



New directions in the evaluation and rehabilitation of neurocognitive processes in addictive disorders

The last decades have resulted in a profound reframing of both basic and clinical research on addictive disorders, which revolves around four central factors that are at the heart of the current Special Issue entitled “*New directions in the evaluation and rehabilitation of neurocognitive processes in addictive disorders*”.

First, the spreading of *neuroscience techniques*. The changes brought by the development and popularization of neuroscience tools have led to the reshaping of fundamental and applied research across all domains related to psychopathology and psychiatry. However, the generalized use of neuroimaging and neurophysiology not only deepened our understanding of the cerebral processes involved in addictive disorders, but also led to the emergence of conceptualizations that considered these disorders as brain diseases (Leshner, 1997; Volkow et al., 2016). Although the brain disease model, in which addiction is conceptualized as a disease caused by neurobiological dysfunctions of cerebral systems, is still dominant in the field, it is increasingly criticized for its underestimation of the role played by psychological, environmental, and interpersonal factors in the onset and perpetuation of addictive behaviors (Lewis, 2018; Perales et al., 2020; Satel & Lilienfeld, 2014). Yet, and despite ongoing theoretical debates, the blooming of neuroscience techniques significantly contributed to renew the understanding of addictive disorders and to promote an integrative approach to their treatment.

Second, there is a need to further endorse *evidence-based approach to treatment*, and to promote the adoption of a *neuropsychological perspective* in the psychiatry field. Nowadays, psychological and medical treatment approaches in addictive disorders are largely capitalizing on evidence-based indicators of efficacy and effectiveness, which ultimately promote personalized treatment (e.g., identifying the most suitable treatment protocol according to individual and situational variables). Moreover, as it is now well established that impaired cognitive and social abilities play a pivotal role in the etiology of addictive disorders, tailored rehabilitation based on individualized neuropsychological assessment has emerged as a valuable therapeutic approach (Rolland et al., 2019; Rupp et al., 2012).

Third, the emergence of a *transdiagnostic and process-based account* of addictive disorders. Based on the initial works conducted in the field of emotional disorders (mainly concerning anxiety and depression-related disorders) and stipulating that key psychological dimensions play a joint role in the etiology of psychopathological conditions (Kinderman, 2005; Mansell, Harvey, Watkins, & Shafran, 2009), recent studies have tried to identify and disentangle the common psychological processes (e.g., affective, cognitive, motivational) involved in addictive disorders (e.g., Rochat et al., 2019; Perales et al., 2020). In the context of addiction

research, this transdiagnostic account was initially anchored within a dual-process perspective (Stacy & Wiers, 2010) in which addictive behaviors are conceptualized as the result of an imbalance between a reflective system (involved in effortful control and self-regulation) and an automatic system (promoting substance-related cue reactivity and impulsive approach behaviors). More recently, propositions have emerged that also consider transdiagnostic processes related to emotional and social cognition abilities, deficits related to these dimensions being consistently found among individuals characterized by addictive disorders (e.g., Bora & Zorlu, 2017).

Fourth and finally, the recognition of the *behavioral addiction construct* (namely, non-substance-related addictive behaviors). This construct became legitimized when gambling disorder was categorized, along with substance use and addictive disorder, in the release of the DSM-5 in 2013. The decision to conceptualize gambling disorder as a genuine addiction was fostered by decades of research that showed similarities with substance use disorders, such as comparable neurobiological and cognitive impairments and shared psychosocial risk factors (Clark, 2010). In 2019, the World Health Organization included both gambling and (video) gaming disorder in the ICD-11, further validating the construct of behavioral addiction. This trend is also confirmed by the blooming of Journals specifically dedicated to behavioral addictions, as well as by publications focused on these behavioral addictions in journals previously devoted to substance-related addictions. In recent years, an increasing number of behaviors have been considered potentially addictive, some related to basic needs (e.g., eating; Hebebrand et al., 2014) or emerging habits (e.g., binge watching; Flayelle et al., 2020), which led to caution regarding the risk of pathologizing everyday behaviors (Billieux et al., 2015; Starcevic, Billieux, & Schimmenti, 2017). In particular, recent research showed that applying the diagnosis criteria associated with traditional substance use disorders (e.g., tolerance) to define behavioral addictions (e.g., gaming disorder) is not necessarily relevant at the clinical level and leads to the risk of conflating intense (but not problematic) and pathological behavioral patterns, thus *in fine* increasing the likelihood of pathologizing normal habits (Castro-Calvo et al., 2021). The boundaries determining which habits can be considered addictive states are still a matter of discussion (Karddefelt-Winther et al., 2017), but there is a growing consensus on the fact that some repeated and functionally impairing behaviors can be conceptualized as addictive disorders, even when they are not related to the consumption of a psychoactive substance *per se*.

Although the revolution described above undoubtedly affected our understanding and conceptualization of the behavioral and cerebral mechanisms involved in addictive disorders, we must acknowledge that

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this has not yet resulted in the expected improvement of therapeutic interventions. Indeed, treatment has limited efficiency, as very high relapse rates are still observed (Moos & Moos, 2006). This current statement of failure is at least partly due to the lack of dialogue and transferability between basic research and clinical practice: the brain disease approach is still often seen as reductionist by clinicians and is not perceived as directly useful for understanding and treating patients; neuropsychological evaluation and treatment programs remain rarely applied in clinical settings due to a lack of adapted tools and expertise; treatment is still mostly focused on a diagnosis-based rather than on a process-based and transdiagnostic approach; and the treatment offered to people presenting behavioral addictions often consists of recycling protocols developed for substance-use disorders, without sufficiently considering the unique features and specificities of non-substance-related addictive behaviors.

A key challenge for addiction research is thus to simultaneously keep on developing, among other research lines, the four pillars of its revolution described above, and to ensure the transfer of generated knowledge into everyday clinical practice. Research advances can then be converted into improved therapeutic outcomes by capitalizing on (1) the use of neuroscience insights to better understand and optimize patients' cerebral and cognitive functioning (e.g., neuro-modulation techniques); (2) the implementation of efficient and empirically validated neuropsychological assessment and treatment programs (which are highly used in the context of neurological disorders but still in their infancy in psychiatry); (3) the replacement of the exclusive diagnosis-based perspective with a transdiagnostic and process-based approach, allowing for idiosyncratic clinical case formulation and individualized treatment, notably in the case of multiple comorbid addictive disorders and other mental conditions (e.g., depressive disorder); and (4) the development of new treatment approaches specifically adapted to behavioral addictions and other addictive-like emerging problematic behaviors.

The objective of the current Special Issue is not to offer a comprehensive response to all of these four challenges, but at least to offer a panorama of the current attempts to address them. Indeed, the articles integrated here, beyond providing up-to-date and innovative data on addictive disorders (e.g., elucidation of key neurocognitive factors involved in the etiology of addictive behaviors, development of new assessment tools or process-based treatments), have the potential to foster dialogue between basic research and clinical practices. As shown in Fig. 1, this Special Issue gathers leading experts in addiction science to

present a coherent set of papers distributed along four dimensions, namely (1) *Methods*, ranging from behavioral approaches to brain correlate studies, encompassing eye tracking (Brandtner et al., 2020), electrophysiology (Lutz et al., 2021), neurofeedback (Douset et al., 2020), and neuroimaging (Yang et al., 2021); (2) *Perspective*, ranging from therapeutic to fundamental approaches, with papers focused on new clinical proposals (Cabé et al., 2021), relapse prediction (Dandaba et al., 2020), and new conceptualizations of addictive disorders (Wiers & Verschure, 2021); (3) *Processes explored*, ranging from basic cognition to social cognition, as this Special Issue includes studies that explore classic cognitive deficits (Vicario et al., 2020) and neuropsychological recovery (Maillard et al., 2020), as well as substance-related cognitive biases (Gladwin et al., 2020), emotion recognition (Hanegraaf et al., 2020) or emotion regulation training (Nandirino et al., 2021), and social functioning (Pabst et al., 2020); and (4) *Population*, ranging from substance-related addictions to behavioral addictions, as studies encompass populations with substance consumption and gambling disorder (Kildahl et al., 2020; Perandrés-Gómez et al., 2021), or with polysubstance use from a transdiagnostic perspective (Lewis et al., 2020).

In conclusion, this Special issue, by covering a large spectrum of the contemporary research avenues in addictive disorders, provides the reader with a timely overview of its current evolution while offering concrete perspectives for renewing clinical practices here and now.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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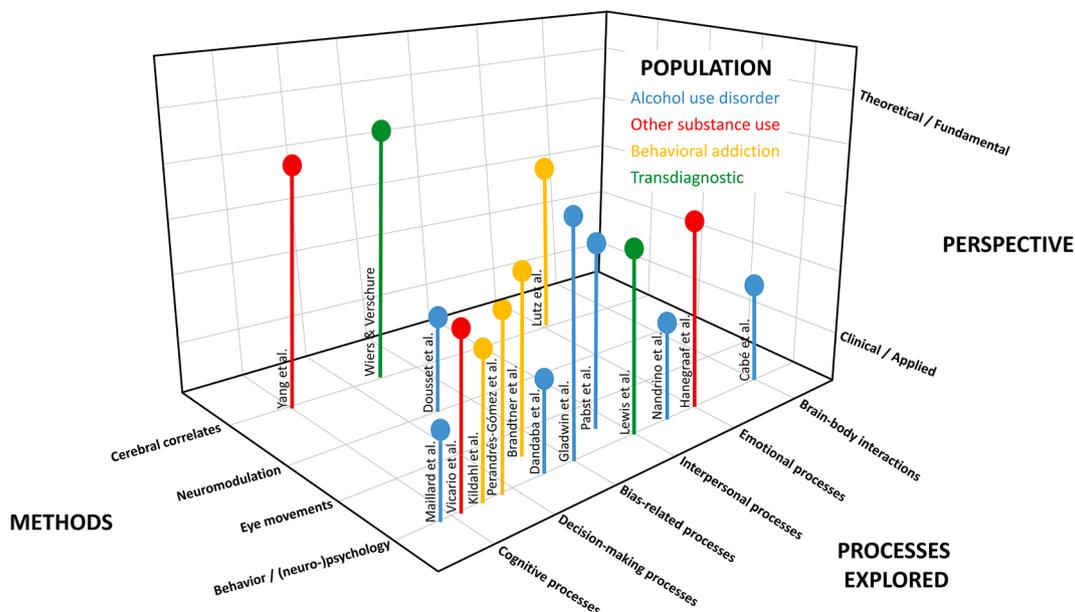


Fig. 1. Graphic representation of the papers included in the Special Issue, according to the *Methods*, *Perspective*, *Processes explored* and *Population* dimensions.

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