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To play or not to play: A personal dilemma in pathological gambling

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ABSTRACT

Research has shown that healthy people would rather avoid losses than gamble for even higher gains. On the other hand, research on pathological gamblers (PGs) demonstrates that PGs are more impaired than non-pathological gamblers in choice under risk and uncertainty. Here, we investigate loss aversion by using a rigorous and well-established paradigm from the field of economics, in conjunction with personality traits, by using self-report measures for PGs under clinical treatment. Twenty pathological gamblers, at the earlier and later stages of clinical treatment, were matched to 20 non-gamblers (NG). They played a "flip coin task" by deciding across 256 trials whether to accept or reject a 50–50 bet with a variable amount of gains and losses. They completed questionnaires aimed at assessing impulsivity. Compared to NG, pathological gamblers, specifically those in the later stages of therapy, were more loss averse and accepted a lower number of gambles with a positive expected value, whereas their impulsivity traits were significantly higher. This study shows for the first time that changes in loss aversion, but not in personality traits, are associated with the time course of pathology. These findings can be usefully employed in the fields of both gambling addiction and decision-making.

1. Introduction

Gambling addiction is currently a real problem among the population. Although gambling represents a recreational activity for most people, it is an affliction for many others. About 1.6% of adult population (Reuter et al., 2005) is unable to stop their gambling behavior, and therefore an increasing number of individuals are asking for help. The Diagnostic and Statistical Manual (DSM; American Psychiatric Association, 1980) defined criteria for pathological gambling in 1980, classifying it as an "impulse control disorder not elsewhere categorized". Pathological gambling (PG) is also defined as a "habit and impulse disorder" in the International Classification of Disorders (ICD 10). This impulse disorder has seriously detrimental consequences for the quality life in people that experience gambling addiction. PG is associated with increased substance abuse, as well as losses of money that may lead to bankruptcy, suicide, divorce and legal problems (Lesieur and Rosenthal, 1991). The latest version of the DSM (DSM-V; American Psychiatric Association, 2013) defines gambling disorder as an addictive disorder, and more specifically as a "non-substance-related disorder", under the classification of Substance-related and Addictive Disorders.

Several cognitive factors are related to PG, such as the gambler's fallacy, illusion of control, and superstitions (Ladouceur and Walker, 1996). These factors, along with others such as the failure to understand mutual independence of chance events, imply that, for example, after a sequence of losing bets, PGs bet even more as they interpret these independent outcomes as dependent, irrationally expecting gains to follow losses (Breen et al., 2001). Indeed, frequent gamblers produce more irrational statements than non-frequent gamblers when gambling (Gaboury and Ladouceur, 1989; Griffiths, 1994). The cognitive factors can have important implications in PG's ability to make decisions. Research in this field has shown impaired PG performance on decision-making (Monterosso et al., 2001; Suhr and Tsanadisa, 2007; Franken et al., 2007; Sweitzer et al., 2008; Crone et al., 2003). Several studies demonstrated, for example, that pathological gamblers have a preference for options with higher risk and reward (Bechara, 2003, 2005), and for short rather than long temporal outcomes rewards (Petry, 2001). Several other studies have shown that PGs are more impaired than controls in decision-making

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under risk as well as in decision-making under ambiguity and uncertainty (Brand et al., 2002, 2005; Labudda et al., 2007; Roca et al., 2008; Lawrence et al., 2009; Ligneul et al., 2013; Brevers et al., 2012). The difference between these two types of decisions is that the decisions under risk are those where outcome probabilities are known, whereas decisions under ambiguity and uncertainty are those in which such probabilities are unknown (Kahneman and Tversky, 1979). Studies on decisions under ambiguity and uncertainty have shown that PGs perform more poorly than healthy participants in the Iowa Gambling Task (Cavedini et al., 2002; Brand et al., 2005; Goudriaan et al., 2005; Linnet et al., 2006; Kertzman et al., 2006; Brevers et al., 2012). Also, PGs have impaired decisions under risk at both the executive (Brand et al., 2005) and feedback (Labudda et al., 2007) levels, as well as impaired decisions under ambiguity at pre-and post-choice emotional activation levels (Goudriaan et al., 2006). Recently, Ligneul et al. (2013) argued that PGs are risk seeking because they are characterized by increased risk attractiveness and greater optimism for risky events. In these studies, authors have also found that gamblers score higher than control participants on personality inventories assessing impulsivity.

To date, research has primarily focused on understanding the cognitive and personality differences between pathological gamblers and healthy individuals. Thus, researchers used self-report questionnaires, decision-making and other cognitive tasks and utilized as participants habitual or pathological gamblers, but not PGs during clinical treatment. As a consequence, it is still unknown whether and how these cognitive and personality factors change across the course of pathology. Interestingly, Goudriaan et al. (2008) recently investigated the predictive ability of both self-report measures (viewed as indicators of the phenotype of the disorder, that is "as the disorder appears") and cognitive tasks (viewed as indicators of the endophenotype of the disorder, that is "functions that underlie a disorder"), on relapse in a group of out-patients PG.

They showed that endophenotypical characteristics (that is, cognitive measures on disinihibition and decision-making), but not phenotypical characteristics (that is, self-report measures on impulsivity and reward sensitivity), are predictive of relapse in PG. A more recent study (De Wilde et al., 2013) showed that some, but not all, cognitive and personality measures on impulsivity could detect changes between PGs (relapsed and non-relapsed) and healthy controls, whereas they did not show any difference between relapsed and non-relapsed PGs.

Taken together these studies help better understand differences in pathological gambling in a variety of cognitive and personality factors. However, it is still unclear whether, and how, endophenotypical cognitive characteristics, as detected by a paradigm investigating aversion to losses in a risky choice context, and phenotypical characteristics (on impulsivity, obsessive–compulsiveness related to pathological gambling and reward sensitivity), differ between pathological populations and non-pathological populations, and across the stages of pathology itself. This is the aim of the present study.

To the best of our knowledge, this is the first study that combines PGs under current clinical treatment along with a rigorous and well-established paradigm in economic field, with the aim of investigating variations in both the perceptions of losses and of impulsivity in pathological gamblers.

1.1. The current study

With this aim, we employed a well-known risky choice task, similar to the one used by De Martino et al. (2010). This task consists in a "flip coin task" where participants have to decide whether to accept or reject a 50–50 bet with a variable amount of gains and losses. If they decide to accept the bet then the coin is flipped and they can lose or gain the amount of money associated with that gamble, whereas if they reject the gamble then nothing happens. Research has shown that healthy people's decisions are affected by the fact that they would rather avoid losses rather than gamble for even higher gains. Indeed, people usually only accept a 50–50 bet when the amount they could win is at least twice the amount they could lose (Kahneman, 2003; Rabin and Thaler, 2001). This behavior is driven by the fact that people's choices are based on how different outcomes will make them feel (Mellers et al., 1999; Loewenstein et al., 2003; Wilson and Gilbert, 2003). Players typically overestimate the intensity and duration of their negative feelings (Kahneman and Snell, 1992; Mellers and McGraw, 2001; Gilbert et al., 2002; Loewenstein et al., 2003; Wilson and Gilbert, 2003) and therefore they strongly try to avoid negative outcomes by refraining from gambling when the bet does not offer a higher gain than loss. This phenomenon, according to which losses loom larger – about 1.5–2 times – than gains, is called "loss aversion" and is well-described in Prospect theory (Kahneman and Tversky, 1979). Prospect theory describes risky choice by using a value function, which is convex in the domain of losses and concave in the domain of gains. Loss aversion is represented by a value curve, which is steeper for losses than for gains.

In this study we want to investigate whether and how loss aversion changes in pathological gamblers as compared to healthy population. In addition, in order to investigate similarities (and potential differences) within PGs, we tested loss aversion tendencies at two different stages of clinical treatment. Until now, only one study (Brevers et al., 2012) has used this task, though with problem gamblers recruited in a casino, and in order to investigate risk taking behavior rather than loss aversion by using its critical lambda value, that is, the coefficient that indicates the degree to which an agent is loss averse. In this study authors found that problem gamblers indeed accepted a greater number of risky gambles as compared to normal controls. In the present study we instead tested for the difference in the willingness to accept gambles and in the sensitivity to losses in pathological and non-gambling participants, by testing the critical lambda value. We also checked for variations between the earlier and later stages of the clinical treatment in pathological gamblers only.

We hypothesized differences, in terms of both decision behavior and self-administered questionnaires, between PGs and non-PGs. More precisely, following findings from the literature (Brevers et al., 2012), one hypothesis is that PGs would show a higher willingness to gamble and lower sensitivity to losses as compared to non-PGs. However, another possibility could be that PGs are characterized by a lower willingness to gamble and a higher sensitivity to losses than non-PGs. If so, this could be ascribed to the course of the clinical treatment. A significant difference between PGs at the earlier and later stages of the therapy would further confirm this latter hypothesis. Following this reasoning, we can expect that PGs at the earlier stage of the therapy will not differ from non-PGs as they have already started therapy which could have immediately reduced their gambling behavior. If so, these findings would show that, based on the endophenotype of the disorder, that is, the cognitive and/or emotional factors related to decision-making, PGs differ significantly from non-PGs, and that variation in the PG endophenotype can also be detected at different stages of the clinical treatment. As a consequence, such endophenotypical characteristics can even help pathological gamblers to refrain from gambling.

Lastly, in order to assess whether and how personality traits change between PGs and non-PGs and across the clinical treatment, we also used several self-administered questionnaires. Here, we would expect that PGs differ from non-PGs, indicating the