Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of “other specified disorders due to addictive behaviors”?

MATTHIAS BRAND1,2*, HANS-JÜRGEN RUMPF3, ZSOLT DEMETROVIC4, ASTRID MÜLLER5, RUDOLF STARK6,7, DANIEL L. KING8, ANNA E. GOUDRIAN9,10,11, KARL MANN11, PATRICK TROTZKE1,2, NAOMI A. FINEBERG13,14,15, SAMUEL R. CHAMBERLAIN16,17, SHANE W. KRAUS18, ELISA WEGMANN1, JOËL BILLIEUX19,20 and MARC N. POTENZA21,22,23

1 General Psychology: Cognition and Center for Behavioral Addiction Research (CeBAR), University of Duisburg-Essen, Duisburg, Germany
2 Erwin L. Hahn Institute for Magnetic Resonance Imaging, Essen, Germany
3 Department of Psychiatry and Psychotherapy, Research Group S:TEP (Substance Use and Related Disorders: Treatment, Epidemiology, and Prevention), University of Lübeck, Lübeck, Germany
4 Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary
5 Department of Psychosomatic Medicine and Psychotherapy, Hannover Medical School, Hannover, Germany
6 Department of Psychotherapy and Systems Neuroscience, Justus Liebig University of Giessen, Giessen, Germany
7 Bender Institute of Neuroimaging, Justus Liebig University of Giessen, Giessen, Germany
8 College of Education, Psychology, and Social Work, Flinders University, Adelaide, Australia
9 Amsterdam University Medical Center, Department of Psychiatry, University of Amsterdam, Amsterdam, The Netherlands
10 Arkin Mental Health Care, Amsterdam, The Netherlands
11 Amsterdam Public Health Research Institute, Amsterdam, The Netherlands
12 Department of Addictive Behavior and Addiction Medicine, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany
13 Hertfordshire Partnership University NHS Foundation Trust, Hertfordshire, UK
14 Centre for Health Services and Clinical Research, School of Life and Medical Sciences, University of Hertfordshire, Hatfield, UK
15 School of Clinical Medicine, University of Cambridge, Cambridge, UK
16 Department of Psychiatry, University of Cambridge, Cambridge, UK
17 Cambridge & Peterborough NHS Foundation Trust, Cambridge, UK
18 University of Nevada, Las Vegas, Department of Psychology, Las Vegas, NV, USA
19 Institute of Psychology, University of Lausanne (UNIL), Lausanne, Switzerland
20 Centre for Excessive Gambling, Lausanne University Hospitals (CHUV), Lausanne, Switzerland
21 Departments of Psychiatry, Neuroscience and Child Study, Yale University School of Medicine, New Haven, CT, USA
22 Connecticut Council on Problem Gambling, Wethersfield, CT, USA
23 Connecticut Mental Health Center, New Haven, CT, USA
ABSTRACT

Background: Gambling and gaming disorders have been included as “disorders due to addictive behaviors” in the International Classification of Diseases (ICD-11). Other problematic behaviors may be considered as “other specified disorders due to addictive behaviors (6C5Y).” Methods: Narrative review, experts’ opinions. Results: We suggest the following meta-level criteria for considering potential addictive behaviors as fulfilling the category of “other specified disorders due to addictive behaviors”:

1. Clinical relevance: Empirical evidence from multiple scientific studies demonstrates that the specific potential addictive behavior is clinically relevant and individuals experience negative consequences and functional impairments in daily life due to the problematic and potentially addictive behavior.
2. Theoretical embedding: Current theories and theoretical models belonging to the field of research on addictive behaviors describe and explain most appropriately the candidate phenomenon of a potential addictive behavior.
3. Empirical evidence: Data based on self-reports, clinical interviews, surveys, behavioral experiments, and, if available, biological investigations (neural, physiological, genetic) suggest that psychological (and neurobiological) mechanisms involved in other addictive behaviors are also valid for the candidate phenomenon. Varying degrees of support for problematic forms of pornography use, buying and shopping, and use of social networks are available. These conditions may fit the category of “other specified disorders due to addictive behaviors”. Conclusion: It is important not to over-pathologize everyday-life behavior while concurrently not trivializing conditions that are of clinical importance and that deserve public health considerations. The proposed meta-level-criteria may help guide both research efforts and clinical practice.

META-LEVEL-CRITERIA FOR CONSIDERING ADDICTIVE BEHAVIORS AS OTHER SPECIFIED DISORDERS DUE TO ADDICTIVE BEHAVIORS

Like some potential addictive behaviors that may be considered for 6C5Y designation, disordered gaming is often conducted on the Internet. The three diagnostic guidelines for gaming disorder in the ICD-11 include impaired control over gaming, increasing priority of (and preoccupation with) gaming, and continuation or escalation of gaming despite experiencing negative consequences (World Health Organization, 2019). In addition, the behavioral pattern must lead to significant impairment in personal, family, social, educational, occupational, or other important life domains. These diagnostic guidelines should also be applied to potential addictive behaviors beyond gaming disorder (and gambling disorder, which shares diagnostic guidelines with gaming disorder). In addition to these diagnostic guidelines, we suggest three meta-level-criteria from a scientific perspective for considering potential addictive behaviors as fulfilling the ICD-11 category “other specified disorders due to addictive behaviors”. We propose these meta-level-criteria in order to help guide both research efforts and clinical practice.

Scientific evidence for clinical relevance

Criterion 1: Empirical evidence from multiple scientific studies, including ones involving treatment-seeking individuals, demonstrates that the specific potential addictive behavior is clinically relevant and individuals experience negative consequences and functional impairments in daily life due to the problematic and potentially addictive behavior.

Rationale: Functional impairment is a core criterion in many mental disorders, including in gaming and gambling disorders (Billieux et al., 2017; World Health Organization, 2019). Therefore, scientific studies should show that the
potential addictive behavior is related to functional impairment that justifies treatment (Stein et al., 2010). The phenomenon should be specific, which means that the problems experienced in daily life must be consequences attributed to the specific potentially addictive behaviors and not due to a wider range of different problematic behaviors or explained by other mental disorders (e.g., due to a manic episode).

**Theoretical embedding**

Criterion 2: Current theories and theoretical models belonging to the field of research on addictive behaviors describe and explain most appropriately the candidate phenomenon of a potential addictive behavior.

Rationale: If a behavioral phenomenon is considered a disorder due to addictive behaviors, the (neuroscientific) theories explaining addictive behaviors should be valid for the candidate phenomenon. Otherwise, it would not be justified to term the phenomenon an addiction, but perhaps rather an impulse-control disorder or obsessive-compulsive disorder. The current theories that are considered specifically relevant within substance-use disorders and behavioral addictions research include the incentive sensitization theory (Robinson & Berridge, 2008), impaired response inhibition and salience attribution (IRISA) model (Goldstein & Volkow, 2011), reward deficiency syndrome (Blum et al., 1996), dual-process approaches of addiction (Bechara, 2005; Everitt & Robbins, 2016) including those focusing on implicit cognitions (Stacy & Wiers, 2010; Wiers & Stacy, 2006), and more specific models of behavioral addictions. This last group includes such models as Davis’s early model of Internet-use disorders (Davis, 2001), the cognitive-behavioral model of gaming disorder (Dong & Potenza, 2014), the tripartite model of gaming disorder (Wei, Zhang, Turel, Bechara, & He, 2017), and the interaction of person-affect-cognition-execution (I-PACE) model of specific Internet-use disorders (Brand, Young, Laier, Wölling, & Potenza, 2016) and of addictive behaviors in general (Brand, Wegmann, et al., 2019). In the scientific literature discussing the candidate phenomenon, theories of addictive behaviors should be applicable and studies should show that the core processes underlying addictive behaviors are also involved in the candidate phenomenon (see next criterion). This situation is important in order to follow a theory-driven and hypotheses-testing approach instead of simply addressing some specific correlates of a potential addictive behavior.

**Empirical evidence for underlying mechanisms**

Criterion 3: Data based on self-reports, clinical interviews, surveys, behavioral experiments, and, if available, biological investigations (neural, physiological, genetic) suggest that psychological (and neurobiological) mechanisms involved in other addictive behaviors (cf., Potenza, 2017) are also valid for the candidate phenomenon.

Rationale: We argue that it is important to have data from multiple studies that have used various methods to examine specific processes underlying the candidate phenomenon before one may consider the classification of a behavioral condition as disorder due to addictive behaviors. The studies should confirm that the theoretical considerations of addictive behaviors seem to be valid for the candidate phenomenon. This also implies that it is not enough if only a very few studies, for example using a new screening instrument, have addressed a new potential addictive behavior to use the term “disorder due to addictive behaviors.” Moreover, studies must include sufficient and rigorous methods with respect to samples and assessment instruments (Rumpf et al., 2019). Only when reliable and valid sets of data from multiple studies (and from different working groups) – as has been considered a criterion of reliability of screening tools in the field (King et al., 2020) – are available showing that theory-driven hypotheses on specific aspects of the addictive behavior have been confirmed, the respective definition as an addictive behavior may be valid. This is important also in terms of avoiding over-pathologizing everyday-life behaviors as addictions (Billieux, Schimmenti, et al., 2015) as mentioned above in the section on functional impairment. A summary of the three meta-level-criteria proposed, including the hierarchical organization and questions to be answered when considering the classification of a candidate phenomenon as an “other specified disorder due to addictive behaviors” is visualized in Fig. 1.

**EVALUATION OF THE SCIENTIFIC EVIDENCE SUPPORTING THE APPROPRIATENESS OF SPECIFIC TYPES OF BEHAVIORAL ADDICTIONS WITHIN THE ICD-11 CATEGORY OF “OTHER SPECIFIED DISORDERS DUE TO ADDICTIVE BEHAVIORS”**

Varying degrees of support for problematic forms of pornography use, buying and shopping, and use of social networks are available. The evidence will be summarized in the next sections. Note that we are not suggesting the inclusion of new disorders in the ICD-11. Rather, we aim to emphasize that some specific potentially addictive behaviors are discussed in the literature, which are currently not included as specific disorders in the ICD-11, but which may fit the category of “other specified disorders due to addictive behaviors” and consequently may be coded as 6C5Y in clinical practice. By defining more precisely the rationale for considering these three potentially addictive behaviors, we also aim to express that for some other phenomena, there may not be sufficient evidence to term them “addictive” behaviors.

**Pornography-use disorder**

Compulsive sexual behavior disorder, as has been included in the ICD-11 category of impulse-control disorders, may include a broad range of sexual behaviors including excessive viewing of pornography that constitutes a clinically relevant phenomenon (Brand, Blycker, & Potenza, 2019;
The classification of compulsive sexual behavior disorder has been debated (Derbyshire & Grant, 2015), with some authors suggesting that the addiction framework is more appropriate (Gola & Potenza, 2018), which can be particularly the case for individuals suffering specifically from problems related to pornography use and not from other compulsive or impulsive sexual behaviors (Gola, Lewczuk, & Skorko, 2016; Kraus, Martino, & Potenza, 2016).

The diagnostic guidelines for gaming disorder share several features with those for compulsive sexual behavior disorder and may potentially be adopted by changing “gaming” to “pornography use.” These three core features have been considered central to problematic pornography use (Brand, Blycker, et al., 2019) and appear to fit appropriately the basic considerations (Fig. 1). Several studies have demonstrated the clinical relevance (criterion 1) of problematic pornography use, leading to functional impairment in daily life including jeopardizing work and personal relationships, and justifying treatment (Gola & Potenza, 2016; Kraus, Meshberg-Cohen, Martino, Quiñones, & Potenza, 2015; Kraus, Voon, & Potenza, 2016). In several studies and review articles, models from the addiction research (criterion 2) have been used to derive hypotheses and to explain the results (Brand, Antons, Wegmann, & Potenza, 2019; Brand, Wegmann, et al., 2019; Brand, Young, et al., 2016; Stark et al., 2017; Wéry, Deleuze, Canale, & Billieux, 2018). Data from self-report, behavioral, electrophysiological, and neuroimaging studies demonstrate an involvement of psychological processes and underlying neural correlates that have been investigated and established to varying degrees for substance-use disorders and gambling/gaming disorders (criterion 3). Commonalities noted in prior studies include cue-reactivity and craving accompanied by increased activity in reward-related brain areas, attentional biases, disadvantageous decision-making, and (stimuli-specific) inhibitory control (e.g., Antons & Brand, 2018; Antons, Mueller, et al., 2019; Antons, Trotzke, Wegmann, & Brand, 2019; Bothe et al., 2019; Brand, Snagowski, Laier, & Maderwald, 2016; Gola et al., 2017; Klucken, Wehrum-Osinsky, Schweckendiek, Kruse, & Stark, 2016; Kowalewska et al., 2018; Meichelmann et al., 2014; Stark, Klucke, Potenza, Brand, & Strahler, 2018; Voon et al., 2014).

Based on evidence reviewed with respect to the three meta-level-criteria proposed, we suggest that pornography-use disorder is a condition that may be diagnosed with the ICD-11 category “other specified disorder due to addictive behaviors” based on the three core criteria for gaming disorder, modified with respect to pornography viewing.

Kraus et al., 2018). The classification of compulsive sexual behavior disorder has been debated (Derbyshire & Grant, 2015), with some authors suggesting that the addiction framework is more appropriate (Gola & Potenza, 2018), which can be particularly the case for individuals suffering specifically from problems related to pornography use and not from other compulsive or impulsive sexual behaviors (Gola, Lewczuk, & Skorko, 2016; Kraus, Martino, & Potenza, 2016).

The diagnostic guidelines for gaming disorder share several features with those for compulsive sexual behavior disorder and may potentially be adopted by changing “gaming” to “pornography use.” These three core features have been considered central to problematic pornography use (Brand, Blycker, et al., 2019) and appear to fit appropriately the basic considerations (Fig. 1). Several studies have demonstrated the clinical relevance (criterion 1) of problematic pornography use, leading to functional impairment in daily life including jeopardizing work and personal relationships, and justifying treatment (Gola & Potenza, 2016; Kraus, Meshberg-Cohen, Martino, Quiñones, & Potenza, 2015; Kraus, Voon, & Potenza, 2016). In several studies and review articles, models from the addiction research (criterion 2) have been used to derive hypotheses and to explain the results (Brand, Antons, Wegmann, & Potenza, 2019; Brand, Wegmann, et al., 2019; Brand, Young, et al., 2016; Stark et al., 2017; Wéry, Deleuze, Canale, & Billieux, 2018). Data from self-report, behavioral, electrophysiological, and neuroimaging studies demonstrate an involvement of psychological processes and underlying neural correlates that have been investigated and established to varying degrees for substance-use disorders and gambling/gaming disorders (criterion 3). Commonalities noted in prior studies include cue-reactivity and craving accompanied by increased activity in reward-related brain areas, attentional biases, disadvantageous decision-making, and (stimuli-specific) inhibitory control (e.g., Antons & Brand, 2018; Antons, Mueller, et al., 2019; Antons, Trotzke, Wegmann, & Brand, 2019; Bothe et al., 2019; Brand, Snagowski, Laier, & Maderwald, 2016; Gola et al., 2017; Klucken, Wehrum-Osinsky, Schweckendiek, Kruse, & Stark, 2016; Kowalewska et al., 2018; Meichelmann et al., 2014; Stark, Klucke, Potenza, Brand, & Strahler, 2018; Voon et al., 2014).

Based on evidence reviewed with respect to the three meta-level-criteria proposed, we suggest that pornography-use disorder is a condition that may be diagnosed with the ICD-11 category “other specified disorder due to addictive behaviors” based on the three core criteria for gaming disorder, modified with respect to pornography viewing.
One condition sine qua non for considering pornography-use disorder within this category would be that the individual suffers solely and specifically from diminished control over pornography consumption (nowadays online pornography in most cases), which is not accompanied by further compulsive sexual behaviors (Kraus et al., 2018). Further, the behavior should be considered as an addictive behavior only if it is related to functional impairment and experiencing negative consequences in daily life, as it is also the case for gaming disorder (Billieux et al., 2017; World Health Organization, 2019). However, we also note that pornography-use disorder may currently be diagnosed with the current ICD-11 diagnosis of compulsive sexual behavior disorder given that pornography viewing and the frequently accompanying sexual behaviors (most frequently masturbation but potentially other sexual activities including partnered sex) may meet the criteria for compulsive sexual behavior disorder (Kraus & Sweeney, 2019). The diagnosis of compulsive sexual behavior disorder may fit for individuals who not only use pornography addictively, but who also suffer from other non-pornography-related compulsive sexual behaviors. The diagnosis of pornography-use disorder as other specified disorder due to addictive behaviors may be more adequate for individuals who exclusively suffer from poorly controlled pornography viewing (in most cases accompanied by masturbation). Whether or not a distinction between online and offline pornography use may be useful is currently debated, which is also the case for online/offline gaming (Király & Demetrovics, 2017).

Buying-shopping disorder

Buying-shopping disorder has been defined by preoccupation with buying-shopping, diminished control over excessive buying of goods, which are often not needed and not used, and recurrent maladaptive buying-shopping behavior. The basic considerations (as suggested in Fig. 1) may be considered fulfilled given that diminished control over buying-shopping, increasing priority given to buying-shopping, and continuation or escalation of buying-shopping have been described as core features of buying-shopping disorder (Guerrero-Vaca et al., 2019; Weinstein, Maraz, Griffiths, Lejoeux, & Demetrovics, 2016). The behavioral pattern leads to clinically significant distress and impairments in important areas of functioning (criterion 1) including a severe reduction of quality of life and personal relationships and an accumulation of debt (cf., Müller, Brand, et al., 2019). In recent articles on buying-shopping disorder, theories and concepts of addiction research are used (criterion 2), including, for example, dual-process approaches involving cue-reactivity and craving as well as diminished top-down control and disadvantageous decision-making (Brand, Wegmann, et al., 2019; Kyrios et al., 2018; Trotzke, Brand, & Starcke, 2017). Evidence for the validity of the concepts of the addiction research (criterion 3) in buying-shopping disorder comes from large-scale studies (Maraz, Urban, & Demetrovics, 2016; Maraz, van den Brink, & Demetrovics, 2015), experimental studies (Jiang, Zhao, & Li, 2017; Nicolai, Darancó, & Moshagen, 2016), studies assessing (treatment-seeking) individuals with self-reported and behavioral measures (Derbyshire, Chamberlain, Odlauß, Schreiber, & Grant, 2014; Granero et al., 2016; Müller et al., 2012; Trotzke, Starcke, Pedersen, Müller, & Brand, 2015; Voth et al., 2014), skin-conductance responses to buying-shopping cues (Trotzke, Starcke, Pedersen, & Brand, 2014), and one neuroimaging study (Raab, Elger, Neuner, & Weber, 2011). Based on the evidence reviewed with respect to the three meta-level criteria proposed, we suggest that buying-shopping disorder may be considered as an “other specified disorder due to addictive behaviors” (Müller, Brand, et al., 2019), until it may be considered an own entity in upcoming revisions of the ICD. Given that there is also some evidence for differences in the phenomenology between offline and online buying-shopping behavior (Müller, Steins-Loeber, et al., 2019; Trotzke, Starcke, Müller, & Brand, 2015), when buying-shopping disorder is diagnosed as an addictive behavior, it may be useful to differentiate between buying-shopping disorder, predominantly offline or online, to be consistent with gambling and gaming disorders in the ICD-11, although this approach has been debated, as mentioned above (Király & Demetrovics, 2017).

Social-network-use disorder

The consideration of problematic use of social networks and other communication applications as a condition that may fit with the criteria for "other specified disorders due to addictive behaviors" is warranted and timely. Diminished control over the use of social networks, increasing priority given to the use of social networks, and continuation of using social networks despite experiencing negative consequences (basic considerations in Fig. 1) have been considered core features of problematic social-networks use (Andressen, 2015), even though empirical evidence regarding specific features of problematic social-network use is mixed and still scarce compared to, for example, gaming disorder (Wegmann & Brand, 2020). Functional impairment in daily life due to the behavior (criterion 1) is still less intensively documented than in other behavioral addictions. Some studies report negative consequences in different life domains resulting from poorly controlled overuse of communication applications, such as social-networking sites, by some individuals (Guedes, Nardi, Guimarães, Machado, & King, 2016; Kuss & Griffiths, 2011). According to meta-analyses, systematic reviews, and nationally representative studies, excessive use of online social networks may be associated with mental health disorders, psychological distress, and decreased well-being (Bányai et al., 2017; Frost & Rickwood, 2017; Marino, Gini, Vieno, & Spada, 2018). Although negative consequences of poorly controlled social-network use can be significant and linked to functional impairment (Karaikos, Tzavellas, Balta, & Paparrigopoulos, 2010), most studies have used convenience samples and defined the negative consequences in accordance with cut-off scores in screening instruments. The
theoretical embedding (criterion 2), however, is widely within the addiction framework (Billieux, Maurage, Lopez-Fernandez, Kuss, & Griffiths, 2015; Turel & Qahri-Saremi, 2016; Wegmann & Brand, 2019). Several neuroimaging and behavioral studies (criterion 3) demonstrate parallels between excessive use of social-network sites and substance-use, gambling and gaming disorders (cf., Wegmann, Mueller, Ostendorf, & Brand, 2018), including findings from experimental studies on cue reactivity (Wegmann, Stodt, & Brand, 2018), inhibitory control (Wegmann, Muller, Turel, & Brand, 2020), and attentional bias (Nikolaidou, Stanton, & Hinvest, 2019) as well as initial results from a clinical sample (Leménager et al., 2016). In contrast, other studies reported preliminary data supporting preserved frontal lobe functioning in individuals displaying excessive social-network use (He, Turel, & Bechara, 2017; Turel, He, Xue, Xiao, & Bechara, 2014). Despite less definitive evidence and some mixed findings (e.g., neuroscience studies), it is likely that the key mechanisms involved in pathological use of social networks are potentially comparable with those involved in gaming disorder, although this needs direct investigation. The evidence with respect to functional impairment in daily life and findings from multi-methodological studies including clinical samples are arguably currently less convincing compared to pornography-use disorder and buying-shopping disorder. Nevertheless, the ICD-11 category “other specified disorders due to addictive behaviors” may currently be useful for diagnosing an individual whose social-network use is the primary source of psychological suffering and functional impairment, if the individually experienced functional impairment is directly related to poorly controlled use of social network. However, more studies, which include clinical samples, are needed before a final consensus can be reached about the validity of the category 6C5Y for poorly controlled use of social networks.

CONCLUSION

Establishing agreed-upon criteria for considering which behaviors may be diagnosed as “other specified disorders due to addictive behaviors” is helpful for both research and clinical practice. It is important not to over-pathologize everyday-life behaviors (Billieux, Schimmenti, et al., 2015; Kardefelt-Winther et al., 2017) while concurrently considering potential conditions associated with impairment (Billieux et al., 2017). For this reason, we have here considered conditions that fit with the ICD-11 category coded as 6C5Y and have not proposed new disorders. Jurisdictions around the world will likely decide individually how to use the ICD-11 and may therefore specify the coding of disorders within specific ICD-11 subcategories. For research, it is important to reach an international consensus about the consideration of specific disorders. We therefore propose these meta-level criteria for considering disorders that potentially fit the 6C5Y category. Again, we argue that it is important to be sufficiently conservative when using the term “addictive behaviors,” which implies to use this term only for behavioral phenomena for which solid scientific evidence exists. In all cases, it is important to consider carefully functional impairment in daily life, to distinguish frequent behavioral engagement from a behavioral pattern that fulfills the criteria for disorders due to addictive behaviors. This is of particular importance in order not to trivialize conditions that are of clinical importance and that deserve public health considerations. We encourage the conduct of further studies on the considered conditions in representative samples with sound measures of the respective conditions and with the use of sound assessments of impairment and clinical relevance. In addition, we suggest more research that directly compares psychological and neurobiological processes potentially involved in the different types of addictive behaviors that are proposed.

Conflicts of interests: JB, ZD, NAF, DLK, SWK, KM, MNP, and HJR have been members of the WHO or other networks, expert groups or advisory groups on addictive behaviors, Internet use and/or CSBD.AM, JB, MB, SRC, ZD, NAF, DLK, MNP, and HJR are members or observers of the COST Action 16207 “European Network for Problematic Usage of the Internet”. AEG, NAF, and MNP have received grants/funding/support from pharmaceutical, legal or other relevant (business) entities, including consulting.

Authors’ contributions: MB and MNP wrote the manuscript. All co-authors contributed comments to the draft. The manuscript’s content was discussed with and approved by all co-authors.

Acknowledgments: This article/publication is based upon work from COST Action 16207 "European Network for Problematic Usage of the Internet", supported by COST (European Cooperation in Science and Technology), www.cost.eu/.

REFERENCES

Andreassen, C. S. (2015). Online social network site addiction: A comprehensive review. Current Addiction Reports, 2, 175–184. https://doi.org/10.1007/s40429-015-0056-9.

Antons, S., & Brand, M. (2018). Trait and state impulsivity in males with tendency towards Internet-pornography-use disorder. Addictive Behaviors, 79, 171–177. https://doi.org/10.1016/j.addbeh.2017.12.029.

Antons, S., Mueller, S. M., Wegmann, E., Trotzke, P., Schulte, M. M., & Brand, M. (2019). Facets of impulsivity and related aspects differentiate among recreational and unregulated use of Internet-pornography. Journal of Behavioral Addictions, 8, 223–233. https://doi.org/10.1556/2006.8.2019.22.

Antons, S., Trotzke, P., Wegmann, E., & Brand, M. (2019). Interaction of craving and functional coping styles in heterosexual males with varying degrees of unregulated Internet-pornography use. Personality and Individual Differences, 149, 237–243. https://doi.org/10.1016/j.paid.2019.05.051.
Bányai, F., Zsila, Á., Király, O., Maraz, A., Elekes, Z., Griffiths, M. D., et al. (2017). Problematic social media use: Results from a large-scale nationally representative adolescent sample. PloS One, 12, e0169839. https://doi.org/10.1371/journal.pone.0169839.

Bechara, A. (2005). Decision making, impulse control and loss of moral incongruence and mechanisms of addictive or compulsive behaviors. Journal of Sexual Medicine, 13, 815–824. https://doi.org/10.1016/j.jsxm.2016.02.169.

Brand, M., Blycker, G. R., & Potenza, M. N. (2019). When pornography becomes a problem: Clinical insights. Psychiatric Times. CME section, Dec 13.

Brand, M., Rumpf, H. J., Demertovics, Z., King, D. L., Potenza, M. N., & Wegmann, E. (2019). Gambling disorder is a disorder due to addictive behaviors: Evidence from behavioral and neuroscientific studies addressing cue reactivity and craving, executive functions, and decision-making. Current Addiction Reports, 48, 296–302. https://doi.org/10.1007/s40429-019-00258-y.

Brand, M., Snagowski, J., Laier, C., & Maderwald, S. (2016). Ventral striatum activity when watching preferred pornographic pictures is correlated with symptoms of Internet pornography addiction. Neurolmage, 129, 224–232. https://doi.org/10.1016/j.neurolmage.2016.01.033.

Brand, M., Wegmann, E., Stark, R., Müller, A., Wolling, K., Robbins, T. W., et al. (2019). The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond Internet-use disorders, and specification of the process character of addictive behaviors. Neuroscience and Biobehavioral Reviews, 104, 1–10. https://doi.org/10.1016/j.neubiorev.2019.06.032.

Brand, M., Young, K. S., Laier, C., Wolling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. Neuroscience and Biobehavioral Reviews, 71, 252–266. https://doi.org/10.1016/j.neubiorev.2016.08.033.

Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. Computers in Human Behavior, 17, 187–195. https://doi.org/10.1016/S0747-5632(00)00041-8.

Derbyshire, K. L., Chamberlain, S. R., Odlaug, B. L., Schreiber, L. R., & Grant, J. E. (2014). Neurocognitive functioning in compulsive buying disorder. Annals of Clinical Psychiatry, 26, 57–63.

Derbyshire, K. L., & Grant, J. E. (2015). Compulsive sexual behavior: A review of the literature. Journal of Behavioral Addictions, 4, 37–43. https://doi.org/10.1556/2006.4.2015.003.

Dong, G., & Potenza, M. N. (2014). A cognitive-behavioral model of Internet gaming disorder: Theoretical underpinnings and clinical implications. Journal of Psychiatric Research, 58, 7–11. https://doi.org/10.1016/j.jpsychires.2014.07.005.

Dullur, P., & Starcevic, V. (2018). Internet gaming disorder does not qualify as a mental disorder. Australian and New Zealand Journal of Psychiatry, 52, 110–111. https://doi.org/10.1177/0004867417741554.

Everitt, B. J., & Robbins, T. W. (2016). Drug addiction: Updating actions to habits to compulsions ten years on. Annual Review of Psychology, 67, 23–50. https://doi.org/10.1146/annurev-psych-122414-033457.

Fineberg, N. A., Demertovics, Z., Stein, D. J., Ioannidis, K., Potenza, M. N., Grünblatt, E., et al. (2018). Manifesto for a European research network into problematic usage of the Internet. European Neuropsychopharmacology, 11, 1232–1246. https://doi.org/10.1016/j.euroneuro.2018.08.004.

Frost, R. L., & Rickwood, D. J. (2017). A systematic review of the mental health outcomes associated with Facebook use. Computers in Human Behavior, 76, 576–600. https://doi.org/10.1016/j.chb.2017.08.001.

Gola, M., Lewczuk, K., & Skorko, M. (2016). What matters: Quantity or quality of pornography use? Psychological and behavioral factors of seeking treatment for problematic pornography use. Journal of Sexual Medicine, 13, 815–824. https://doi.org/10.1016/j.jsxm.2016.02.169.

Gola, M., & Potenza, M. N. (2016). Paroxetine treatment of problematic pornography use: A case series. Journal of Behavioral Addictions, 5, 529–532. https://doi.org/10.1556/2006.5.2016.046.

Gola, M., & Potenza, M. N. (2018). Promoting educational, classification, treatment, and policy initiatives – Commentary on: Compulsive sexual behaviour disorder in the ICD-11 (Kraus et al., 2018). Journal of Behavioral Addictions, 7, 208–210. https://doi.org/10.1556/2006.7.2018.51.

Gola, M., Wordecha, M., Sescousse, G., Lew-Starowicz, M., Kosowski, B., Wypych, M., et al. (2017). Can pornography be addictive? An fMRI study of men seeking treatment for
problematic pornography use. *Neuropsychopharmacology*, 42, 2021–2031. https://doi.org/10.1038/s41386-017-0100-x.

Goldstein, R. Z., & Volkow, N. D. (2011). Dysfunction of the prefrontal cortex in addiction: Neuroimaging findings and clinical implications. *Nature Reviews Neuroscience*, 12, 652–669. https://doi.org/10.1038/nrn3119.

Granero, R., Fernández-Arándea, F., Mestre-Bach, G., Steward, T., Baño, M., del Pino-Gutiérrez, A., et al. (2016). Compulsive buying behavior: Clinical comparison with other behavioral addictions. *Frontiers in Psychology*, 7, 914. https://doi.org/10.3389/fpsyg.2016.00914.

Guedes, E., Nardi, A. E., Guimarães, F. M. C. L., Machado, S., & King, A. L. S. (2016). Social networking, a new online addiction: A review of Facebook and other addiction disorders. *Medical-Express*, 3, 1–6. https://doi.org/10.5935/MedicalExpress.2016.01.01.

Guerrero-Vaca, D., Granero, R., Fernández-Arándea, F., González-Doña, J., Müller, A., Brand, M., et al. (2019). Underlying mechanism of the comorbid presence of buying disorder with gambling disorder: A pathways analysis. *Journal of Gambling Studies*, 35, 261–273. https://doi.org/10.1007/s10899-018-9786-7.

He, Q., Turel, O., & Bechara, A. (2017). Brain anatomy alterations associated with social networking site (SNS) addiction. *Scientific Reports*, 23, 45064. https://doi.org/10.1038/srep45064.

Jiang, Z., Zhao, X., & Li, C. (2017). Self-control predicts attentional bias assessed by online shopping-related Stroop in high online shopping addiction tendency college students. *Comprehensive Psychiatry*, 75, 14–21. https://doi.org/10.1016/j.comppsych.2017.02.007.

Karaiskos, D., Tzavellas, E., Balta, G., & Paparrigopoulos, T. (2010). Social network addiction: A new clinical disorder? *European Psychiatry*, 25, 855. https://doi.org/10.1016/S0924-9338(10)70846-4.

Kardefelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Behrens, F. M. C. L., Machado, S., et al. (2016). Exploration of the neural basis of avatar gaming disorder: A comprehensive systematic review. *Clinical Psychology Review*, 77, 101831. https://doi.org/10.1016/j.cpr.2020.101831.

King, D. L., Chamberlain, S. R., Carragher, N., Billieux, J., Stein, D., Mueller, K., et al. (2020). Screening and assessment tools for gaming disorder: A comprehensive systematic review. *Clinical Psychology Review*, 77, 101831. https://doi.org/10.1016/j.cpr.2020.101831.

King, D. L., Delâbro, P. H., Potenza, M. N., Demetrovics, Z., Billieux, J., & Brand, M. (2018). Internet gaming disorder should qualify as a mental disorder. *Australian and New Zealand Journal of Psychiatry*, 52, 615–617. https://doi.org/10.1177/000486741771189.

Király, O., & Demetrovics, Z. (2017). Inclusion of gaming disorder in ICD has more advantages than disadvantages: Commentary on: Scholars’ open debate paper on the World Health Organization ICD-11 gaming disorder proposal (Aarseth et al.). *Journal of Behavioral Addictions*, 6, 280–284. https://doi.org/10.1556/2006.6.2017.046.

Klücken, T., Wehrum-Osnisky, S., Schweckendiek, J., Kruse, O., & Stark, R. (2016). Altered appetitive conditioning and neural connectivity in subjects with compulsive sexual behavior. *Journal of Sexual Medicine*, 13, 627–636. https://doi.org/10.1016/j.jsm.2016.01.013.

Kowalewska, E., Grubbs, J., Potenza, M. N., Gola, M., Draps, M., & Kraus, S. W. (2018). Neurocognitive mechanisms in compulsive sexual behavior disorder. *Current Sexual Health Reports*, 1–10. https://doi.org/10.1017/s13930-018-0176-z.

Kraus, S. W., Krueger, R. B., Brien, P., First, M. B., Stein, D. J., Kaplan, M. S., et al. (2018). Compulsive sexual behaviour disorder in the ICD-11. *World Psychiatry*, 17, 109–110. https://doi.org/10.1002/wps.20499.

Kraus, S. W., Martino, S., & Potenza, M. N. (2016). Clinical characteristics of men interested in seeking treatment for use of pornography. *Journal of Behavioral Addictions*, 5, 169–178. https://doi.org/10.1556/2006.5.2016.036.

Kraus, S. W., Meshberg-Cohen, S., Martino, S., Quinones, L. J., & Potenza, M. N. (2015). Treatment of compulsive pornography use with naltrexone: A case report. *American Journal of Psychiatry*, 172, 1260–1261. https://doi.org/10.1176/appi.ajp.2015.15060843.

Kraus, S. W., & Sweeney, P. J. (2019). Hitting the target: Considerations for differential diagnosis when treating individuals for problematic use of pornography. *Archives of Sexual Behavior*, 48, 431–435. https://doi.org/10.1007/s10508-018-1301-9.

Kraus, S. W., Voorn, V., & Potenza, M. N. (2016). Should compulsive sexual behavior be considered an addiction? *Addiction*, 111, 2097–2106. https://doi.org/10.1111/add.13297.

Kuss, D. J., & Griffiths, M. D. (2011). Online social networking and addiction: A review of the psychological literature. *International Journal of Environmental Research and Public Health*, 8, 3528–3552. https://doi.org/10.3390/ijerph8093528.

Kyrios, M., Trottke, P., Lawrence, L., Fassnacht, D. B., Ali, K., Laskowski, N. M., et al. (2018). Behavioral neuroscience of buying-shopping disorder: A review. *Current Behavioral Neuroscience Reports*, 5, 263–270. https://doi.org/10.1007/s40473-018-0165-6.

Leménager, T., Dieter, J., Hill, H., Hoffmann, S., Reinhard, I., Beutel, M., et al. (2016). Exploring the neural basis of avatar identification in pathological Internet gamers and of self-reflection in pathological social network users. *Journal of Behavioral Addictions*, 5, 485–499. https://doi.org/10.1556/2006.5.2016.048.

Maraz, A., Urban, R., & Demetrovics, Z. (2016). Borderline personality disorder and compulsive buying: A multivariate etiological model. *Addictive Behaviors*, 60, 117–123. https://doi.org/10.1016/j.addbeh.2016.04.003.

Maraz, A., van den Brink, W., & Demetrovics, Z. (2015). Prevalence and construct validity of compulsive buying disorder in shopping mall visitors. *Psychiatry Research*, 228, 918–924. https://doi.org/10.1016/j.psychres.2015.04.012.

Marino, C., Gini, G., Vieno, A., & Spada, M. M. (2018). The associations between problematic Facebook use, psychological distress and well-being among adolescents and young adults: A systematic review and meta-analysis. *Journal of Affective Disorders*, 226, 274–281. https://doi.org/10.1016/j.jad.2017.10.007.

Mechelms, D. J., Irvine, M., Banca, P., Porter, L., Mitchell, S., Mole, T. B., et al. (2014). Enhanced attentional bias towards sexually explicit cues in individuals with and without...
compulsive sexual behaviours. *PloS One*, 9, e105476. https://doi.org/10.1371/journal.pone.0105476.

Müller, A., Brand, M., Claes, L., Demetrovics, Z., de Zwaan, M., Fernández-Aranda, F., et al. (2019). Buying-shopping disorder–Is there enough evidence to support its inclusion in ICD-11 CNS Spectrums, 24, 374–379. https://doi.org/10.1017/S1092852918001323.

Müller, A., Mitchell, J. E., Crosby, R. D., Cao, L., Claes, L., & de Zwaan, M. (2012). Mood states preceding and following compulsive buying episodes: An ecological momentary assessment study. Psychiatry Research, 200, 575–580. https://doi.org/10.1016/j.psychres.2012.04.015.

Müller, A., Steins-Loeber, S., Trotzke, P., Vogel, B., Georgiadou, E., & de Zwaan, M. (2019). Online shopping in treatment-seeking patients with buying-shopping disorder. *Comprehensive Psychiatry*, 94, 152120. https://doi.org/10.1016/j.comppsych.2019.152120.

Nicolai, J., Darancó, S., & Moshagen, M. (2016). Effects of mood state on impulsivity in pathological buying. Psychiatry Research, 244, 351–356. https://doi.org/10.1016/j.psychres.2016.08.009.

Nikolaïdou, M., Stanton, F. D., & Hinvest, N. (2019). Attentional bias in Internet users with problematic use of social networking sites. *Journal of Behavioral Addictions*, 8, 733–742. https://doi.org/10.1556/2006.2018.00060.

Potenza, M. N. (2017). Clinical neuropsychiatric considerations regarding nonsubstance or behavioral addictions. *Brain Dialogues in Neuroscience*, 19, 281–291.

Potenza, M. N., Higuchi, S., & Brand, M. (2018). Call for research into a wider range of behavioural addictions. *Nature*, 555, 30. https://doi.org/10.1038/d41586-018-02568-z.

Raab, G., Elger, C. E., Neuner, M., & Weber, B. (2011). A neurological study of compulsive buying behaviour. *Journal of Consumer Policy*, 34, 401–413. https://doi.org/10.1006/jcpsi.2010.91196-3.

Robinson, T. E., & Berridge, K. C. (2008). The incentive sensitization theory of addiction: Some current issues. *Philosophical Transactions of the Royal Society B*, 363, 3137–3146. https://doi.org/10.1098/rstb.2008.0093.

Rumpf, H. J., Achah, S., Billieux, J., Bowden-Jones, H., Carragher, N., Demetrovics, Z., et al. (2018). Including gaming disorder in the ICD-11: The need to do so from a clinical and public health perspective. *Journal of Behavioral Addictions*, 7, 556–561. https://doi.org/10.1556/2006.7.2018.59.

Rumpf, H. J., Brandt, D., Demetrovics, Z., Billieux, J., Carragher, N., Brandt, M., et al. (2019). Epidemiological challenges in the study of behavioral addictions: A call for high standard methodologies. *Current Addiction Reports*, 6, 331–337. https://doi.org/10.1007/s40429-019-00262-2.

Stacy, A. W., & Wiers, R. W. (2010). Implicit cognition and addiction: A tool for explaining paradoxical behavior. *Annual Review of Clinical Psychology*, 6, 551–575. https://doi.org/10.1146/annurev.clinpsy.121108.131444.

Starcevic, V., Billieux, J., & Schimmenti, A. (2018). Selffits and behavioural addiction: A plea for terminological and conceptual rigour. *Australian and New Zealand Journal of Psychiatry*, 52, 919–920. https://doi.org/10.1177/0004867418797442.

Stark, R., Klucken, T., Potenza, M. N., Brand, M., & Strahler, J. (2018). A current understanding of the behavioral neuroscience of compulsive sexual behavior disorder and problematic pornography use. *Current Behavioral Neuroscience Reports*, 5, 218–231. https://doi.org/10.1007/s40473-018-0162-9.

Stark, R., Kruse, O., Wehrum-Osinsky, S., Snagowski, J., Brand, M., Walter, B., et al. (2017). Predictors for (problematic) use of Internet sexually explicit material: Role of trait sexual motivation and implicit approach tendencies towards sexual explicit material. *Sexual Addiction & Compulsivity*, 24, 180–202. https://doi.org/10.1080/10720162.2017.1329042.

Stein, D. J., Billieux, J., Bowden-Jones, H., Grant, J. E., Fineberg, N., Higuchi, S., et al. (2018). Balancing validity, utility and public health considerations in disorders due to addictive behaviours (letter to the editor). *World Psychiatry*, 17, 363–364. https://doi.org/10.1002/wps.20570.

Stein, D. J., Phillips, K. A., Bolton, D., Fulford, K. W., Sadler, J. Z., & Kendler, K. S. (2010). What is a mental/psychiatric disorder? From DSM-IV to DSM-V. *Psychological Medicine*, 40, 1759–1765. https://doi.org/10.1017/S0033291709999226.

Trotzke, P., Brand, M., & Starcke, K. (2017). Cue-reactivity, craving, and decision making in buying disorder: A review of the current knowledge and future directions. *Current Addiction Reports*, 4, 246–253. https://doi.org/10.1007/s40429-017-0155-x.

Trotzke, P., Starcke, K., Müller, A., & Brand, M. (2015). Pathological buying online as a specific form of Internet addiction: A model-based experimental investigation. *PloS One*, 10, e0140296. https://doi.org/10.1371/journal.pone.0140296.

Trotzke, P., Starcke, K., Pedersen, A., & Brand, M. (2014). Cue-induced craving in pathological buying: Empirical evidence and clinical implications. *Psychosomatic Medicine*, 76, 694–700.

Trotzke, P., Starcke, K., Pedersen, A., Müller, A., & Brand, M. (2015). Impaired decision making under ambiguity but not under risk in individuals with pathological buying-behavioral and psychophysiological evidence. *Psychiatry Research*, 229, 551–558. https://doi.org/10.1016/j.psychres.2015.05.043.

Turel, O., He, Q., Xue, G., Xiao, L., & Bechara, A. (2014). Examination of neural systems sub-serving Facebook “addiction”. *Psychological Reports*, 115, 675–695. https://doi.org/10.2466/18.PR0.115c3128.

Turel, O., & Qahri-Saremi, H. (2016). Problematic use of social networking sites: Antecedents and consequence from a dual system theory perspective. *Journal of Management Information Systems*, 33, 1087–1116. https://doi.org/10.1080/07421222.2016.1267529.

van Rooij, A. J., Ferguson, C. J., Colder Carras, M., Kardefelt-Winther, D., Shi, J., Aarseth, E., et al. (2018). A weak scientific basis for gaming disorder: Let us err on the side of caution. *Journal of Behavioral Addictions*, 7, 1–9. https://doi.org/10.1556/2006.7.2018.19.

Voon, V., Mole, T. B., Banca, P., Porter, L., Morris, L., Mitchell, S., et al. (2014). Neural correlates of sexual cue reactivity in individuals with and without compulsive sexual behaviours. *PloS One*, 9, e102419. https://doi.org/10.1371/journal.pone.0102419.

Voth, E. M., Claes, L., Georgiadou, E., Selle, J., Trotzke, P., Brand, M., et al. (2014). Reactive and regulatory temperament in patients with compulsive buying and non-clinical controls measured by self-report and performance-based tasks. *Comprehensive Psychiatry*, 55, 1505–1512. https://doi.org/10.1016/j.comppsych.2014.05.011.
Wegmann, E., & Brand, M. (2019). A narrative overview about psychosocial characteristics as risk factors of a problematic social-network use. *Current Addiction Reports, 6*, 402–409. https://doi.org/10.1007/s40429-019-00286-8.

Wegmann, E., & Brand, M. (2020). Cognitive correlates in gaming disorder and social networks use disorder: A comparison. *Current Addiction Reports*, in press. https://doi.org/10.1007/s40429-020-00314-y.

Wegmann, E., Mueller, S., Ostendorf, S., & Brand, M. (2018). Highlighting Internet-communication disorder as further Internet-use disorder when considering neuroimaging studies. *Current Behavioral Neuroscience Reports, 5*, 295–301. https://doi.org/10.1007/s40473-018-0164-7.

Wegmann, E., Müller, S. M., Turel, O., & Brand, M. (2020). Interactions of impulsivity, general executive functions, and specific inhibitory control explain symptoms of social-networks-use disorder: An experimental study. *Scientific Reports, 10*, 3866. https://doi.org/10.1038/s41598-020-60819-4.

Wegmann, E., Stodt, B., & Brand, M. (2018). Cue-induced craving in Internet-communication disorder using visual and auditory cues in a cue-reactivity paradigm. *Addiction Research & Theory, 26*, 306–314. https://doi.org/10.1080/16066359.2017.1367385.

Wei, L., Zhang, S., Turel, O., Bechara, A., & He, Q. (2017). A tripartite neurocognitive model of Internet gaming disorder. *Frontiers in Psychiatry, 8*, 285. https://doi.org/10.3389/fpsyt.2017.00285.

Weinstein, A., Maraz, A., Griffiths, M. D., Lejoyeux, M., & Demetrovics, Z. (2016). Compulsive buying—features and characteristics of addiction. In V. R. Preedy (Ed.), *Neuropathology of drug addictions and substance misuse* (Vol. 3, pp. 993–1007). New York: Elsevier Academic Press.

Wery, A., Deleuze, J., Canale, N., & Billieux, J. (2018). Emotionally laden impulsivity interacts with affect in predicting addictive use of online sexual activity in men. *Comprehensive Psychiatry, 80*, 192–201. https://doi.org/10.1016/j.comppsych.2017.10.004.

Wiers, R. W., & Stacy, A. W. (2006). Implicit cognition and addiction. *Current Directions in Psychological Science, 15*, 292–296. https://doi.org/10.1111/j.1467-8721.2006.00455.x.

World Health Organization. (2019). *ICD-11 for mortality and morbidity statistics*. 2019(06/17).