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Research report

Decision making in pathological gambling: A comparison between pathological gamblers, alcohol dependents, persons with Tourette syndrome, and normal controls

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Abstract

Decision making deficits play an important role in the definition of pathological gambling (PG). However, only few empirical studies are available regarding decision making processes in PG. This study therefore compares decision making processes in PG and normal controls in detail using three decision making tasks examining general performance levels on these tasks as well as feedback processing using reaction time analyses. To investigate the specificity of decision making deficits in PG, a substance dependence group (alcohol dependence; AD) and an impulse control disordered group (Tourette syndrome; TS) were included. The PG group ($n = 48$), AD group ($n = 46$), TS group ($n = 47$), and a normal control (NC) group ($n = 49$) were administered (1) the Iowa Gambling Task (IGT), an ecologically valid gambling task; (2) the Card Playing Task, a task measuring perseveration for reward; and (3) a Go/No-Go discrimination task, a task measuring reward and response cost sensitivity. The PG group showed a diminished performance on all tasks and deficient feedback processing as compared to the NC group on the IGT and the Card Playing Task. In general, performance measures were not associated with levels of comorbidity or with self-reported motivational measures. For the larger part, deficiencies in decision making processes in the PG group were also present in the AD group, but not in the TS group. Subgroup analyses revealed larger decision making deficits in pathological slot machine gamblers than in pathological casino gamblers. Deficits in decision making and feedback processing in PG should be addressed in treatment and incorporated more explicitly in theoretical models of PG.

Theme: Neural basis of behavior
Topic: Cognition

Keywords: Decision making; Pathological gambling; Substance dependence; Impulse control disorder; Feedback processing; Reward; Response cost; Alcohol dependence; Tourette syndrome

1. Introduction

Pathological gambling (PG) is characterized by a loss of control over gambling and continued gambling despite negative consequences. The disorder is included in the Diagnostic and Statistical Manual of Mental Disorders IV (DSM IV) as an impulse control disorder [1]. Estimated 1-year prevalence of PG is 1.4% in the United States, and with

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growing availability of gambling opportunities, the prevalence of PG is on the rise [37,74]. PG is a serious public health problem, since it can result in severe psychological distress and is associated with a higher suicide rate [39,55,56]. More than half of the pathological gamblers commits criminal offenses in order to finance their gambling activities [64]. DSM IV criteria for PG include repeated unsuccessful efforts to control, cut back, or stop gambling, committing illegal acts to finance gambling, and jeopardizing a job or significant relationship due to gambling. The phenomenology of PG is thus characterized by persistent, non-adaptive gambling and impaired decision making, since the gambling behavior persists despite the long-term negative consequences for the person involved.

Theories on addiction (e.g., Refs. [14,31,36]) as well as theories on pathological gambling [13,67] have emphasized the role of deficiencies in self-regulatory behavior in the development and maintenance of these disorders. Furthermore, measures employed in decision making research in patients with ventromedial prefrontal lobe damage have shown decision making deficiencies in substance-dependent populations [4,15,22,61,62], populations that show a large phenomenological overlap with PG.

Despite the phenomenological evidence of deficient decision making in pathological gamblers, and the attention given to deficiencies in self-regulatory behavior in theoretical accounts on PG, studies on decision making processes in PG are scarce. One study [18] found deficient performance of pathological gamblers on an experimental decision making task, the Iowa Gambling Task (IGT). However, the IGT includes elements of a gambling game, which could have negatively influenced decision making processes in pathological gamblers. Furthermore, results from this study cannot be generalized to female pathological gamblers since this study included mainly males. Indirect evidence of a decision making deficit in pathological gamblers comes from a study using the IGT, including groups of substance abusers with and without PG [53]. Results from this study indicated that comorbid PG resulted in an additive effect on decision making deficiencies on the IGT.

The available decision making literature in PG is limited not only in size but also in methodological rigor [32]. In general, existing neuropsychological research in PG is based on relatively small samples that do not allow for subgroup analyses of different levels of severity, different types of PG (e.g., casino game gamblers versus slot machine gamblers; [67]), and the presence of psychiatric comorbidity. Theoretical accounts on PG emphasize these factors as important issues to be addressed in future studies [13,67]. Therefore, in this study, performance on different decision making tasks was studied in a group of pathological gamblers sufficiently large to assess the influence of gambling severity, gambling type, and comorbidity. Since psychiatric conditions such as depression, anxiety disorders, and attention deficit hyperactivity disorder (ADHD) can influence performance on decision making tasks [2,28,34,45,59] and are associated with PG [21,25,68,73], influence of these factors on decision making parameters was investigated. Decision making studies in pathological gamblers also did not investigate feedback processing (e.g., response timing after wins or losses, or effects of wins and losses on choices on subsequent trials), which is important for an effective decision making strategy [18,26,53]. In this study, feedback processing was therefore studied in all tasks employed. Different decision making tasks were applied, varying in complexity and measurement potential, and tapping into different components of decision making. In this way, the pervasiveness of deficits in decision making in PG could be investigated.

In this study, both a substance dependence group of recently abstinent alcohol dependent (AD) participants and an impulse control disorder group of persons with Tourette syndrome (TS) were included in order to study the specificity of decision making deficits for PG. Both substance dependence and impulse control disordered groups are relevant clinical reference groups, given the debate about the classification of PG as an impulse control disorder or as a 'behavioral addiction' [12,42–44,66]. In this way, we investigated whether the decision making profile as exhibited by pathological gamblers resembles more closely the profile of an impulse control disorder group or that of a substance dependence group. Finally, to investigate a potential effect of motivational differences between the groups on task performance, differences between the groups were also investigated with regard to self-report data on motivation and task performance.

The IGT investigates decision making in an ecologically valid gambling task. A substantial number of studies on the IGT [5] have been published, and deficient performance has been found in people with ventromedial frontal lobe (VMF) damage ([5,8]; but see Ref. [41]) and people with a diversity of disinhibited behaviors such as substance dependencies, psychopathy, and ADHD [4,11,20,33,53,65,72,75]. In the IGT, participants have to choose between four decks of cards. Two of these decks give high rewards, but even higher losses, and these decks are disadvantageous in the long run. The two other decks give lower rewards, but even lower losses, and these decks are more advantageous in the long run. While the IGT renders information on decision making under uncertain reward and loss contingencies, interpretation of task performance is somewhat hindered by the complexity of the task. The decks of the IGT not only differ in terms of long-term outcome (advantageous or disadvantageous), but also in terms of punishment frequency: each pair of advantageous and disadvantageous decks consists of one deck which results in small frequent losses and one deck which results in high but infrequent losses. Furthermore, the IGT includes reward trials and combined reward and loss trials, but no loss trials. Thus, differences in task performance could be due to different underlying motivational and cognitive predispositions. Therefore, additional decision making tasks were employed measuring the effects of separate wins and losses.