychological, genetic, neurobiological, cultural and other domains (Petry, 2006; Potenza, 2006; Potenza et al., 2009). Such an approach, one that focuses on incorporating findings from a broad range of domains, will be important to pursue with a range of potentially addictive behaviors (e.g., gaming, forms of Internet use, sex, shopping and eating) to consider the extent to which each one may have addictive potential.

The authors also note the importance of considering differences across addictions. Such differences are important to consider from a treatment perspective. For example, medications that have indications for the treatment of one addiction (e.g., disulfiram for alcohol dependence) may not have efficacy in the treatment of other addictions, particularly given different mechanisms of action of specific medications and specific aspects of the addiction (e.g., alcohol metabolism in alcohol dependence). While the authors mention that subgroups of individuals warrant consideration (e.g., those with different forms of problematic Internet use), enthusiasm for the impact on treatment development might be tempered given challenges in using subtyping measures to match individuals to specific behavioral therapies (e.g., see project MATCH, in which subgroups of individuals with alcohol dependence did not differ in hypothesized responses to behavioral therapies (Project MATCH Research Group, 1997)). On the other hand, there appear to be important differences in the sociodemographic features as they relate to patterns of Internet use; for example, males appear to have more problems with Internet-related gaming and pornography viewing and females more problems with social networking (Rehbein & Mößle, 2013). As such, considering multiple forms of Internet use may have important public health implications, and systematic study of these behaviors across multiple domains may provide insight into the extent to which excessive and problematic engagement may be best classified as addictions. Appropriate classification holds multiple implications. From a scientific perspective, related disorders may provide a framework for testing hypotheses regarding the pathophysiologies of individual behavioral addictions and thus promote more rapid understandings of disease processes. Similarly, interventions with demonstrated efficacy for substance addictions may hold promise for behavioral addictions, and this may guide prevention, treatment and policy efforts. Classification of disorders as addictions may help promote educational and clinical efforts if, for example, teaching about and treating behavioral addictions become incorporated into existing venues for teaching about and treating substance addictions. As such, the appropriate definition and classification of conditions as behavioral addictions holds significant public health implications (Potenza, 2015).

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

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This commentary considers a recent article on how the proliferating use of atheoretical, confirmatory and diagnosis driven research approaches is resulting in the over-identification of behavioral addictions. In response to the original article, I reflect on the timeliness and value of its observations and expand on a central point it raises: The importance of thinking beyond diagnostic frameworks in developing a comprehensive understanding of addictive behaviors and associated treatments.

Keywords: addictive behaviors, behavioral addictions, diagnosis, idiographic knowledge, mechanisms of change, transdiagnostic approach

The article by Billieux et al. (2015) titled 'Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research' is timely, important, stimulating and a much needed contribution to a central debate in our field: that of the utility and validity of conceptualizing what are essentially *addictive behaviors* as *behavioral addictions* (or psychiatric 'entities'). The difference between these terms is of crucial importance in demarcating the functional (or process) view of psychopathology (favored by Billieux and colleagues) from the syndromal-diagnostic one. Indeed the term 'addictive behaviors' can be interpreted to imply the *potential* for developing a perseverative behavioral *problem,* whilst the term 'behavioral addiction' can be interpreted to imply a behavioral *condition* necessitating diagnosis.

The debate regarding the centrality of diagnostic classification, in the understanding and treatment of psychopathology, can be probably traced to Wilhelm Windelband's (1894/1998) delineation of two forms of evidence-based knowledge, which he termed 'idiographic' and 'nomothetic'. Idiographic knowledge refers to a description or explanation that is specific to an event or thing. Nomothetic knowledge is characterized by the pursuit of general laws and theories.

The idiographic versus nomothetic debate in psychopathology reached its zenith in the late 1940s and early 1950s (Bruch & Bond, 1997; Turkat & Maisto, 1983) as epitomised by the Conference on Graduate Education in Psychology that took place in Boulder, Colorado in 1949 (Benjamin & Baker, 2000; Committee on Training in Clinical Psychology, 1947; O'Sullivan & Quevillon, 1992; Raimy, 1950). At this time, clinicians dealing with psychopathological presentations, especially in psychiatric settings, were mostly expected to define these in terms of nosological categorization and prescribe treatment accordingly. When, in the early 1950s, behavior therapy emerged as an effective form of treatment for various forms of psychopathology, the nosological approach was challenged as hardly any instrumental value could be found in a classification system which aimed at scientific order and communication, but with questionable validity and reliability, as well as limited explanatory power regarding mechanisms for change (Bruch & Bond, 1997; Turkat & Maisto, 1983). Half a century later, these views were reiterated by Bentall (2003) who reminded us of the limitations of the disorder-specific/diagnostic approach in terms of explaining elevated comorbidity, poor construct validity, high prevalence of sub-threshold disorders and high heterogeneity of symptoms among individuals with the same disorder.

Billieux et al. (2015) in a modern incarnation of the views favoring an idiographic approach to the understanding of addictive behaviors, convincingly highlight how the diagnostic approach is neglecting the phenomenology and specificity of addictive behaviors against a backdrop of growing evidence indicating that addictive behaviors are context dependent and decay spontaneously. The focus in the field, which is a matter of concern to Billieux et al. (2015) appears to be the shifting towards atheoretical and confirmatory views characterized by a priori anecdotal observations of behavior as 'addictive' and the drawing of comparisons between such behavior and substance addiction, leading to the increasing classification of almost any behavior as, potentially, a behavioral addiction.

Billieux et al. (2015) underscore how this push towards a diagnostic approach to addictive behaviors is undermining the crucial role played by function and process based frameworks in the understanding of such presentations. This view aligns itself, and finds support, in the work of several scientist-practitioners who have stressed the importance of understanding the idiographic and transdiagnostic mechanisms (be they cognitive, affective, motivational or behavioral) which are responsible for the development, maintenance and recurrence of psychopathology (e.g. Bruch & Bond, 1997; Mansell, Harvey, Watkins & Shafran, 2009; Wells & Matthews, 1994). Billieux et al.'s (2015) view also

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lends support to the idea that the development and validation of individualized transdiagnostic treatment targeting specific mechanisms underlying symptoms and problematic behaviors may be of greater clinical value than the adoption of standardized treatments (Caselli & Spada, 2015; Ezzamel, Spada & Nikčević, 2015; Spada, Caselli, Nikčević & Wells, 2015).

In conclusion, I find myself as a clinician, researcher and teacher in the field, in strong agreement with Billieux et al.'s (2015) views which emphasize how everyday life behaviors are becoming overpathologized, and falling prey to diagnostic speculation and labeling. We must, as Billieux et al. (2015) argue, not lose focus of the specificity of addictive behaviors, their complex inter-functional relationships with other biopsychosocial factors, and their transdiagnostic features. If we do lose this focus, because of an unwillingness to tolerate the challenges that come with such complexity, we may find that the credibility of our field will become increasingly compromised and treatment outcomes inevitably affected for the worse.

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Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research

Addictions as a psychosocial and cultural construction

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This commentary proposes a complementary perspective to that developed by Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015). The addiction-as-disease approach tends to sideline explanatory factors of a psychosocial, cultural, political, or historical nature. I therefore suggest taking into account not only the personal characteristics (loss of self-control, impulsivity) related to the disease model, but also the social determinants of addictive behaviors (weak social ties, social exclusion, hyperindividualism, poverty, unemployment, etc.). Moreover, the disease model of addiction removes addictive behaviors from the cultural and historical contexts that shape them. I argue that the cultural and historical reasons for which certain factors (such as loss of self-control) became so important in the explanation of addictive behaviors should be more thoroughly considered.

Keywords: behavioral addictions, addictive behaviors, addiction-as-disease approach, psychosocial and cultural approaches, individualized psychosocial formulation

In the last few years, the domain of addiction has expanded spectacularly. It has included, beyond substance addictions, an increasing number of behavioral addictions involving a great variety of behaviors and activities, such as sex, work, shopping, attachment to others (co-dependency), physical exercise, gambling, Internet use (social networking, gaming, pornography), and eating. Recently, more specific types of addictions have been described, namely, tanning addiction (Kourosh, Harrington & Adinoff, 2010), fortune telling addiction (Grall-Bonnec, Bulteau, Victorri-Gigneau, Bouju & Sauvaget, 2015), educational studying addiction (Atroszko, Andreassen, Griffiths & Pallesen, 2015), dance addiction (Maraz, Urbán, Griffiths & Demetrovics, 2015), and even a subtype of dance addiction, Argentine tango addiction (Tharghetta, Nalpas & Perney, 2013). Thus, the potential number of behavioral addictions seems infinite. By presenting, in part seriously, in part ironically, a model railroading addiction (based on the DSM-IV-TR criteria for pathological gambling, the words *model railroading* being substituted for the word *gambling*), Mihordin (2012) showed how easy it is to create a new form of addiction. In addition, the more we attribute a psychiatric diagnosis of addiction to persons presenting certain problematic behaviors, the more we increase their numbers (Peele, 2004). Thus, following the identification of the Argentine tango addiction, we may see multiple forms of dancing addictions appear, involving rock and roll, twist, rumba, waltz, java, Charleston, etc. – an inexhaustible source of publications! According to Reinarman and Granfield (2015), it looks like we have become addicted to addiction. Indeed, the notion of addiction is more and more frequently used by a wide range of professionals, and even by ordinary citizens, to serve as an all-purpose explanation for a great variety of everyday difficulties or problems.

Billieux, Schimmenti, Khazaal, Maurage and Heeren (2015) provide a compelling view regarding the overpathologization of everyday life behaviors induced by the "addiction model." They also convincingly identify the methodological and theoretical limits of this approach and show how it leads to the neglect of the heterogeneity of the so-called addictive behaviors, as well as of their multifaceted and context-dependent nature. I fully concur, but I suggest a complementary perspective: addictions viewed as a psychosocial and cultural construction.

Substance and behavioral addictions are dominantly considered as a chronic, relapsing (brain) disease and are mainly explained in terms of biological (genetic, physiological, or neurological) factors. This addiction-as-disease approach tends to sideline explanatory factors of a psychosocial, cultural, political, or historical nature (Reinarman & Granfield, 2015; Suissa, 2006). Interestingly, Sussman, Lisha and Griffiths (2011) examined the prevalence of 11 potential addictions (tobacco, alcohol, illicit drugs, eating, gambling, Internet, love, sex, exercise, work, and shopping) among U.S. adults (based on data from 83 studies). The results suggest that, most plausibly, about 47% of the U.S. population had an addictive behavior, with serious negative consequences, in a 12-month period. The authors concluded that it may be useful to think of addictions not only in terms of personal factors, but also as problems of lifestyle, modeled by social-environmental factors.

From this point of view, Suissa (2014), inspired by the work of Peele (2004), proposes adopting a psychosocial perspective of addiction by including social determinants (weak social ties, social exclusion, hyperindividualism,

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poverty, unemployment, etc.) and not just personal characteristics (loss of self-control, impulsivity) related to the disease model. More specifically, he considers that we are all candidates for developing different addictive behaviors. However, the potential to become dependent is higher when the motivation of the person is to escape from difficulties such as work stress, feelings of loneliness, feelings of emptiness, boredom, low self-esteem, identity problems, etc. This motivation may initiate a "cycle of vulnerability to addiction," in which the addictive behavior is intended to "anesthetize" the negative emotions; this behavior temporarily alleviates distress, but the person is again confronted with reality (malaise, guilt, low self-esteem), which contributes to the continuation and strengthening of the cycle (see also Billieux, Philippot et al., 2015, for a similar interpretation concerning mobile phone overuse).

At a more global level, Reinarman and Granfield (2015) indicate that biological models of addiction remove addictive behaviors from the cultural and historical contexts that shape them. As an example, loss of self-control is considered an important factor in the brain disease theories of addiction. The social and cultural reasons for which self-control became so important and yet so difficult to maintain should thus be taken into account in the explanation of addictive behaviors. Reinarman and Granfield (2015) mention, among such reasons, the proliferation of pleasures in modern society and the idea that ordinary citizens have a right to pleasure; the encouragement of immediate gratification by mass consumption cultures (while persuading consumers that shopping is a core leisure activity); and the existence of various types of social and cultural dislocations from families, communities, traditions, and ways of life that guide and constrain individuals. Paradoxically, modern society encourages individuals to exercise self-control and restraint (to "take responsibility" for their actions), but, at the same time, encourages them to consume and to abandon themselves to the pleasures of self-fulfillment. Society is thus organized in part to undermine self-control. Under these conditions, more and more people will show increasing difficulties in regulating their desires.

Similarly, Reith (2007, 2013) argues that the emergence of "pathological gambling" as a distinct social phenomenon must be understood from the contradictions of late-modern consumer societies. Moreover, in a series of longitudinal and qualitative studies (Kristiansen, Trajberg & Reith, 2015; Reith & Dobbie, 2011, 2012, 2013), she and her colleagues reveal the importance of social networks (family, friends, colleagues), as well as geographical-cultural environment, social class, age, and gender, in the initiation of gambling. Their findings indicate that young people start gambling not because of purely personal characteristics, but through a social process within significant social networks involving a transfer of skills and knowledge (in particular, the attribution of specific meanings to gambling). Reith and colleagues also show that gambling behavior is highly variable over time (with four different trajectories of behavior: progression, reduction, consistency, and nonlinearity) and that this variability is related to material factors such as employment, environment, and social support. Finally, they observe that the recovery processes are embedded in wider social relations and revolve around shifting concepts of self-identity.

In conclusion, we need an important revision of the way we think about addictive behaviors from a clinical point of view. In a paper entitled "Imagine there is no diagnosis, it's easy if you try," Kinderman (2015) suggests that, rather than using diagnostic labels for putative disorders, we should instead make a list of a person's problems. In order to understand these well-defined and specific problems, we should develop an individualized psychosocial formulation in which we incorporate social factors, circumstantial factors, and biological factors, as well as the psychological processes that mediate the responses to those factors. In terms of research, addiction studies should necessarily be multidisciplinary and holistic (Reinarman & Granfield, 2015).

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