



Risk-taking propensity and sensitivity to punishment in adolescents with attention deficit and hyperactivity disorder symptoms and/or reading disability



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ABSTRACT

Many studies reported that adolescents with ADHD/RD more frequently engage in risk-taking behaviors. Very few have examined their risk taking patterns and the impact of their comorbidity. The present study compared the risk-taking propensity, sensitivity to punishment and delinquency outcome in Chinese adolescents with ADHD symptoms (AS) and/or RD using a simulated risk task, the Balloon Analogous Risk Task (BART). Adolescents with AS ($n = 37$), RD ($n = 35$), AS + RD ($n = 35$), and control ($n = 36$) were recruited from local secondary schools. Results showed that adolescents with ADHD, despite their great risk-taking propensity, were sensitive to immediate punishment whereas adolescents with RD were found to display normal risk-taking propensity, yet showed a tendency of being less sensitive to punishment. The comorbidity ADHD + RD group had the highest delinquency score, and exhibited greatest risk taking and least sensitivity to punishment, which provided further support that comorbid condition might have stronger impact on risk taking or even delinquency than the pure groups. The present findings provides a useful picture of the risk taking pattern associated with different groups, allowing for effective matching for future prevention and intervention program.

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What this paper adds?

Although research consistently demonstrates that the presence of ADHD and RD increases the probability of risky behavior, there is still an ongoing debate as to whether and how they are related. Moreover, those studies that have examined risk taking within the adolescent RD or ADHD population have focused primarily on pure groups, the question of whether the comorbid condition contribute to increased risk taking is still unknown. The current study aimed to answer all these question by examining the two neuropsychological processes: risk taking propensity and sensitivity to punishment in four groups of adolescents, AS, RD, AS + RD and control, using a simulated risk task, the Balloon Analogue Risk Task (BART). We believe that the contributions of this paper is theoretically and practically important because it allows for the

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establishment of a profile of evidence based risk taking pattern in adolescents with AS, RD and their comorbidity that may be useful in future intervention.

1. Introduction

1.1. Background

Adolescence is a time of increasing challenges as well as vulnerabilities to engaging in risky behaviors such as drug use, sexual activity, anti-social behavior and delinquency, and this may be particularly true for adolescents with special developmental needs. In fact, studies conclude that attention deficit and hyperactivity disorder (ADHD) and reading disability (RD) are risk factors to a wide range of risk taking behaviors (e.g. Maniadaki & Kakouros, 2011 ; Shelley-Tremblay, O'Brien, & Langhinrichsen-Rohling, 2007; Langhinrichsen-Rohling, Rebold, O'Brien, O'Farrill-Swails, & Ford, 2005), but how these impacts are exerted is still in question. Moreover, the co-occurrence of ADHD and RD is one of the most consistent findings in the literature regarding each disorder (Aaron, Joshi, Palmer, Smith, & Kirby, 2002; Pisecco, Baker, Silva, & Brooke, 2001). Numerous researches provide preliminary support that the comorbid condition may have a far more severe impact on risk taking than originally expected (Willcutt & Pennington, 2000), yet there has been little research that extends this investigation to include risk-taking behavior in adolescents with comorbid condition.

Although it is currently unclear how the two disorders may be connected with risk taking behavior, one of the emerging approaches to explaining the normative spike in adolescent risk taking, with a focus on delinquent/antisocial behavior, is based on recent advances in developmental neuroscience (Evans-Chase et al., 2015). Brain imaging studies have recognized two core neural processes in adolescent brain directly impacts delinquent behavior: one that is associated with a sharp rise in risk-taking propensity and a second that is involved with a decreased sensitivity to punishment, both hypothesized to be primary factors in the increase in delinquent act in adolescence (Evans-Chase et al., 2015).

The first neuropsychosocial process implicated in heightened risk-taking propensity involves sudden and dramatic changes in activity in the limbic system that coincides with puberty. These changes include an increase in dopamine activity that arouses the response towards rewards and makes rewards seem more salient and gratifying (Bava and Tapert, 2010). This change in puberty causes impact on sensation-seeking behavior, which is "the tendency to seek novel, varied or highly stimulating experiences and the willingness to take risks in order to attain them" (Steinberg et al., 2008, p. 1765). Much research confirms that propensity in risk taking is a strong predictor of delinquency (e.g., Hansen & Breivik, 2001; Fischer & Smith, 2004). Risk taking can be viewed as the voluntary participation in any behavior which carries some probability for negative consequences (Boyer, 2006). Moreover, Byrnes (1998) suggests that the estimation of risk is an important step related to the committing of crime. Specifically, he proposes that individuals who exhibit high tendency in risk taking are more likely to bypass a rational decision-making process (e.g. attending to relevant information and evaluating situations prior to acting) resulting in irrational and even potentially dangerous risk-taking behavior such as delinquency (Byrnes, 2003).

Accompanying this sudden increase in sensation seeking is another neural process that decrease the sensitivity to punishment. Specifically, neuroscientists observe a reduced activity in the amygdala, which is involved in the avoidance response to punishment or threat, with reduced activity making negative outcomes seem less striking and aversive (Doremus-Fitzwater and Varlinskaya, 2010). Many researchers (e.g. Clarke & Felson, 1993) propose that the perceived consequences of crime is a significant factor in the decision-making process of offending. In particular, researchers confirm that poor sensitivity to punishment has been correlated with a greater risk of involvement in persistent criminal activity (Andrew, 1995). Further, Dodge and Newman (1981) found that serious offenders perceive fewer external cues and thus may fail to improve their decision making even with the pain of punishment. Taken together, the two neuropsychological processes have the effect of both increasing the salience of wanting and reward seeking in adolescents while at the same time decreasing the impact or salience of threat (of negative punishment) over decision making process (Bava and Tapert, 2010; Doremus-Fitzwater and Varlinskaya, 2010).

Although a general pattern of increased risk- taking behavior is identified in the ADHD or RD population (e.g. Molina & Pelham, 2001; McNamara, Vervaeke, & Willoughby, 2008), those studies that have examined such relationships have focused primarily on self-reported measures (Rhodes & Jasinski, 1990; Weinberg, 2001). Self-report or parental report rating scale is frequently used as it is the most direct and easy way to collect information across a wide range of variables such as delinquent-related tendencies or delinquency outcome. However, some researchers propose that reliance solely on self-report measures presents other limitations (Barratt, 1985; Eysenck, Pearson, Easting, & Allsopp, 1985). First, the truthfulness of self-report may be limited by any perceived negative consequences of reporting undesirable behavior or parental biased. In addition, some respondents, such as those with psychological disorders, may lack the insight or ability to provide an accurate report of their or their children's behavior (e.g., Ladouceur et al., 2000). Finally, because these instruments often rely on questions that inquire about the behavior under question, it is considerably less useful in explaining the motives or mechanism behind a particular behavior and also in predicting later pattern (Andrew & Cronin, 1997; Greene et al., 2000). Given the downsides of relying solely on self-report measures, there is great potential utility in including other measures to provide a more comprehensive picture in understanding the behavior under question.

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