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Linking empathy to visuospatial perspective-taking in gambling addiction

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ABSTRACT

It has been demonstrated that people suffering from substance-related addictions are less empathic than their non-addicted counterparts. Our first aim was to verify if this is also true for behavioral addictions. We hypothesized that problem gamblers are less empathic than healthy controls. Our second aim was to identify a cognitive marker of empathy that could be targeted in cognitive rehabilitation strategies. We propose that a potential cognitive marker of empathy could be visuospatial perspective-taking. Specifically, we hypothesized that visuospatial perspective-taking performances are lower in problem gamblers compared to healthy controls and that these visuospatial performances predict empathy. Thirty-one non-gamblers, 24 healthy gamblers, and 21 problem gamblers performed a visuospatial perspective-taking task before completing the Interpersonal Reactivity Index (IRI; Davis, 1980; Davis, 1983). Problem gamblers had decreased empathy and lower performance at the visuospatial perspective-taking task than non-gamblers and healthy gamblers. Furthermore, we confirmed that visuospatial perspective-taking abilities predict empathy on the IRI dimensions of interpersonal perspective-taking and personal distress. The present study provides new evidence that reduced empathy is not limited to subjects with substance-related addictions; rather, it extends to behavioral addictions. Visuospatial perspective-taking may be a viable cognitive marker for use as a rehabilitation target of empathy.

1. Introduction

Empathy is the ability to react to others' experiences by sharing their emotions and adopting their perspective. There is broad consensus among scholars that empathy is a multifaceted construct (Davis, 1980, 1983; Ickes, 1997; Preston and de Wall, 2002) involving an emotional, automatic response to others' feelings and the cognitive capacity to take others' perspectives. This ability is crucial to interpersonal interactions and social functioning (Anderson and Keltner, 2002). Being able to share others' emotions and to take others' perspectives allows people to understand each others' intentions, predict their behaviors, and reason in moral terms regarding altruistic behaviors (Batson et al., 1995), or at least to respond rapidly and effectively to favorable or adverse social occurrences. An impaired ability to empathize with others reduces the individual's capacity to adapt to the social environment. Empathy impairment has been observed in several psychiatric disorders (Blair, 2005) such as autism (Baron-Cohen and Wheelwright, 2004), antisocial personality disorder (Ellis, 1982; Soderstrom, 2003), schizophrenia (Bora et al., 2008; Derntl et al., 2009), and depression (Schreiter et al., 2013), and at least partially explains the social maladaptation of these psychiatric populations in everyday life.

Substance-related addiction is often associated with social malfunction (Daley, 2013). This condition reduces the quality of social relations and contributes towards making addiction one of the most stigmatized mental disorders in society (Crisp et al., 2000). Recent studies have assessed empathy in substance-related addicted populations, and some reported reduced empathy in abstinent alcohol-addicted patients (Martinotti et al., 2009; Maurage et al., 2011), cocaine users (Preller et al., 2014b), methamphetamine users (Premack and Woodruff, 1978), and polyabusers (i.e. opioids, cocaine, cannabis, alcohol, and benzodiazepine) (Ferrari et al., 2014). Other studies had cocaine users perform cognitive tasks and showed decreased emotional empathy characterized by diminished performance on a mental perspective-taking task (Preller et al., 2014b) and impaired emotion and prosody recognition compared to healthy controls (Hulka et al., 2013). The prolonged use of psychoactive substances causes neurobiological modifications. This includes neural circuits related to social cognition, which could lead to changes in social behavior (Homer et al., 2008). For example, cocaine users exhibited decreased activation of the medial orbitofrontal cortex, a brain region implicated in reward processing and associated with emotional and cognitive empathy (Abu-Akel and Shamay-Tsoory, 2011; Fan et al., 2011). This reduced state of activation correlated with a smaller self-reported social network (Preller et al., 2014a).

Like substance-related addictions, behavioral addiction such as gambling are associated with social dysfunction (Black et al., 2012; Cowlishaw et al., 2016). There is now sufficient evidence that

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substance-related addictions and behavioral addictions share neurophysiological similarities (Bergh et al., 1997; Blum et al., 1996; Kalivas and Volkow, 2005; Koob and Le Moal, 2008) concerning noradrenergic circuits (Roy et al., 1988; Sofuoglu and Sewell, 2009) and serotoninergic systems (Potenza, 2001). Furthermore, there are neurocognitive similarities in terms of executive functions such as memory and concentration (Goudriaan et al., 2006; Potenza et al., 2003; Regard et al., 2003). Yet to date, the increasing interest in social cognition and empathy in addictive disorders has largely focused on substance-related disorders. These shared characteristics led us to question whether the assumption of decreased empathy in substance-related addiction can be extended to a behavioral addiction such as gambling addiction. This is a pertinent question as there is a need to better understand the relationship between empathy and addiction. Specifically, it is important to establish whether diminished empathy in addiction is due to the effects of the substance that is consumed or to the condition itself. We note that substance addiction is characterized by difficulties in controlling the addictive behavior, constant preoccupations, and social and occupational consequences (American Psychiatry Association, 2013). Further, examining the relationship between empathy and problem gambling is crucial since decreased empathy leads to social isolation (Nakagawa et al., 2015), which is a major health concern associated with problem gambling (McQuade and Gill, 2012; Trevorrow and Moore, 1998). Our first aim was, therefore, to verify whether problem gambling is associated to lower empathy towards others than healthy counterparts. We hypothesized that, as for substance abusers, problem gamblers have reduced empathy compared to healthy gamblers and non-gamblers (H1).

Our second aim was to identify a cognitive marker to investigate the possibility that impaired empathy can be rehabilitated with cognitive training. A training-induced improvement of this cognitive marker could positively impact the ability to feel empathy. Therefore, we sought to verify whether there is a relationship between a supposed cognitive marker and the higher-level measure of empathy. In the present study, we consider the capacity to operate changes in visuospatial perspective-taking as a potential cognitive marker of empathy.

The relationship between visual perspective-taking and empathy has been little examined so far. However, two recent studies using the Interpersonal Reactivity Index to assess empathy (IRI; Davis, 1980, 1983) converge in pointing to a positive association between visual perspective-taking performances and empathy (Mattan et al., 2016; Thakkar and Park, 2010). These indicated that, the higher the participants' visuospatial perspective-taking performances, the higher their self-reported empathy. Yet, this conclusion has been drawn by using two distinct visual perspective-taking tasks. In the Mattan et al. (2016) study, a *third-person perspective-taking* task was used. The task consisted of looking at a virtual room from above and indicating, from one's own external point of view, what target-avatars in the room could see. Therefore, the participants accomplished the task by maintaining their own external viewpoint, that is, without putting themselves in another's place. Alternatively, in the Thakkar and Park (2010) study, visual perspective-taking was measured by means of a *self-other transformation* task. Here, participants imagined themselves in the position of a pictorial front or rear-facing individual with arms outstretched and a circled hand. With this in mind, they indicated whether the circled hand corresponded to their right or left hand. Hence, this task required participants to mentally transform themselves into the body of another to represent the location of their body parts.

In the current study, we examined the relationship between visual perspective-taking and empathy through a visuospatial *perspective change* task. The task was adapted from the Piaget and Inhelder (1948) three-mountains task. This was originally used to determine the stage in childhood when children move from an egocentered perception of the world to a heterocentered one. The heterocentered perception implies being able to see things from the perspective of another. In our task, the respondents were instructed to take the perspective of an avatar that was depicted as standing by a table, facing the objects placed on it. They were required to select which of two response-pictures represented the avatar's viewpoint of the scene. The rationale of using this task to examine the relationship between visuospatial perspective-taking and empathy is twofold. Firstly, both visuospatial and interpersonal viewpoint changes imply that a mental self-rotation is made. This involves a change from an egocentered position to a heterocentered one (Surtees et al., 2013; Thirioux et al., 2009, 2014, 2010). Secondly, the attempt to represent how things look from others' perspectives is a central element of the interpersonal perspective-taking construct of empathy (IRI; Davis, 1980, 1983). If there should be a relationship between visuospatial perspective-taking and empathy, we would expect two additional findings: problem gamblers should have reduced abilities to operate perspective changes on a visuospatial task compared to healthy controls (H2); and the capacity to change perspective in visuospatial terms should predict the capacity to be empathic (H3).

To test our three hypotheses, problem gamblers (PG), healthy non-gambling controls (NGC) and healthy gambling controls (GC) took part in the study. After completing an initial questionnaire to assess addiction (i.e. cigarettes, alcohol, illegal substances, drugs, and gambling) and psychiatric disorders, all of the participants performed a visuospatial task.

They then completed the IRI self-reported questionnaire for the measure of empathy (IRI; Davis, 1980, 1983). The IRI is a 28-item questionnaire that includes four subscales: fantasy, perspective-taking, empathic concern, and personal distress. The fantasy scale (FS) reveals the tendency to transpose oneself into fictional characters and situations. It has been shown that this subscale positively relates to sensitivity towards others (i.e. awareness of others' feelings and understanding others) and emotionality (i.e. being nervous in novel situations and vulnerability). Perspective-taking (PT) represents the ability of the individual to adopt others' viewpoints, with higher scores being associated with better social functioning. Two items of this PT dimension relate to imagining how things "look from others' perspectives", and examines how difficult it is for the respondent to "see things from the other guy's point of view". Empathic concern (EC) assesses the feelings of concern and compassion towards others. EC is related to emotionality, selflessness, and concern for others. Personal distress (PD) assesses feelings of anxiety in tense interpersonal situations. PD has been associated with social dysfunction, emotional vulnerability, and fearfulness.

From a functional point of view, emotional distress is likely to be a consequence of inadequate top-down emotional regulation, which is key to the experience of empathy (Decety and Moriguchi, 2007). Insufficient emotional control and regulation results in an aversive and self-oriented affective inner state (Batson, 1987). This compromises the possibility of engaging in an other-oriented empathic process. More specifically, higher personal distress weakens the cognitive capacity to take others' perspective and reduces other-oriented motivation and concern. This inverse pattern of higher PD and lower PT and/or EC compared to controls, has been reported in several subject groups. This includes people with mental disorders such as depression (Cusi et al., 2011; Wilbertz et al., 2010), alexithymia (Moriguchi et al., 2006), schizophrenia (Haker et al., 2012; Montag et al., 2007) and Asperger's syndrome (Dziobek et al., 2008; Rogers et al., 2007).

In keeping with these findings, we predicted that PGs would be less empathic than both NGCs and GCs. Moreover, their scores would be lower on the FS, PT, and EC, and higher on the PD scale. We also hypothesized that PGs would have lower visuospatial performances than the two control groups. Finally, we anticipated that visuospatial perspective-taking performance would be a predictor of empathy. More precisely, higher visuospatial perspective-taking performances should be reflected in higher FS, PT, and EC rates, and lower PD rates.

2. Method

2.1. Participants

Seventy-eight participants took part in the study. One participant self-reported severe depression, and another participant mentioned suffering