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Research paper

Attentional biases in problem and non-problem gamblers

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ABSTRACT

Background: From a cognitive perspective, attentional biases are deemed as factors responsible in the onset and development of gambling disorder. However, knowledge relating to attentional processes in gambling is scarce and studies to date have reported contrasting results. Moreover, no study has ever examined which component and what type of bias are involved in attentional bias in gambling.
Methods: In the present study, 108 Italian participants, equally divided into problem and non-problem gamblers, were administered a modified Posner Task, an attentional paradigm in which – through the manipulation of stimuli presentation time – it is possible to measure both initial orienting and maintenance of attention. In addition to the experimental task, participants completed self-report measures involving (i) craving (Gambling Craving Scale), (ii) depression, anxiety and stress (Depression Anxiety Stress Scale) and (iii) emotional dysregulation (Difficulties in Emotion Regulation Scale).
Results: Analyses revealed facilitation in detecting gambling-related stimuli at the encoding level in problem gamblers but not in non-problem gamblers. Compared to non-problem gamblers, problem gamblers also reported higher levels of craving, emotional dysregulation, and negative mood states. Furthermore, all measures correlated with the gambling severity.
Limitations: The use of indirect measure of attentional bias could be less accurate compared to direct measures.
Conclusions: The facilitation in detecting gambling-related stimuli in problem gamblers and the correlation between subjective craving and facilitation bias suggests that attentional bias could not be due to a conditioning process but that motivational factors such as craving could induce addicted-related seeking-behaviors.

1. Introduction

A large body of research has demonstrated that addictions are characterized by attentional biases toward addiction-related stimuli (see Field and Cox, 2008 for a review). Attentional bias can be defined as an automatic and uncontrollable tendency to allocate attention towards stimuli related to the individual's area of concern (Robinson and Berridge, 2008). Studies that have examined the attentional biases in addictions to nicotine (Ehrman et al., 2002), alcohol (Townshend and Duka, 2001), cannabis (Field et al., 2004), cocaine (Copersino et al., 2004), and gambling (Hønsi et al., 2013) have shown that addiction-related stimuli are processed more efficiently by addicted individuals, further strengthening irrational cognitions and maladaptive behaviors (Field and Cox, 2008; Field et al., 2009).

As proposed by Robinson and Berridge's (1993, 2008) *incentive-sensitization model*, stimuli associated with reward, through a classical conditioning process (such as substance-related or gambling-related stimuli), induce sensitization in the mesocorticolimbic dopamine system in the brain. This sensitization generates craving for addiction stimuli that captures attention and determines attentional biases, contributing to the maintenance of the disorder and leading to possible relapse. In the specific case of gambling, the continuous exposure to gambling can facilitate the detection of gambling-related stimuli in the environment, which can trigger a relapse through conditioned responses. In fact, once a gambling-related stimulus is detected, it can be processed automatically, making difficult to shift attention away from it. Moreover, since the attention is a limited resource, directing attention to a specific category of stimuli prevents the possibility of other stimuli being attended to (Kastner et al., 1998).

In the context of addictions that do not involve the ingestion of

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psychoactive substances, such as gambling disorder (American Psychiatric Association, 2013), knowledge relating to attentional processes is scarce. Studies carried out have reported contrasting results, probably due to the variety of instruments and/or to small sample sizes.

The most commonly used attentional instrument is the addiction Stroop Task (Cox et al., 2006). Using this instrument (in which people are required to read the color of the words, ignoring their semantic content), gamblers have been found to be slower to respond to gambling-related words and commit more errors compared to healthy controls (Boyer and Dickerson, 2003; McCusker and Gettings, 1997; Molde et al., 2010). Diskin and Hodgin's (1999) experimental study measured the reaction times of gamblers and non-gamblers to neutral stimuli such as a light during a gambling episode. They reported that regular gamblers took longer to react to irrelevant stimuli, demonstrating that gambling experience captures the attention of regular gamblers to a greater extent than among occasional gamblers.

Other research has found that problem gamblers display more signs of error-related attentional biases to gambling stimuli and commit more errors on response inhibition task in gambling-related trials (van Holst et al., 2012). However, some studies have failed to support the evidence of attentional biases in gambling. For example, Diskin and Hodgins (2001), in an effort to replicate their first (1999) experiment, confirmed only partially the pattern of results and (unlike their first study) did not find differences in the reaction times between occasional and problem gamblers. Similarly, Atkins and Sharpe (2003) examined reaction times with a modified Stroop Task in high- and low-frequency problem gamblers and found no difference between the two groups. Other studies have found no differences in the speed of reading relevant words between gamblers and control groups when the participants were not under the effect of dopamine agonist (Zack and Poulos, 2004) or antagonist (Zack and Poulos, 2007). These findings, that do not support the presence of attentional biases among gamblers, are probably due to the small samples (Atkins and Sharpe, 2003; Zack and Poulos, 2004, 2007) and/or to the absence of problem gambling among participants (Atkins and Sharpe, 2003).

In addition, some issues remain unanswered. Firstly, it is not clear which attentional component is involved in gambling disorder. Researchers have distinguished between two components of selective attention: orienting and maintenance (Allport, 1989; LaBerge, 1995). Orienting refers to the rapid and automatic shift of attention (that occurs within 200 ms), while maintenance refers to slow and continuous stimuli elaboration (that occurs within 500 ms or more) (Field and Cox, 2008; Field et al., 2009; Noël et al., 2006). To date, the majority of the studies evaluating attentional biases have employed the addiction Stroop Task that is unanimously considered a measure of the early stages of cognitive processing (Cox et al., 2006). Other studies (e.g., Grant and Bowling, 2015; Vizcaino et al., 2013) found no bias in attentional engagement and demonstrated that gambling frequency is associated with the maintenance of attention when using gambling-related stimuli. A recent study (Brevers et al., 2011b) used an attentional paradigm that allows the evaluation of these two attentional components. The study found that problem gamblers (compared to controls) were faster to detect gambling-related changes and showed biases in the initial orienting of attention.

Furthermore, it is necessary to examine the nature of gambling-related attentional biases. Recently, three types of biases have been distinguished (Cisler and Koster, 2010): *facilitation*, that is the easiness to direct attention towards valenced stimuli (in this specific case, gambling-related cues in respect to neutral ones); *avoidance*, namely the tendency to avoid specific cues, allocating attention away from these; and *disengagement*, referring to a difficulty in diverting attention from these stimuli. Using a direct measure of attention (i.e., eye-tracking technology), Brevers et al. (2011a) observed a facilitation to respond to gambling-related pictures and a difficulty in disengaging attention away from these, namely a prolonged maintenance on gambling stimuli, with problem gamblers directing their gaze more frequently towards gambling stimuli.

Secondly, the relationship between craving and attentional biases is not clear. In Field's (2009) meta-analysis, a relationship between craving and attentional biases in drug addictions was detected, while, in the field of gambling, these results have not been confirmed (Brevers et al., 2011a; Wölfling et al., 2011), except in one study (i.e., Molde et al., 2010) that observed a correlation between attentional biases and abstinence. The relationship between craving and attentional biases on gambling-related stimuli needs clarifying as this could have important theoretical and practical implications. A correlation between these two constructs may indicate that attentional biases are not only the consequence of a classical conditioning process but that are associated with motivational states such as craving, and that a psychotherapeutic intervention on motivations to gamble may have an influence on biases.

Moreover, in the gambling studies literature, the role of gambling activity as a way to escape from negative emotions or mood is well known (Wood and Griffiths, 2007). In several studies that have examined gambling motivation, one of the most reported motivations is the use of gambling as a relief from negative psychological states (Blaszczynski and McConaghy, 1989; Blaszczynski and Nower, 2002; Dickerson et al., 1996). The refuge in gambling is not only a way to ameliorate mood states (e.g., Wood and Griffiths, 2007) but it may serve as a way to experience excitement and relieving boredom (Griffiths, 1995). Gambling involvement is also associated with the inability to manage emotions. For instance, Williams et al. (2012) reported that gamblers experience a high lack of emotional clarity and awareness and have a difficulty in adopting emotion-regulation strategies. Since the relationship between emotions and attentional bias has never been investigated, it is hypothesized that negative emotions and the inability to manage them in a healthy and functional way are likely to be associated with a tendency to allocate attention to very specific stimuli, such as gambling-related ones, and provide relief from them. Such issues have yet to be empirically addressed.

The comprehension of both the type of attentional biases and the attentional components involved in gambling disorder may help clinicians in the psychotherapeutic programs to aim their focus towards attentional modification. In light of this background, the purpose of the present study was threefold. Firstly, attentional biases in healthy controls and problem gamblers were measured, using a modified version of the Posner Task with exposure times assessing both early attentional processing and maintenance. Secondly the differentiation of three types of attentional biases was investigated. Finally, the relationships between these variables were analyzed.

Among indirect measures of biases, the choice to employ the Posner Task paradigm steams from two reasons. Firstly, through manipulation of cue presentation time, it allowed the assessment of biases at two levels: early orientation (100 ms) and maintenance of attention (500 ms). Secondly, the use of images (as opposed to words or other types of stimuli) is reported in the literature as being more suited to capturing attentional biases (Molde et al., 2010).

To the best of the authors' knowledge, the present study is the first to evaluate attentional processing, craving, emotional dysregulation, and emotional distress in both problem gamblers and healthy controls. It was hypothesized that there would be facilitation bias in problem gamblers but not in healthy controls. Finally, it was hypothesized that there would be positive