The Harmful Dysfunction Analysis applied to the concept of behavioral addiction: A secondary analysis of data from the Health Behaviour in School-aged Children 2018

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Data availability

This study will analyze data from the Health Behaviour in School-aged Children (HBSC) 2018 study publicly available online and distributed by the HBSC Data Management Centre (https://www.uib.no/en/hbscdata) that coordinates the work with the international datafile and the trend data and is the Data Bank for the HBSC study. The centre distributes data under the HBSC data access policy.

Conflict of Interest Statement

The authors declare that this study is not related to any potential conflict of interest.

Abstract

Objective: The present study is an attempt to advance the debate on the validity of the diagnosis of gaming disorder and other specified disorders due to addictive behaviours~~behavioral addiction~~ by improving the differentiation between excessive/high involvement versus pathological involvement ~~with social media~~. The principal aim of the study is to ~~test~~ explore the usefulness of the Harmful Dysfunction Analysis (HDA) in identifying individuals with pathological social media use as an alternative approach to the study of behavioral addictions while also analyzing similarities and differences with DSM-5-TR-based scoring ~~based on~~adopting –criteria for internet gaming and substance use disorders.

Method: The present study will use Swiss data (N = 7,510) from the Health Behaviour in School-aged Children Study 2018, a World Health Organization collaborative cross-national study of adolescent health and well-being. First, convergence between different scoring methods (HDA and DSM-5-TR-based) will be examined. Second, groups based on each scoring method (i.e., non-overlapping cases) will be compared on measures of physical health (physical activity and body mass index) and mental health (psychosomatic health, life satisfaction, school well-being). Adjusted models for age, gender, migration status, and family affluence will also be tested. Data from Hungary (N = 3,789) was selected to repeat the analysis as part of a sensitivity investigation.

Results: A detailed summary of the results of the above analysis will be provided in the text of the manuscript while the results of the sensitivity analysis will be reported as supplementary material.

Conclusions: The conclusions will consist of a description of the research and clinical implications of the findings. The limitations of the study will be discussed as well as recommendations for future research applying the HDA.

Keywords: harmful dysfunction analysis; theoretical framework; addictive behavior; normal engagement; normal involvement.

Introduction

The present study is an attempt to advance the debate on the validity of the diagnosis of gaming disorder and other specified disorders due to addictive behaviours ~~behavioral addiction~~ by improving the differentiation between excessive/high involvement versus pathological behavioral involvement ~~with a form of behavior~~. The Harmful Dysfunction Analysis (HDA) (Wakefield, 1992b, 1992a, 2013, 2015, 2020) is proposed as a useful theoretical framework for constructing improved diagnostic criteria for ~~behavioral~~ addictive disorders~~ons~~ (Amendola, 2023b; Wakefield & Schmitz, 2014, 2015). The DSM-5-TR's (American Psychiatric Association, 2022) definition of a mental disorder requires both the presence of symptoms that are manifestations of "a dysfunction in the psychological, biological, or developmental processes underlying mental functioning" and "are usually associated with significant distress or disability in social, occupational, or other important activities", and the Manual asserts that "each disorder…must meet the definition of a mental disorder" (p. 14). Building on the core of the DSM's definition of mental disorder, the HDA postulates that a mental disorder is a *harmful dysfunction* requiring the presence of both a dysfunction, i.e., the failure (even under the appropriate circumstances) of some psychological mechanism to perform a natural function that it was biologically designed to perform, and consequent harm, i.e., the dysfunction causes harm to the individual as evaluated by social values (Wakefield, 2017b, 2017a).

Our ultimate goal is to evaluate whether the HDA framework offers an appropriate approach to increasing the validity of diagnosis of (Internet) Gaming Disorder (GD) and other specified disorders due to addictive behaviors, an area in which the validity of diagnosis remains highly controversial. However, in this preliminary study, we use data on the related condition of Problematic~~athological~~ Social Media Use (PSMU), not classified as a behavioral addiction in any major diagnostic manual, as a surrogate to test our hypothesis that the HDA offers a useful approach to validation. We first review evidence on the addictive potential of some forms of PSMU, the serious challenge of validly discriminating intensive but psychologically normal-range gaming or other behaviors from pathological versions of those behaviors, and we consider the limitations of current approaches to solving this problem. We then propose a test of the validity of the HDA against other recent approaches to behavioral addiction disorder validation, particularly the "confirmatory approach" that, relying on the components model of addiction (Griffiths, 2005), construes potential DSM behavioral addiction categories as strictly analogous logically to DSM's substance use disorder categories (Billieux et al., 2015).

Background

Despite the inclusion of specific diagnostic criteria for "Gaming Disorder" in ICD-11 (World Health Organization, 2019) and "Internet Gaming Disorder" as a "Condition for Further Study" in DSM-5-TR (American Psychiatric Association, 2022), debate continues on the optimal way to define GD ~~— on which we focus here —~~ as well as other conditions considered behavioral addictions. One issue is how to resolve differences between the DSM-5-TR and ICD-11 definitions of GD (Amendola, 2023b; Borges et al., 2021; Karhulahti et al., 2022). However, a more fundamental challenge is how to validly differentiate high-engagement/excessive but nonpathological ~~involvement in~~ gaming from true pathological/disordered gaming and thus limit "false positive" diagnoses (Amendola, 2023b, 2023c; Billieux et al., 2017; Deleuze et al., 2017; Fournier et al., 2023; Lehenbauer-Baum et al., 2015). This question is particularly urgent in a category such as GD that is concerned with an area of behavior in which it is common for individuals to have highly intensive and sometimes excessive involvement from a social or personal perspective that could easily be mistaken for pathological loss of control. In attempting to distinguish such cases, there exist no agreed biomarkers or other etiological markers of GD pathogenesis that could be used as a consensual criterion of validity.

The issue of valid diagnosis is not specific to GD and offers an especially difficult conceptual challenge to the entire field of behavioral addiction. Indeed, in recent years, based on the currently dominant "confirmatory approach" to disorder category formation (considered below), a seemingly endless number of apparently excessive behaviors have been proposed as categories of behavioral addiction. For example, Griffiths (2019) offers a partial list of conditions for which psychometric tests of disorder status have been formulated that includes gaming addiction, work addiction, exercise addiction, social media addiction, Facebook addiction, YouTube addiction, Tinder addiction, shopping addiction, pornography addiction, sex addiction, love addiction, dance addiction, tanning addiction, and television series watching addiction. This proliferation of categories of presumptively undesirable or excessive behavior as possible disorder categories underscores the need for procedures to establish valid diagnostic criteria that avoid over-pathologizing healthy highly-involved users, if the behavioral addictions field is to gain the credibility and acceptance that it deserves (Billieux et al., 2015, 2019).

Social media use and its addictive potential

Social media refers to "websites and applications which enable users to create and share content or to participate in social networking" or "websites and computer programs that allow people to communicate and share information on the internet using a computer or mobile phone" according to the Oxford English Dictionary and the Cambridge Advanced Learner's Dictionary & Thesaurus, respectively. The present study focuses on social media use for social networking rather than on the broader concepts of smartphone use and screen time. Indeed, social media and networking are only some of the possible activities to which screen time and smartphone use refer.

Besides disorders due to addictive behaviors related to gaming and gambling, the ICD-11 considers the possibility of other problematic behaviors as "other specified disorders due to addictive behaviours" (code: 6C5Y). According to the results of a recent review and experts' opinions study (Brand et al., 2020), problematic forms of pornography use, buying and shopping, and use of social networks may represent conditions of clinical importance and fit the category of "other specified disorders due to addictive behaviours". Additionally, the American Psychological Association (2023) issued its "Health Advisory on Social Media Use in Adolescence" recommending screening adolescents for signs of PSMU, which refer to typical symptoms of addictive behaviors, and training adolescents to recognize them. In an updated document, PSMU is linked with hypersensitivity to social feedback/stimuli and rejection from others (e.g., likes and followers counts) and underdeveloped impulse control (e.g., infinite scroll) contributing to difficulty disengaging from social media and symptoms of dependency (American Psychological Association, 2024). The importance of poor social competencies (Boer, Stevens, Finkenauer, & Eijnden, 2022; Chegeni et al., 2021) and fear of missing out (Kuss & Griffiths, 2017) as part of PSMU were also emphasized. All of this aligns well with a previous contribution discussing the complexity of social media (Bayer et al., 2020). Despite the conceptualization and validity of PSMU as a behavioral addiction being debated (Casale, 2020; Varona et al., 2022; Zendle & Bowden-Jones, 2019), findings from qualitative studies examining subjects' perspectives about the use of social media supported the view that some forms of social media use may be addictive (Ciudad-Fernández et al., 2024; O'Reilly et al., 2018; Throuvala et al., 2019, 2021). The PSMU may thus refer to a spectrum of PSMU patterns with the possibility that one extreme of the spectrum (or some difficult-to-define part of the spectrum) is a problematic/harmful disorder, whereas other parts are problematic/harmful non-disorders.

The present study attempts to provide insights that will be helpful to the ~~valid~~ correct identification of ~~behavioral addictions~~addictive behaviors in general~~, including GD~~. It uses ~~a~~PSMU as a condition with addictive potential ~~related behavioral addiction, PSMU~~, in a test of validity. In line with the above discussion, PSMU is a particularly good domain in which to explore whether an HDA approach can discriminate disordered from non-disordered variants. ~~The PSMU category appears to suffer from the same sorts of validity challenges and diagnostic ambiguities described above for GD and~~

~~other behavioral addictions.~~ According to a recent meta-analytic study, the estimated prevalence of PSMU ranges from 5% to 25% depending on the classification scheme used (Cheng et al., 2021). This very substantial range suggests differences in how various diagnostic instruments draw the line between pathology versus high-frequency normality. The literature reveals that PMSU correlates with a variety of negative conditions, including poorer social support, cyberbullying, and lower well-being across multiple domains of functioning including psychological, school, and sleep problems (Boer et al., 2020; Boer, Stevens, Finkenauer, Koning, et al., 2022; Boer, van den Eijnden, et al., 2022; Boniel-Nissim et al., 2022; Borraccino et al., 2022; Marengo et al., 2021; Šablatúrová et al., 2022), as well as with lower life satisfaction and school performance (Van Den Eijnden et al., 2018). Yet, findings of initial longitudinal studies show no significant causal relationship between PSMU and distress (Di Blasi et al., 2022). Other longitudinal studies present a confusing picture in which PSMU correlates with such conditions as anxiety, insomnia, and depression, but at an individual level is not necessarily causally related to such conditions (Chang et al., 2022; Lin et al., 2021). Despite the findings suggesting a negative impact on functioning, the definition of the category of PMSU, resulting from the use of a confirmatory approach (see below), appears to potentially encompass high and pathological involvement, which might explain the confusing findings.

High involvement versus pathological involvement

Billieux et al. (2019) reviewed the characteristics of high involvement and pathological involvement in video games as well as the boundaries between the two conditions. The authors referred to previous studies showing that high involvement in terms of time spent playing video games is not necessarily problematic or associated with impairment/distress. At the same time, there is a close association between time spent gaming and risk of ~~diagnosis with~~ gaming disorder diagnosis ~~under standardly used~~using standard criteria (Jeong et al., 2018; Király et al., 2019; Liao et al., 2023; Pontes et al., 2022). This suggests that, while time spent playing video games seems to play a major role in determining diagnosis under current approaches, it may not be an effective indicator for validly differentiating high versus pathological involvement, indicating a challenge to current approaches.

The Dualistic Model of Passion (Vallerand et al., 2003) was suggested as a useful theoretical framework for identifying pathological gamers characterized by the inability to control gaming or by a compulsive pattern of gaming that interferes with daily functioning (Billieux et al., 2019). This conceptualization is in line with the definition of GD in the ICD-11 from the World Health Organization (World Health Organization, 2019) which focuses specifically on impaired control over behavior and its negative consequences in daily life. The ICD's approach is congruent in many respects with the HDA approach, as we shall see. By contrast, in the DSM-5-TR, GD is conceptualized under a broader addiction framework in which loss of control or impaired control over gaming is only one of the dependence symptoms (Amendola, 2023b; American Psychiatric Association, 2013). Consequently, the importance of impaired control over behavior, although acknowledged as one essential aspect of addiction, remains understudied as a primary factor indicating pathological involvement (Fillmore, 2003; Kahler et al., 1995; Leeman et al., 2012, 2014; Sripada, 2022). Regarding PSMU specifically, it has been recently documented that help-seekers may apply different self-limiting strategies to control social media use and that success in achieving it depends on both individual and environmental factors but also that lack of knowledge about PSMU complicates seeking and receiving support (Vainio et al., 2023).

The confirmatory approach to behavioral addiction and its challenges

Increasing recent criticism has been aimed at what has come to be called the "confirmatory approach" to behavioral addictions. This criticism is also aimed at distinctive features of the DSM-5-TR approach that differentiate it from the ICD-11. The basic idea of the DSM criteria is to adapt behavioral addiction criteria from the DSM substance use disorder (SUD) criteria (Brown, 1993; Griffiths, 1996, 2005; Marlatt et al., 1988). This yields a logically appealing approach that consists

of simply confirming that analogs of SUD criteria are satisfied by the target behavior (Billieux et al., 2015; Flayelle et al., 2022).

Thus, according to the confirmatory approach, ~~each~~ new apparently excessive behavior can be conceptualized as a behavioral addiction if one can, first, demonstrate the presence of symptoms similar to those of SUD; second, create new psychometric measures of the behavior using SUD criteria; and third, establish associations with variables traditionally correlated with SUD. By following these steps, ~~almost any~~a considerable number of daily life activity that are normally prone to intensive involvement can be theorized as a behavioral addiction when performed in an intensive high-engagement way, resulting in the proliferation of behavioral addictions (Billieux et al., 2015). Accordingly, several studies have questioned the validity of the confirmatory approach (Deleuze et al., 2017; Fournier et al., 2023; Lehenbauer-Baum et al., 2015). Despite stimulating critical thinking and new research, these studies have often had methodological limitations (e.g., interpretation of results based on small sample sizes and possibly resulting from researchers arbitrary choices, use of extreme groups) that may have influenced their results (Amendola, 2023c, 2023a; Fisher et al., 2020; Nylund-Gibson & Choi, 2018). At the same time, Griffiths (2019) emphasized the need for some degree of a confirmatory approach to unify the study of addictions, suggesting that "addictions should be conceptualized based on similarities rather than differences […] otherwise there is little point in calling such behaviours 'addictions.'" (p.181). However, Griffiths' concern does not require a mechanical analogy to SUD criteria, and could be addressed by retaining some core features of SUD. As we discuss below, this is how Griffiths has pursued his "components model" that, based on DSM SUD criteria, requires several necessary components of behavioral addiction. Alternative perspectives to the confirmatory approach have been proposed. For example, the (addictive) behaviors have been considered as reflecting impulse control or compulsive problems, or a coping strategy to deal with problems in daily life, rather than true addiction (Kardefelt-Winther et al., 2017).

A major problem with Griffiths' argument is that SUD diagnostic criteria themselves vary in their face validity as indicators of pathology. Thus, the validity of the analogous criteria Griffiths has used have been questioned as being peripheral or irrelevant to diagnosis of behavioral addiction. For example, Charlton (~~Charlton,~~ 2002) and Charlton and Danforth (~~Charlton & Danforth,~~ 2007) examined the components model of addiction as applied to computer and video game use, with two factors labelled "Addiction" and "Low engagement" consistently found across the two studies, and these results provided evidence that some criteria (i.e., tolerance, euphoria, cognitive salience) of the components model may be peripherical as criteria for addiction or represent phenomena that occur early in the process of disorder development and are best considered risk factors.

Moreover, the DSM symptom threshold for SUD diagnosis—any two or more out of nine possible symptoms—has been criticized as too low, potentially yielding false positive problems for the substance use disorder category itself (Wakefield & Schmitz, 2014, 2015). Those taking a confirmatory approach, including Griffiths in his components model, implicitly attempt to address this problem by following DSM's approach in GD criteria of requiring more symptoms than are required for SUD, and picking and choosing what they consider central among the SUD criteria. Yet, given the essential rationale of the confirmatory approach in which the symptomatic equivalence of a form of behavior to SUD is postulated as the rationale for diagnosis of behavioral addiction, these alterations and the raised threshold levels appear conceptually arbitrary until tested for validity. These various issues regarding SUD criteria and their uses make the current overarching confirmatory approach to behavioral addiction, and the components model on which it is based, a questionable conceptual baseline for diagnosing behavioral addiction pending further validation of criteria and thresholds.

The Harmful Dysfunction Analysis of the concept of behavioral addiction

In accordance with the viewpoints expressed by previous commentators (Billieux et al., 2015; Kardefelt-Winther et al., 2017), it is possible that the risk of over-pathologizing common behaviors results from two challenges to validity: (1) the use of atheoretical and confirmatory approaches with a focus on symptoms analogous to the DSM's SUD symptoms rather than a focus on key dimensions that have conceptual validity, such as dysfunction and impairment/distress; and (2) inherent ambiguities in vague SUD-type symptom descriptions that have long been criticized as encompassing both pathological and normal-range phenomena. Regarding the first problem, although the DSM-5-TR definition of GD includes some criteria indicating the presence of impairment/distress (e.g., criteria 6 and 9), the presence of impairment/distress is not a requirement for the GD diagnosis because diagnosis depends only on any five (or more) of the nine criteria being met, regardless of their content. Moreover, the aspect of dysfunction in psychological domains has not been explicitly addressed or required by the criteria, either. Therefore, the risk of false-positive cases, even when judged by the DSM's own definition of mental disorder, needs to be considered. It is true that the high DSM diagnostic threshold of 5 or more symptoms—as compared to the SUD threshold of 2 or more symptoms—does make it highly likely that most diagnosed cases will have symptoms of dysfunction and impairment/distress. However, in addition to a risk of false positives, the DSM-5 diagnostic threshold risks making false negative diagnoses in which true disorder is present at a lower number of symptoms. More importantly, it has no conceptual rationale as a threshold given its dramatic deviation from the two-symptom SUD threshold and the theory of the confirmatory approach, and so requires validation.

In some ways, the ICD-11 comes closer to the HDA approach than does the dominant DSM approach. A focus on significant harm/distress and persistence over time, and not just a repetitive behavior in itself, has been recommended by previous writers (Kardefelt-Winther et al., 2017) and the optimal nature of exclusion criteria has been debated (Griffiths, 2019; Kardefelt-Winther et al., 2017). The ICD-11 definition of GD benefited from these suggestions and incorporated changes clarifying that the main symptom of GD is not excessive involvement itself but rather impaired control over gaming, with other classic symptoms of dependence included as possible additional clinical features. Notably, increasing priority given to gaming over other life interests and daily activities, continuation or escalation of gaming despite the occurrence of negative consequences, and significant impairment are required for the diagnosis of GD. However, despite providing some suggestions to differentiate GD from normal gaming behavior, the definition of the ICD-11 does not propose specific and effective indicators for discriminating between normal-range (e.g., functional, high-involvement gaming) and ~~disordered~~ pathological ~~-~~gaming.

In the case of addictive disorders, dysfunctions may be caused by evolutionarily novel stimuli (e.g., technological creations) for which the brain and other biological systems were not designed and that lead to failures of designed regulatory systems (Wakefield, 2017b, 2017a). The dysfunction that results from the novel input has been referred to as a dysfunction in self-regulation, a dysfunction of the desire/deliberation/choice system, a pathological degree of diminution of control (Wakefield, 2009, 2013, 2017a, 2017b) or a motivational dysfunction (Wakefield, 2018, 2020). The compulsive behavior may be a symptom that the biological design of motivational and choice systems has failed. This fits well with the discussion about mechanistic and functional explanations of addiction and may represent a phenomenon that unifies all the manifestations of interest (Murphy & Smart, 2018). Wakefield and Conrad (~~Wakefield & Conrad,~~ 2019) clarified that "social values or standards are not synonymous with the attitudes or opinions that predominate at any given moment" and that "whether a condition is a disorder is not determined by how the diagnosed individual subjectively happens to feel about the condition's effects, but by more 'objective' standards determined by the culture's value system" (p.1). In this sense, there is some degree of social relativity present in disorder status because harm is related to what a specific culture values as important and as indicating impairment/distress.

The HDA offers a potentially useful perspective on how to distinguish high involvement and pathological (i.e., dysfunctional and harmful) involvement. According to this view, both dysfunction and harm are required for a disorder. Dysfunction not causing harm does not qualify as a disorder but rather as a harmless abnormality. For example, some passionate or excessive gamers/social media users (e.g., professional gamers, influencers) may experience difficulties in controlling the time spent gaming/using social media or resisting the urge to play/use social media but their functioning in daily life is not directly affected (e.g., they display good sleep quality, are physically active, attend school/work, and maintain intimate/social relationships). The behavior and experience of such gamers/social media users do~~es~~ not qualify as an addictive disorder or psychopathology. Similarly, the absence of harm may distinguish addiction from addictive disorder (Wakefield, 2020).

Conversely, harmful consequences in the absence of a dysfunction do not qualify as a disorder. For example, obesity or postural problems may be consequences of inactivity or sedentary behaviors due to high amount of time spent gaming/using social media in absence of a dysfunction. Information about the specific contexts in which symptoms occur can often help to clarify whether a syndrome is due to a dysfunction or to normal mental functioning under stressful or problematic circumstances (Wakefield & First, 2012). For example, some gamers/social media users may use technological devices to cope with adverse events and/or negative and painful emotions that may decrease self-regulation and motivation. Under these circumstances, the gaming/social media use behavior may increase distress even if a dysfunction causing the behavior itself is absent. According to the HDA, if there is only harm and no dysfunction, the behavior does not qualify as a disorder. However, the possibility also exists that problematic contexts can cause internal dysfunctions in vulnerable individuals, with symptoms then no longer dependent on the context, and this can complicate diagnostic inferences (Wakefield & First, 2012). The importance of environmental influences, such as familial and social/cultural norms and values, has been previously discussed in-depth (Bax, 2014; Snodgrass et al., 2021).

Study objectives ~~and hypotheses~~

The principal aim of the study is to ~~test~~ explore the usefulness of the ~~Harmful Dysfunction Analysis~~HDA applied to the concept of PSMU in ~~identifying~~ differentiating individuals showing a pathological involvement with ~~PSMU~~ social media from those with a high non-pathological involvement. HDA as an alternative approach to the study of behavioral addictions ~~while~~ is ~~also~~ further analyze~~d~~~~ing~~ investigating similarities and differences with DSM-5-TR-based scoring. This aim will be pursued by 1) exploring differences between HDA cases and non-cases (i.e., the rest of the sample), 2) examining convergence between different scoring methods and 3~~2~~) comparing groups based on each scoring method (i.e., non-overlapping cases) on measures of physical health (physical activity and body mass index) and mental health (i.e., psychosomatic health, life satisfaction, school well-being). ~~First, differences between cases and non-cases (i.e., the rest of the sample) will be examined for each scoring method separately; second~~In the latter analysis, different groups of non-overlapping cases as defined by different scoring methods will be directly compared. ~~In addition to directly testing differences in validating measures of groups of PSMU cases using different scoring methods, when examining PSMU cases according to more than one scoring method we will also examine the groups excluded by one method and included by the other for caseness indicators.~~ Adjusted models for age, gender, migration status and family affluence will also be tested. ~~It is hypothesized that adopting the HDA scoring will identify a group of PSMU with lower physical and mental health compared to those identified by different DSM-5-TR-based scoring methods (i.e., DSM-5-TR-based GD scoring and DSM-5-TR-based SUD criteria applied to PSMU).~~

Methods

We report how sample size was determined, all data exclusions (if any), all manipulations, and selected measures from the original study.

Data

The present study uses data from the Health Behaviour in School-aged Children (HBSC) study, a World Health Organization collaborative cross-national study of adolescent health and well-being. The survey is undertaken every four years using a self-report questionnaire exploring health behaviors and complaints, school context, family and peer relationships, with randomly selected representative samples of adolescents aged 11-15 years. Data collection is conducted under a multidisciplinary protocol developed (and updated over the years) by the international surveillance group made up of researchers from all the participating countries (Inchley et al., 2018). The HBSC International Protocol specifies a nationally representative sample of approximately 1,500 pupils from each age group in each participating country, giving a total national sample size of approximately 4,500 children. According to the study protocol, ethical approval for the study protocol was sought from the involved institutions and where ethics committees were not in place, countries adhered to national ethical guidelines concerning research with children and submitted the protocol to any relevant board at country level. Data from the HBSC 2018 was obtained from the HBSC Data Management Centre (https://www.uib.no/en/hbscdata), that coordinates the work with the international datafile and the trend data and is the Data Bank for the HBSC study. The present study was not required to undergo independent approval by an ethical committee because freely online available data, with no identifiable information, was re-analyzed. Data from Switzerland (N= 7,510) and Hungary (N= 3,789) (randomly selected for conducting sensitivity analyses; see statistical analysis paragraph below) ~~were~~ will be used.

Measures

Independent variable

The nine-item Social Media Disorder Scale (SMDS) measures symptoms of PSMU during the last year (van den Eijnden et al., 2016). It consists of nine items with a dichotomous response ("yes", "no") corresponding to the nine diagnostic criteria for GD according to the DSM-5. The questions were introduced as follows: "We are interested in your experiences with social media. The term social media refers to social network sites (e.g. Facebook, [add other local examples]) and instant messengers (e.g. [insert local examples], WhatsApp, Snapchat, Facebook messenger). During the past year, have you…", followed by items description. The scale showed adequate psychometric properties in recent studies (Boer et al., 2020; Boer, Stevens, Finkenauer, Koning, et al., 2022; Boer, van den Eijnden, et al., 2022).

Considering that our interest is on diagnosis and conceptualization of addictive disorder, we will focus in this study on the definition and criteria for GD and SUD from the DSM-5-TR. Although testing for ICD-11 criteria would also be useful, the Social Media Disorder Scale items used here were constructed to be compatible with the DSM-5-TR criteria, so an attempt to use them as measures for ICD-11 criteria would involve questionable assumptions about how they are interpreted by respondents. Thus, we leave the evaluation of ICD-11 criteria for another time. It should be noted that we would expect a substantial convergence between HDA and ICD-11 diagnoses because HDA and ICD-11 GD criteria applied to PSMU both require what amounts to the presence of both harm and dysfunction for diagnosis.

DSM-5-TR-based scoring methods derived from the diagnostic threshold for the diagnosis of GD (i.e., endorsing at least five of the nine diagnostic criteria) and SUD (i.e., endorsing at least two of the seven diagnostic criteria explored by the instrument), will be used (Table 1). Consequently, DSM-

5-TR GD-based PSMU will be considered present if five or more symptoms are met ("yes"). Conversely, DSM-5-TR SUD-based PSMU will be considered present if two or more symptoms are met.

Harmful dysfunction analysis (HDA) of ~~Pathological~~ Problematic Social Media Use (PSMU)

According to the HDA, dysfunction and harm are both required for the diagnosis of a disorder. The nine items of the scale exploring symptoms of PSMU were categorized depending on whether each item indicated dysfunction or harm or neither one (Table 1). The latter category is necessary because some items do not directly indicate harm and do not most plausibly reflect an underlying dysfunction according to the HDA.

Note that both the concepts of "dysfunction" and "harm" are fuzzy and open to a degree of interpretation, and the DSM criteria were not originally formulated with these concepts in mind. Consequently, there is a degree of judgment involved in our categorization, and alternative judgments are possible. In this study, where possible we have followed or tried to remain consistent with consensus judgments of harm and dysfunction made in earlier studies of alcohol use disorder (Wakefield & Schmitz, 2014, 2015). Nonetheless, the formulations of several of the DSM criteria retain a degree of ambiguity as to whether a criterion suggests a dysfunction or a normal-range behavior, and similarly whether a criterion rises to the level and kind of harm that would justify a diagnosis. Thus, to evaluate whether a more demanding approach would yield different and potentially more valid results, we tested two versions of the HDA. The first version, HDA1, as in earlier studies of alcoholism, requires just one dysfunction and one harm symptom, whereas the second version, HDA2, requires two dysfunction and two harm symptoms, to reach diagnostic threshold.

Thus, we categorized items indicative of reduced inhibitory control (persistence despite desiring to stop), lessened interest in alternative rewards (preoccupation with this one type of reward), and withdrawal symptoms as suggesting that internal mechanisms are not functioning as designed (Wakefield, 2018; Wakefield & Schmitz, 2014, 2015). We categorized neglect of other activities and roles, serious conflict with family members, and regular arguments with others as harm caused by excessive use. Items exploring tolerance, escape/mood regulation (which can be adaptive), and deception of others in regard to one's behavior were not judged to be direct indicators of dysfunction or harm. The categorization of these latter symptoms is consistent with recent research on GD that suggests that those criteria are weak or questionable indicators of addictive disorder (Castro-Calvo et al., 2021; Ko et al., 2020; Yen et al., 2022). PSMU diagnosis based on the HDA (HDA1) required that an individual meet at least one dysfunction criterion and at least one harm criterion, as previously reported (Amendola, 2023b; Wakefield & Schmitz, 2014), or, for our stronger criterion, HDA2, that the individual meet at least two dysfunction criteria and at least two harm criteria.

The original scoring of the SMDS (Table 1) is based on DSM criteria but deviates in one important way: it requires 6 out of 9 symptoms parallel to substance use disorder symptoms for diagnosis, rather than 5 out of 9 as in the DSM-5-TR proposed criteria for GD. These thresholds for the respective behavioral additions appear arbitrary because neither one matches the substance use disorder threshold of 2 symptoms or more. If it was applied literally, the confirmatory approach would presumably match the criteria for substance use disorder, allowing a lower threshold than either the SMDS or DSM-5-TR.

Table 1. The nine items of the Social Media Disorder Scale according to DSM-5-TR-based scoring methods and the Harmful dysfunction analysis (HDA) categories of dysfunction and harm.

Item content	Factor	DSM-5-TR GD-based	DSM-5-TR SUD-based	HDA category
During the past year, have you...				
1. ... regularly found that you can't think of anything else but the moment that you will be able to use social media again?	Preoccupation	✓	✓	Dysfunction
2. ... regularly felt dissatisfied because you wanted to spend more time on social media?	Tolerance	✓	✓	*Not used*
3. ... often felt bad when you could not use social media?	Withdrawal	✓	✓	Dysfunction
4. ... tried to spend less time on social media, but failed?	Persistence	✓	✓	Dysfunction
5. ... regularly neglected other activities (e.g., hobbies, sport) because you wanted to use social media?	Displacement	✓	✓	Harm
6. ... regularly had arguments with others because of your social media use?	Problem	✓	✓	Harm
7. ... regularly lied to your parents or friends about the amount of time you spend on social media?	Deception	✓	*Not used*	*Not used*
8. ... often used social media to escape from negative feelings?	Escape	✓	*Not used*	*Not used*
9. ... had a serious conflict with your parents, brother(s), or sister(s) because of your social media use?	Conflict	✓	✓	Harm

Note. ✓: item used as an indicator of a criterion according to DSM-5-TR diagnosis.

Dependent variables

In addition to the HDA1 and HDA2 validity tests, we formulated other validators available in the HBSC. Although the HBSC included many measures of well-being, none of them are pathognomonic for disorder or non-disorder. Nonetheless, we selected measures of well-being and health-promoting behaviors that could serve as indirect individually weak validators but that as part of an overall picture could yield revealing correlates with diagnostic status.

Physical health. Physical activity was examined asking respondents to report how many hours a week they usually exercise in their free time ("Outside school hours: how many hours a week do you usually exercise in your free time so much that you get out of breath or sweat?"). Responses were on a seven-point scale (from 1= every day, to 7= never) and were dichotomized as regular physical activity (0= once a week, 2-3 times per week, 4-6 times a week, every day) and no or low physical activity (1= never, less than once a month, once a month).
Body mass index (BMI) was also used and calculated using information on height and weight.

Mental health. The HBSC-Symptom Checklist was used to measure psychosomatic health during the last six months (Heinz et al., 2022). It consists of eight items covering the following eight symptoms: headache, abdominal pain, backache, feeling low, irritability or bad mood, feeling nervous, sleeping difficulties and dizziness. Respondents are asked to answer using a five-point scale from 1 (about every day) to 5 (rarely or never). Scores were reversed in order that higher total scores indicate higher psychosomatic distress.

Further, life satisfaction was measured using a one-item scale (Cantril, 1965; Levin & Currie, 2014). Respondents rated their life satisfaction using Cantril's ladder [30], ranging from 0 (worst possible life) to 10 (best possible life). Scores were reversed in order that higher scores indicate higher life dissatisfaction.

Not liking school was used as an indicator of school dissatisfaction. Respondents were asked to indicate their feeling about school ("How do you feel about school at present?") using a four-point scale (from 1= I like it a lot, to 4= I do not like it at all) (Boer et al., 2020; Inchley et al., 2016). Responses were dichotomized as liking school (0= like a bit, like a lot) and not-liking school (1= not at all, not very much).

Summary variables. Despite the heterogeneity and non-independence of these five variables, for ease of presentation and provide a rough sense of global outcome we formulated two summary variables defined as 1) a "composite index" of poor psychophysical health or distress, and 2) as different profiles of psychophysical health or distress obtained relying on a latent profile analysis approach. More information is provided below in the paragraph "Statistical analysis".

Covariates

The following sociodemographic information will be included as covariates. Gender was explored by asking respondents whether they are boy or girl (1= boy, 2= girl). Age was computed according to respondents' month and year of birth and the date of the survey administration. Socio-economic status (SES) was measured using the Family Affluence Scale III (FAS III) (Torsheim et al., 2016). It consists of six items exploring material assets in the household (e.g., number of bathrooms, family holidays). The raw total score ranges from 6 (low SES) to 19 (high SES). Finally, migration status will be measured using information on respondents' and parents' country of birth and coded into: Swiss (respondent and at least one parent born in Switzerland or both parents born in Switzerland), second-generation immigrant (respondent born in Switzerland and parents born abroad), and first-generation immigrant (both respondent and parents born abroad) (Kjelgaard et al., 2017).

Statistical analysis

Responses with missing values on any of the variables of interest will be excluded from the analysis. Differences between participants included (i.e., participants with complete responses) and excluded from the analysis will be tested.

To analyze convergence between different scoring methods Chi-squared test of independence and Cohen's kappa coefficient will be used.

Regarding summary measures, the composite index representing poor psychophysical health or distress will be calculated as the mean of z-scores for the five dependent variables. While different profiles of psychophysical health or distress will be obtained relying on a latent profile analysis approach (using z-scores for the five dependent variables).

Analysis of variance (ANOVA) and analysis of covariance (ANCOVA) will be used for groups comparisons on continuous dependent variables z-scores (i.e., body mass index, psychosomatic distress, life dissatisfaction and composite index) without and with adjustment for the effects of covariates (i.e., gender, age, SES, and migration status) in the models, respectively. For continuous dependent variables (i.e., BMI, psychosomatic distress, and life dissatisfaction) z-scores will be used to interpret effect sizes in terms of standardized mean difference.

Finally, logistic regression models will be used to test associations between PSMU and dichotomous dependent variables (i.e., poor physical activity and school dissatisfaction) without and with adjustment for the effects of covariates (i.e., gender, age, SES, and migration status). While multinomial logistic regression will be used to test associations between PSMU and profiles resulting from latent profiles analysis as a dependent variable.

As a sensitivity analysis, the above analysis will be re-run with a sample from another country randomly selected from the dataset. The sample, from Hungary (N= 3,789), was randomly selected on March 29, 2023. Results of sensitivity analysis will be presented as supplementary material.

Limitations

Some limitations of the current analysis should be considered for proper contextualization of the study findings. First, the present analysis used data from adolescents aged 11-15 years. PSMU has been mainly studied in young people (Cheng et al., 2021). However, adolescents show a greater propensity towards impulsive and risky behaviors and are more attracted to novel stimuli than other age groups (Dayan et al., 2010; Gladwin et al., 2011). Therefore, considering both harm and dysfunction and the more conservative criterion, HDA2, requiring at least two dysfunction criteria and at least two harm criteria for PSMU, allowed the identification of the most impaired users by differentiating them from high-involved non-problematic users, mitigating the risk of over-medicalization.

Second, our analysis will benefit from existing data not tailored for investigating the usefulness of the HDA for the conceptualization of behavioral addictions. As a consequence, seven predefined self-report items that derive from the component model of addiction will be used. Third, related to the previous, the use of self-report items leads to harm inference being self-reported. However, it needs to be considered that the items we will use are arguably indicative in the sampled culture of objective harm. Fourth, and related to all the above, additional potential theory-driven dysfunction and harm must be investigated in future research. Despite being understudied, the importance of impaired control over behavior is acknowledged as a primary factor indicating pathological involvement in our investigation, in the ICD-11 definition of GD, and previous research (Fillmore, 2003; Kahler et al., 1995; Leeman et al., 2012, 2014; Sripada, 2022). We believe that the examination of more articulated symptoms of impaired control representing behavioral (e.g., inhibition such as resisting to and stopping the behavior) (Fillmore, 2003; Kahler et al., 1995; Kowalik et al., 2024) and psychological aspects related to cognition and affect (e.g., salience, preoccupation, distortions, negative urgency and craving) (Fillmore, 2003; Gonçalves et al., 2024; Leeman et al., 2014; Quintero et al., 2020; Sripada, 2022) may advance our understanding of dysfunction in addictive disorders. This is consistent with the HDA focus on dysfunction in self-regulation and desire/deliberation/choice system (Wakefield, 2009, 2013, 2017a, 2017b) or motivation (Wakefield, 2018, 2020). Additionally, harm conceptualization and operationalization should be enhanced through the investigation of other informative aspects such as relational, performance, health, financial and, possibly, existential harms (Karhulahti et al., 2023). Importantly, future research should deepen our understanding of body image dissatisfaction as a potential harm of PSMU evident in self-injury and anorexia (Logrieco et al., 2021) and invasive cosmetic and plastic surgery procedures (Jenny et al., 2020; Laughter et al., 2023; Montemurro et al., 2015; Oregi et al., 2024). Similarly, the study of dysfunctional factors specific to PSMU could explore fear of missing out as an additional symptom of impaired control in affect regulation (for example, see findings from (Brailovskaia et al., 2021; Li et al., 2024).

References

Amendola, S. (2023a). *A reply to "Further evidence for the bidimensionality of the components model of addiction: A reply to Amendola (2023)"*. OSF. https://doi.org/10.31219/osf.io/n3g7p

Amendola, S. (2023b). Commentary on Karhulahti et al. (2022): Exploring gaming disorder from the harmful dysfunction analysis perspective. *Addiction Research & Theory*, *0*(0), 1–2. https://doi.org/10.1080/16066359.2023.2173743

Amendola, S. (2023c). Discussing evidence on the components model of addiction. A commentary on Fournier et al. (2023). *Addictive Behaviors*, *145*, 107764. https://doi.org/10.1016/j.addbeh.2023.107764

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (5th ed.)*. American Psychiatric Association.

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders (5th ed., text rev.)*. American Psychiatric Association Publishing.

American Psychological Association. (2023). *Health Advisory on Social Media Use in Adolescence*. https://www.apa.org/topics/social-media-internet/health-advisory-adolescent-social-media-use

American Psychological Association. (2024). *Potential Risks of Content, Features, and Functions: A closer look at the science behind how social media affects youth*. https://www.apa.org/topics/social-media-internet/youth-social-media-2024

Bax, T. (2014). Internet Addiction in China: The Battle for the Hearts and Minds of Youth. *Deviant Behavior*, *35*(9), 687–702. https://doi.org/10.1080/01639625.2013.878576

Bayer, J. B., Triệu, P., & Ellison, N. B. (2020). Social Media Elements, Ecologies, and Effects. *Annual Review of Psychology*, *71*(Volume 71, 2020), 471–497. https://doi.org/10.1146/annurev-psych-010419-050944

Billieux, J., Flayelle, M., Rumpf, H.-J., & Stein, D. J. (2019). High Involvement Versus Pathological Involvement in Video Games: A Crucial Distinction for Ensuring the Validity and Utility of Gaming Disorder. *Current Addiction Reports*, *6*(3), 323–330. https://doi.org/10.1007/s40429-019-00259-x

Billieux, J., King, D. L., Higuchi, S., Achab, S., Bowden-Jones, H., Hao, W., Long, J., Lee, H. K., Potenza, M. N., Saunders, J. B., & Poznyak, V. (2017). Functional impairment matters in the screening and diagnosis of gaming disorder: Commentary on: Scholars' open debate paper on the World Health Organization ICD-11 Gaming Disorder proposal (Aarseth et al.). *Journal of Behavioral Addictions*, *6*(3), 285–289. https://doi.org/10.1556/2006.6.2017.036

Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions*, *4*(3), 119–123. https://doi.org/10.1556/2006.4.2015.009

Boer, M., Stevens, G. W. J. M., Finkenauer, C., & Eijnden, R. J. J. M. van den. (2022). The course of problematic social media use in young adolescents: A latent class growth analysis. *Child Development*, *93*(2), e168–e187. https://doi.org/10.1111/cdev.13712

Boer, M., Stevens, G. W. J. M., Finkenauer, C., Koning, I. M., & van den Eijnden, R. J. J. M. (2022). Validation of the Social Media Disorder Scale in Adolescents: Findings From a Large-Scale Nationally Representative Sample. *Assessment*, *29*(8), 1658–1675. https://doi.org/10.1177/10731911211027232

Boer, M., van den Eijnden, R. J. J. M., Boniel-Nissim, M., Wong, S.-L., Inchley, J. C., Badura, P., Craig, W. M., Gobina, I., Kleszczewska, D., Klanšček, H. J., & Stevens, G. W. J. M. (2020). Adolescents' Intense and Problematic Social Media Use and Their Well-Being in 29 Countries. *Journal of Adolescent Health*, *66*(6), S89–S99. https://doi.org/10.1016/j.jadohealth.2020.02.014

Boer, M., van den Eijnden, R. J. J. M., Finkenauer, C., Boniel-Nissim, M., Marino, C., Inchley, J., Cosma, A., Paakkari, L., & Stevens, G. W. J. M. (2022). Cross-national validation of the social media disorder scale: Findings from adolescents from 44 countries. *Addiction*, *117*(3), 784–795. https://doi.org/10.1111/add.15709

Boniel-Nissim, M., van den Eijnden, R. J. J. M., Furstova, J., Marino, C., Lahti, H., Inchley, J., Šmigelskas, K., Vieno, A., & Badura, P. (2022). International perspectives on social media use among adolescents: Implications for mental and social well-being and substance use. *Computers in Human Behavior*, *129*, 107144. https://doi.org/10.1016/j.chb.2021.107144

Borges, G., Orozco, R., Benjet, C., Mart´ınez, K. I. M., Contreras, E. V., P´erez, A. L. J., Cedr´es, A. J. P., Uribe, P. C. H., Couder, M. A. C. D., Gutierrez-Garcia, R. ul A., Ch´avez, G. E. Q., Albor, Y., Mendez, E., Medina-Mora, M. E., Mortier, P., & Ayuso-Mateos, J. L. (2021). (Internet) Gaming Disorder in *DSM* -5 and *ICD* -11: A Case of the Glass Half Empty or Half

Full: (Internet) Le trouble du jeu dans le *DSM* -5 et la CIM-11: Un cas de verre à moitié vide et à moitié plein. *The Canadian Journal of Psychiatry*, *66*(5), 477–484. https://doi.org/10.1177/0706743720948431

Borraccino, A., Marengo, N., Dalmasso, P., Marino, C., Ciardullo, S., Nardone, P., Lemma, P., & The 2018 HBSC-Italia Group. (2022). Problematic Social Media Use and Cyber Aggression in Italian Adolescents: The Remarkable Role of Social Support. *International Journal of Environmental Research and Public Health*, *19*(15), 9763. https://doi.org/10.3390/ijerph19159763

Brailovskaia, J., Stirnberg, J., Rozgonjuk, D., Margraf, J., & Elhai, J. D. (2021). From low sense of control to problematic smartphone use severity during Covid-19 outbreak: The mediating role of fear of missing out and the moderating role of repetitive negative thinking. *PLOS ONE*, *16*(12), e0261023. https://doi.org/10.1371/journal.pone.0261023

Brand, M., Rumpf, H.-J., Demetrovics, Z., Müller, A., Stark, R., King, D. L., Goudriaan, A. E., Mann, K., Trotzke, P., Fineberg, N. A., Chamberlain, S. R., Kraus, S. W., Wegmann, E., Billieux, J., & Potenza, M. N. (2020). Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of "other specified disorders due to addictive behaviors"? *Journal of Behavioral Addictions*, *11*(2), 150–159. https://doi.org/10.1556/2006.2020.00035

Brown, R. I. F. (1993). *Some contributions of the study of gambling to the study of other addictions, in Eadington, W. R., Cornelius, J. (Eds.) Gambling Behavior and Problem Gambling* (pp. 341–372). University of Nevada Press.

Cantril, H. (1965). *The pattern of human concerns*. Rutgers University Press.

Casale, S. (2020). Problematic social media use: Conceptualization, assessment and trends in scientific literature. *Addictive Behaviors Reports*, *12*, 100281. https://doi.org/10.1016/j.abrep.2020.100281

Castro-Calvo, J., King, D. L., Stein, D. J., Brand, M., Carmi, L., Chamberlain, S. R., Demetrovics, Z., Fineberg, N. A., Rumpf, H., Yücel, M., Achab, S., Ambekar, A., Bahar, N., Blaszczynski, A., Bowden-Jones, H., Carbonell, X., Chan, E. M. L., Ko, C., de Timary, P., … Billieux, J. (2021). Expert appraisal of criteria for assessing gaming disorder: An international Delphi study. *Addiction*, *116*(9), 2463–2475. https://doi.org/10.1111/add.15411

Chang, C.-W., Huang, R.-Y., Strong, C., Lin, Y.-C., Tsai, M.-C., Chen, I.-H., Lin, C.-Y., Pakpour, A. H., & Griffiths, M. D. (2022). Reciprocal Relationships Between Problematic Social Media Use, Problematic Gaming, and Psychological Distress Among University Students: A 9-Month Longitudinal Study. *Frontiers in Public Health*, *10*, 858482. https://doi.org/10.3389/fpubh.2022.858482

Charlton, J. P. (2002). A factor-analytic investigation of computer 'addiction' and engagement. *British Journal of Psychology (London, England: 1953)*, *93*(Pt 3), 329–344. https://doi.org/10.1348/000712602760146242

Charlton, J. P., & Danforth, I. D. W. (2007). Distinguishing addiction and high engagement in the context of online game playing. *Computers in Human Behavior*, *23*(3), 1531–1548. https://doi.org/10.1016/j.chb.2005.07.002

Chegeni, M., Shahrbabaki, P., Shahrbabaki, M., Nakhaee, N., & Haghdoost, A. (2021). Why people are becoming addicted to social media: A qualitative study. *Journal of Education and Health Promotion*, *10*(1), 175. https://doi.org/10.4103/jehp.jehp_1109_20

Cheng, C., Lau, Y.-C., Chan, L., & Luk, J. W. (2021). Prevalence of social media addiction across 32 nations: Meta-analysis with subgroup analysis of classification schemes and cultural values. *Addictive Behaviors*, *117*, 106845. https://doi.org/10.1016/j.addbeh.2021.106845

Ciudad-Fernández, V., Zarco-Alpuente, A., Escrivá-Martínez, T., Herrero, R., & Baños, R. (2024). How adolescents lose control over social networks: A process-based approach to problematic social network use. *Addictive Behaviors*, *154*, 108003. https://doi.org/10.1016/j.addbeh.2024.108003

Dayan, J., Bernard, A., Olliac, B., Mailhes, A.-S., & Kermarrec, S. (2010). Adolescent brain development, risk-taking and vulnerability to addiction. *Journal of Physiology, Paris*, *104*(5), 279–286. https://doi.org/10.1016/j.jphysparis.2010.08.007

Deleuze, J., Nuyens, F., Rochat, L., Rothen, S., Maurage, P., & Billieux, J. (2017). Established risk factors for addiction fail to discriminate between healthy gamers and gamers endorsing DSM-5 Internet gaming disorder. *Journal of Behavioral Addictions*, *6*(4), 516–524. https://doi.org/10.1556/2006.6.2017.074

Di Blasi, M., Salerno, L., Albano, G., Caci, B., Esposito, G., Salcuni, S., Gelo, O. C. G., Mazzeschi, C., Merenda, A., Giordano, C., & Lo Coco, G. (2022). A three-wave panel study on longitudinal relations between problematic social media use and psychological distress during the COVID-19 pandemic. *Addictive Behaviors*, *134*, 107430. https://doi.org/10.1016/j.addbeh.2022.107430

Fillmore, M. T. (2003). Drug Abuse as a Problem of Impaired Control: Current Approaches and Findings. *Behavioral and Cognitive Neuroscience Reviews*, *2*(3), 179–197. https://doi.org/10.1177/1534582303257007

Fisher, J. E., Guha, A., Heller, W., & Miller, G. A. (2020). Extreme-groups designs in studies of dimensional phenomena: Advantages, caveats, and recommendations. *Journal of Abnormal Psychology*, *129*(1), 14–20. https://doi.org/10.1037/abn0000480

Flayelle, M., Schimmenti, A., Starcevic, V., & Billieux, J. (2022). The Pitfalls of Recycling Substance-Use Disorder Criteria to Diagnose Behavioral Addictions. In N. Heather, M. Field, A. C. Moss, & S. Satel, *Evaluating the Brain Disease Model of Addiction* (1st ed., pp. 339–349). Routledge. https://doi.org/10.4324/9781003032762-34

Fournier, L., Schimmenti, A., Musetti, A., Boursier, V., Flayelle, M., Cataldo, I., Starcevic, V., & Billieux, J. (2023). Deconstructing the components model of addiction: An illustration through "addictive" use of social media. *Addictive Behaviors*, 107694. https://doi.org/10.1016/j.addbeh.2023.107694

Gladwin, T. E., Figner, B., Crone, E. A., & Wiers, R. W. (2011). Addiction, adolescence, and the integration of control and motivation. *Developmental Cognitive Neuroscience*, *1*(4), 364–376. https://doi.org/10.1016/j.dcn.2011.06.008

Gonçalves, S. F., Izquierdo, A. M., Bates, R. A., Acharya, A., Matto, H., & Sikdar, S. (2024). Negative Urgency Linked to Craving and Substance Use Among Adults on Buprenorphine or Methadone. *The Journal of Behavioral Health Services & Research*, *51*(1), 114–122. https://doi.org/10.1007/s11414-023-09845-4

Griffiths, M. (1996). Behavioural addiction: An issue for everybody? *Employee Councelling Today*, *8*(3), 19–25. https://doi.org/10.1108/13665629610116872

Griffiths, M. (2005). A 'components' model of addiction within a biopsychosocial framework. *Journal of Substance Use*, *10*(4), 191–197. https://doi.org/10.1080/14659890500114359

Griffiths, M. (2019). The evolution of the 'components model of addiction' and the need for a confirmatory approach in conceptualizing behavioral addictions. *Düşünen Adam: The Journal of Psychiatry and Neurological Sciences*, *32*, 179–184. https://doi.org/10.14744/DAJPNS.2019.00027

Heinz, A., Sischka, P. E., Catunda, C., Cosma, A., García-Moya, I., Lyyra, N., Kaman, A., Ravens-Sieberer, U., & Pickett, W. (2022). Item response theory and differential test functioning analysis of the HBSC-Symptom-Checklist across 46 countries. *BMC Medical Research Methodology*, *22*(1), 253. https://doi.org/10.1186/s12874-022-01698-3

Inchley, J., Currie, D., Cosma, A., & Samdal, O. (2018). *Health Behaviour in School-aged Children (HBSC) Study Protocol: Background, methodology and mandatory items for the 2017/18 survey*. CAHRU. https://hbsc.org/publications/survey-protocols/

Inchley, J., Currie, D., & Young, T. (2016). *Growing Up Unequal: Gender and Socioeconomic Differences in Young People's Health and Well-being. Health Behaviour in School-aged*

Children (HBSC) Study: International Report from the 2013/2014 Survey. World Health Organization.

Jenny, H. E., Chandawarkar, A., & Kim, R. (2020). Data-Driven Insights on the Effects of COVID-19 on Public Interest in Medical Aesthetics: Part II (Active Analysis). *Aesthetic Surgery Journal*, sjaa173. https://doi.org/10.1093/asj/sjaa173

Jeong, H., Yim, H. W., Lee, S.-Y., Lee, H. K., Potenza, M. N., Kwon, J.-H., Koo, H. J., Kweon, Y.-S., Bhang, S., & Choi, J.-S. (2018). Discordance between self-report and clinical diagnosis of Internet gaming disorder in adolescents. *Scientific Reports*, *8*, 10084. https://doi.org/10.1038/s41598-018-28478-8

Kahler, C. W., Epstein, E. E., & McCRADY, B. S. (1995). Loss of control and inability to abstain: The measurement of and the relationship between two constructs in male alcoholics. *Addiction*, *90*(8), 1025–1036. https://doi.org/10.1046/j.1360-0443.1995.90810252.x

Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P., Carras, M., Edman, J., Blaszczynski, A., Khazaal, Y., & Billieux, J. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction (Abingdon, England)*, *112*(10), 1709–1715. https://doi.org/10.1111/add.13763

Karhulahti, V.-M., Behm, S., & Lukka, L. (2023). Why do adults seek treatment for gaming (disorder)? A qualitative study. *Humanities and Social Sciences Communications*, *10*(1), 1–8. https://doi.org/10.1057/s41599-023-01775-y

Karhulahti, V.-M., Vahlo, J., Martončik, M., Munukka, M., Koskimaa, R., & von Bonsdorff, M. (2022). Ontological diversity in gaming disorder measurement: A nationally representative registered report. *Addiction Research & Theory*, 1–11. https://doi.org/10.1080/16066359.2022.2115033

Király, O., Bőthe, B., Ramos-Diaz, J., Rahimi-Movaghar, A., Lukavska, K., Hrabec, O., Miovsky, M., Billieux, J., Deleuze, J., Nuyens, F., Karila, L., Griffiths, M. D., Nagygyörgy, K., Urbán, R., Potenza, M. N., King, D. L., Rumpf, H.-J., Carragher, N., & Demetrovics, Z. (2019). Ten-Item Internet Gaming Disorder Test (IGDT-10): Measurement invariance and cross-cultural validation across seven language-based samples. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, *33*(1), 91–103. https://doi.org/10.1037/adb0000433

Kjelgaard, H. H., Holstein, B. E., Due, P., Brixval, C. S., & Rasmussen, M. (2017). Adolescent Weight Status: Associations With Structural and Functional Dimensions of Social Relations. *Journal of Adolescent Health*, *60*(4), 460–468. https://doi.org/10.1016/j.jadohealth.2016.11.016

Ko, C.-H., Lin, H.-C., Lin, P.-C., & Yen, J.-Y. (2020). Validity, functional impairment and complications related to Internet gaming disorder in the DSM-5 and gaming disorder in the ICD-11. *Australian & New Zealand Journal of Psychiatry*, *54*(7), 707–718. https://doi.org/10.1177/0004867419881499

Kowalik, B. A., Delfabbro, P. H., & King, D. L. (2024). Impaired control and gaming-related harm in relation to gaming Disorder. *Addictive Behaviors*, *151*, 107926. https://doi.org/10.1016/j.addbeh.2023.107926

Kuss, D. J., & Griffiths, M. D. (2017). Social Networking Sites and Addiction: Ten Lessons Learned. *International Journal of Environmental Research and Public Health*, *14*(3), 311. https://doi.org/10.3390/ijerph14030311

Laughter, M. R., Anderson, J. B., Maymone, M. B. C., & Kroumpouzos, G. (2023). Psychology of aesthetics: Beauty, social media, and body dysmorphic disorder. *Clinics in Dermatology*, *41*(1), 28–32. https://doi.org/10.1016/j.clindermatol.2023.03.002

Leeman, R. F., Beseler, C. L., Helms, C. M., Patock-Peckham, J. A., Wakeling, V. A., & Kahler, C. W. (2014). A brief, critical review of research on impaired control over alcohol use and suggestions for future studies. *Alcoholism, Clinical and Experimental Research*, *38*(2), 301–308. https://doi.org/10.1111/acer.12269

Leeman, R. F., Patock-Peckham, J. A., & Potenza, M. N. (2012). Impaired control over alcohol use: An under-addressed risk factor for problem drinking in young adults? *Experimental and Clinical Psychopharmacology*, *20*(2), 92–106. https://doi.org/10.1037/a0026463

Lehenbauer-Baum, M., Klaps, A., Kovacovsky, Z., Witzmann, K., Zahlbruckner, R., & Stetina, B. U. (2015). Addiction and Engagement: An Explorative Study Toward Classification Criteria for Internet Gaming Disorder. *Cyberpsychology, Behavior, and Social Networking*, *18*(6), 343–349. https://doi.org/10.1089/cyber.2015.0063

Levin, K. A., & Currie, C. (2014). Reliability and Validity of an Adapted Version of the Cantril Ladder for Use with Adolescent Samples. *Social Indicators Research*, *119*(2), 1047–1063. https://doi.org/10.1007/s11205-013-0507-4

Li, J., Zhou, Y., Liu, Y., Yu, Z., & Gao, X. (2024). Profiles of fear of missing out and their social media use among young adults: A six-month longitudinal study. *Addictive Behaviors*, *149*, 107899. https://doi.org/10.1016/j.addbeh.2023.107899

Liao, Z., Chen, X., Huang, S., Huang, Q., Lin, S., Li, Y., Tang, Y., & Shen, H. (2023). Exploring the associated characteristics of Internet gaming disorder from the perspective of various game genres. *Frontiers in Psychiatry*, *13*. https://www.frontiersin.org/articles/10.3389/fpsyt.2022.1103816

Lin, C.-Y., Potenza, M. N., Ulander, M., Broström, A., Ohayon, M. M., Chattu, V. K., & Pakpour, A. H. (2021). Longitudinal Relationships between Nomophobia, Addictive Use of Social Media, and Insomnia in Adolescents. *Healthcare (Basel, Switzerland)*, *9*(9), 1201. https://doi.org/10.3390/healthcare9091201

Logrieco, G., Marchili, M. R., Roversi, M., & Villani, A. (2021). The Paradox of Tik Tok Anti-Pro-Anorexia Videos: How Social Media Can Promote Non-Suicidal Self-Injury and Anorexia. *International Journal of Environmental Research and Public Health*, *18*(3), 1041. https://doi.org/10.3390/ijerph18031041

Marengo, N., Borraccino, A., Charrier, L., Berchialla, P., Dalmasso, P., Caputo, M., & Lemma, P. (2021). Cyberbullying and problematic social media use: An insight into the positive role of social support in adolescents—data from the Health Behaviour in School-aged Children study in Italy. *Public Health*, *199*, 46–50. https://doi.org/10.1016/j.puhe.2021.08.010

Marlatt, G. A., Baer, J. S., Donovan, D. M., & Kivlahan, D. R. (1988). Addictive Behaviors: Etiology and Treatment. *Annual Review of Psychology*, *39*(1), 223–252. https://doi.org/10.1146/annurev.ps.39.020188.001255

Montemurro, P., Porcnik, A., Hedén, P., & Otte, M. (2015). The influence of social media and easily accessible online information on the aesthetic plastic surgery practice: Literature review and our own experience. *Aesthetic Plastic Surgery*, *39*(2), 270–277. https://doi.org/10.1007/s00266-015-0454-3

Murphy, D., & Smart, G. L. (2018). Mechanistic Models for Understanding Addiction as a Behavioural Disorder. In *The Routledge Handbook of Philosophy and Science of Addiction*. Routledge.

Nylund-Gibson, K., & Choi, A. Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in Psychological Science*, *4*, 440–461. https://doi.org/10.1037/tps0000176

Oregi, P., Cavale, N., Khatib, M., & Rahman, S. M. (2024). The Ethics and Responsibilities of Social Media Usage by Plastic Surgeons: A Literature Review. *Aesthetic Plastic Surgery*, *48*(3), 530–542. https://doi.org/10.1007/s00266-023-03553-2

O'Reilly, M., Dogra, N., Whiteman, N., Hughes, J., Eruyar, S., & Reilly, P. (2018). Is social media bad for mental health and wellbeing? Exploring the perspectives of adolescents. *Clinical Child Psychology and Psychiatry*, *23*(4), 601–613. https://doi.org/10.1177/1359104518775154

Pontes, H. M., Schivinski, B., Kannen, C., & Montag, C. (2022). The interplay between time spent gaming and disordered gaming: A large-scale world-wide study. *Social Science & Medicine*, *296*, 114721. https://doi.org/10.1016/j.socscimed.2022.114721

Quintero, M. J., Navas, J. F., & Perales, J. C. (2020). The associative underpinnings of negative urgency and its role in problematic gambling behavior. *Addictive Behaviors*, *111*, 106533. https://doi.org/10.1016/j.addbeh.2020.106533

Šablatúrová, N., Rečka, K., & Blinka, L. (2022). Validation of the Social Media Disorder Scale using network analysis in a large representative sample of Czech adolescents. *Frontiers in Public Health*, *10*, 907522. https://doi.org/10.3389/fpubh.2022.907522

Snodgrass, J. G., Dengah, H. J. F., Upadhyay, C., Else, R. J., & Polzer, E. (2021). Indian Gaming Zones as Oppositional Subculture: A Norm Incongruity "Cultural Dissonance" Approach to Internet Gaming Pleasure and Distress. *Current Anthropology*, *62*(6), 771–797. https://doi.org/10.1086/717769

Sripada, C. (2022). Impaired control in addiction involves cognitive distortions and unreliable self-control, not compulsive desires and overwhelmed self-control. *Behavioural Brain Research*, *418*, 113639. https://doi.org/10.1016/j.bbr.2021.113639

Throuvala, Griffiths, Rennoldson, & Kuss. (2019). A 'Control Model' of Social Media Engagement in Adolescence: A Grounded Theory Analysis. *International Journal of Environmental Research and Public Health*, *16*(23), 4696. https://doi.org/10.3390/ijerph16234696

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2021). Perceived Challenges and Online Harms from Social Media Use on a Severity Continuum: A Qualitative Psychological Stakeholder Perspective. *International Journal of Environmental Research and Public Health*, *18*(6), 3227. https://doi.org/10.3390/ijerph18063227

Torsheim, T., Cavallo, F., Levin, K. A., Schnohr, C., Mazur, J., Niclasen, B., Currie, C., & the FAS Development Study Group. (2016). Psychometric Validation of the Revised Family Affluence Scale: A Latent Variable Approach. *Child Indicators Research*, *9*(3), 771–784. https://doi.org/10.1007/s12187-015-9339-x

Vainio, J., Hylkilä, K., Männikkö, N., Mustonen, T., Kääriäinen, M., Konttila, J., Peltonen, A., Karhulahti, V.-M., & Castrén, S. (2023). Perceptions of health changes and support for self-limiting social media use among young adults in Finland—A qualitative study. *Psychology of Popular Media*. https://doi.org/10.1037/ppm0000508

Vallerand, R. J., Blanchard, C., Mageau, G. A., Koestner, R., Ratelle, C., Léonard, M., Gagné, M., & Marsolais, J. (2003). Les passions de l'âme: On obsessive and harmonious passion. *Journal of Personality and Social Psychology*, *85*, 756–767. https://doi.org/10.1037/0022-3514.85.4.756

van den Eijnden, R. J. J. M., Lemmens, J. S., & Valkenburg, P. M. (2016). The Social Media Disorder Scale. *Computers in Human Behavior*, *61*, 478–487. https://doi.org/10.1016/j.chb.2016.03.038

Van Den Eijnden, R., Koning, I., Doornwaard, S., Van Gurp, F., & Ter Bogt, T. (2018). The impact of heavy and disordered use of games and social media on adolescents' psychological, social, and school functioning. *Journal of Behavioral Addictions*, *7*(3), 697–706. https://doi.org/10.1556/2006.7.2018.65

Varona, M. N., Muela, A., & Machimbarrena, J. M. (2022). Problematic use or addiction? A scoping review on conceptual and operational definitions of negative social networking sites use in adolescents. *Addictive Behaviors*, *134*, 107400. https://doi.org/10.1016/j.addbeh.2022.107400

Wakefield, J. C. (1992a). Disorder as Harmful Dysfunction: A Conceptual Critique of DSM-III-R's Definition of Mental Disorder. *Psychological Review*, *99*(2), 232–247.

Wakefield, J. C. (1992b). The Concept of Mental Disorder: On the boundary between biological facts and social values. *American Psychologist*, *47*(3), 373–388. https://doi.org/10.1037/0003-066X.47.3.373

Wakefield, J. C. (2009). Mental Disorder and Moral Responsibility: Disorders of Personhood as Harmful Dysfunctions, With Special Reference to Alcoholism. *Philosophy, Psychiatry, & Psychology*, *16*(1), 91–99. https://doi.org/10.1353/ppp.0.0220

Wakefield, J. C. (2013). Addiction, the Concept of Disorder, and Pathways to Harm: Comment on Levy. *Frontiers in Psychiatry*, *4*. https://doi.org/10.3389/fpsyt.2013.00034

Wakefield, J. C. (2015). DSM-5 substance use disorder: How conceptual missteps weakened the foundations of the addictive disorders field. *Acta Psychiatrica Scandinavica*, *132*(5), 327–334. https://doi.org/10.1111/acps.12446

Wakefield, J. C. (2017a). Addiction and the Concept of Disorder, Part 1: Why Addiction is a Medical Disorder. *Neuroethics*, *10*(1), 39–53. https://doi.org/10.1007/s12152-016-9300-9

Wakefield, J. C. (2017b). Addiction and the Concept of Disorder, Part 2: Is every Mental Disorder a Brain Disorder? *Neuroethics*, *10*(1), 55–67. https://doi.org/10.1007/s12152-016-9301-8

Wakefield, J. C. (Ed.). (2018). The harmful dysfunction analysis of addiction: Normal brains and abnormal states of mind. In *Pickard, H., & Ahmed, S. H. (Eds.). The Routledge handbook of philosophy and science of addiction (pp. 90-101)* (1st ed.). Routledge. https://doi.org/10.4324/9781315689197

Wakefield, J. C. (2020). Addiction from the harmful dysfunction perspective: How there can be a mental disorder in a normal brain. *Behavioural Brain Research*, *389*, 112665. https://doi.org/10.1016/j.bbr.2020.112665

Wakefield, J. C., & Conrad, J. A. (2019). Does the harm component of the harmful dysfunction analysis need rethinking?: Reply to Powell and Scarffe. *Journal of Medical Ethics*, *45*(9), 594–596. https://doi.org/10.1136/medethics-2019-105578

Wakefield, J. C., & First, M. B. (2012). Placing symptoms in context: The role of contextual criteria in reducing false positives in Diagnostic and Statistical Manual of Mental Disorders diagnoses. *Comprehensive Psychiatry*, *53*(2), 130–139. https://doi.org/10.1016/j.comppsych.2011.03.001

Wakefield, J. C., & Schmitz, M. F. (2014). How Many People have Alcohol Use Disorders? Using the Harmful Dysfunction Analysis to Reconcile Prevalence Estimates in Two Community Surveys. *Frontiers in Psychiatry*, *5*. https://doi.org/10.3389/fpsyt.2014.00010

Wakefield, J. C., & Schmitz, M. F. (2015). The harmful dysfunction model of alcohol use disorder: Revised criteria to improve the validity of diagnosis and prevalence estimates: Alcohol use disorder as harmful dysfunction. *Addiction*, *110*(6), 931–942. https://doi.org/10.1111/add.12859

World Health Organization. (2019). *International statistical classification of diseases and related health problems (11th ed.)*. https://icd.who.int/

Yen, J.-Y., Higuchi, S., Lin, P.-Y., Lin, P.-C., Chou, W.-P., & Ko, C.-H. (2022). Functional impairment, insight, and comparison between criteria for gaming disorder in the International Classification of Diseases, 11 Edition and internet gaming disorder in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. *Journal of Behavioral Addictions*. https://doi.org/10.1556/2006.2022.00079

Zendle, D., & Bowden-Jones, H. (2019). Is excessive use of social media an addiction? *BMJ*, l2171. https://doi.org/10.1136/bmj.l2171