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# Brief Report: Interaction between social class and risky decision-making in children with psychopathic tendencies

**Yu Gao**[a,*], **Laura A. Baker**[b], **Adrian Raine**[a], **Henry Wu**[c], and **Serena Bezdjian**[d]

a *Department of Criminology, Psychiatry, and Psychology, University of Pennsylvania, 3718 Locust Walk, McNeil Building Suite 483, Philadelphia, PA 19104, USA*

b *Department of Psychology, University of Southern California, USA*

c *Keck School of Medicine, University of Southern California, USA*

d *Department of Psychiatry, School of Medicine, Washington University, USA*

## Abstract

**Objective—**Adult psychopaths are thought to have risky decision-making and behavioral disinhibition, but little is known about themoderating effects of psychosocial factors and whether these associations can be observed in children with psychopathic tendencies. This study tests the biosocial hypothesis that social class will moderate psychopathy–neurocognition relationships, with these effects being stronger in children fromhigh social classes.

**Method—**Preadolescent community twins (*N* = 298) were assessed on decision-making (Iowa Gambling) and behavior inhibition (Porteus Maze) tasks, while psychopathic tendencies and socioeconomic status were assessed by the child's caregiver.

**Results—**A significant interaction was observed whereby risky decision-making was associated with psychopathic tendencies only in children from benign home environments.

**Conclusions—**Findings support a biosocial interaction perspective on child psychopathy, suggesting that risky decision-makingmay particularly predispose to psychopathic traits in children frombenign homebackgrounds.

### Keywords

Psychopathy; Children; Risky decision-making; Biosocial interaction; Socioeconomic status

Several studies have reported biology–antisocial relationships only in individuals with high socioeconomic status (SES, e.g., Raine & Venables, 1981). Such findings are explained by the "social push" hypothesis (Raine, 2002) which argues that where an antisocial child lacks *social* factors that *push* or predispose them to antisocial behavior, then biological risk factors more likely explain antisocial behavior. An unresolved question is whether such interaction effects can also be observed in community children with psychopathic tendencies, a construct that is different (albeit related) to antisocial behavior.

Neurocognitive functioning deficits (e.g., more risky decision-making, lack of plan and inhibition) have been found in individuals with psychopathic traits – a cluster of interpersonal, affective, and behavioral characteristics including glibness, impulsivity, poor behavior controls, shallow affect, and lack of empathy, guilt, and remorse (Hare, 1991). Psychopathic

*Corresponding author. Tel.: +1 215 746 4391. E-mail address: yugao@sas.upenn.edu (Y. Gao).

individuals as well as patients with lesions to the orbitofrontal cortex have been found to make more risky decision-making during the Iowa Gambling task (Bechara, Damasio, Damasio, & Anderson, 1994; Blair, Colledge, & Mitchell, 2001), and compared to controls they show a higher Porteus Maze Q score (Porteus, 1965), reflecting poor judgment, difficulties in learning from experience, and a lack of foresight, planning, inhibition, and organizational ability (Morgan & Lilienfeld, 2000).

There are a number of limitations in these prior studies. First, research on neurocognitive functioning in youth with psychopathic tendencies is limited. Second, most research has focused on clinic-referred samples; much less is known about the associations in unselected samples. Third, little is known about gender differences in the neurocognition–psychopathic traits association, though males score higher on psychopathic traits and show more antisocial behavior compared to females (Cale & Lilienfeld, 2002). Fourth, little or no research has been conducted on the biosocial bases of psychopathic tendencies in children which predispose to more serious antisocial behavior.

Based on the above issues, the present study aimed to test the following hypotheses: (1) risky decision-making (indexed by more risky choices in Iowa Gambling task) and behavior disinhibition (indexed by higher Q score in Porteus Maze task) would be associated with higher psychopathic tendencies in children, (2) the neurocognition–psychopathy association would be stronger in individuals from relatively high social class homes, and (3) boys would show higher psychopathic tendencies than girls.

# Method

Subjects consisted of 298 children (149 twin pairs, 54% female) from a larger twin sample in the Los Angeles community on whom complete data were available across two data collection phases (see Baker, Barton, Lozano, Raine, & Fowler, 2006 for details). Children were initially studied at age 9–10 years (mean age = 9.60, SD = 0.60) when social class data were obtained from caregiver. Neurocognitive and psychopathic tendencies' measures were collected 2.3 years later in the same subjects (mean age = 11.90, SD = 0.69) under controlled conditions. All variables are continuous measures. Participants and nonparticipants did not differ on gender, caregiver language, ethnicity, and age (all $p > .120$). However, participants had lower SES and IQ scores than nonparticipants ( $p < .01$). This study was reviewed by the USC Institutional Review Board. Written informed consent and assent were obtained from parents and children, respectively.

## Socioeconomic status (SES)

Family SES was assessed during an interview with the caregivers, based on the Hollingshead's Four-Factor Index (Hollingshead, 1975) in which the education and occupation levels of the mothers and fathers were measured.

## Psychopathy assessment

The Child Psychopathy Scale (CPS, Lynam, 1997) was administered to the twins' caregiver in interview form, with each child receiving a total psychopathy score. Coefficient alpha was 0.85. Validity of the CPS is provided in several studies (e.g., Lynam, 1997).

## The Iowa Gambling task

It consisted of 100 cards and was administered to the participants who were required to draw cards from one of four decks of cards and try to get as much money as possible. Two decks were "risky" with money lost in the long run whereas the other two decks were "safe" with final gains (Bechara et al., 1994). The number of cards picked from the two "risky decks" in the second half of the task was summated and used to assess risk-taking behavior.

### The Porteus Maze test

It consisted of 10 mazes of increasing difficulty that the participants were asked to solve (Porteus, 1965). The participants were instructed not to lift the pencil, cross the walls, or move backward once the labyrinth was entered. The Q score, the number of errors ostensibly reflecting impulsivity (e.g., crossed lines and pencil lifts) made by the participant, was calculated for each child. Validity of this test has been reported by Krikorian and Bartok (1998). All participants completed all 10 mazes.

## Results

All variables (except gender) were *z*-standardized prior to creating the interaction terms (Jaccard, Turrisi, & Wan, 1990). Zero-order correlation showed that psychopathic tendencies were positively correlated with risky decision-making ($r = .111$, $p < .05$) and behavior disinhibition ($r = .134$, $p < .05$).

Considering the dependencies between members of each twin pair, ignoring the interdependence and analyzing the twin data as if it were derived from a set of unrelated individuals can lead to biased significance tests. To solve this problem, multilevel modeling with twin pair as first-level units and individual as second-level units was used together with Log Likelihood statistics to compare the relative fit of nested models (Singer & Willett, 2003). Results showed that the model with main effects of gambling performance and Q score ($M_1$) fits better than the one in which only the intercepts were included ($M_0$), $\chi^2$ (2) = 6.017, $p < .01$. Second, adding the main effects of SES and gender ($M_2$) led to a significantly better fit, $\chi^2$ (2) = 113.296, $p < .01$. Third, the interactions between all variables (i.e., gambling × SES, Q score × SES, gambling × gender, Q score × gender, and SES × gender) were added sequentially and a final model ($M_3$) with all main effects and gambling × SES interaction was significantly better than $M_2$, $\chi^2$ (1) = 4.025, $p < .05$. Boys exhibited higher psychopathic tendencies compared to girls, $\beta = 0.14$, SE = 0.06, $p = .025$. The interaction of gambling performance and SES was also significant, $\beta = 0.11$, SE = 0.05, $p = .045$. No other statistically significant associations were found ($p > .183$). Model fit results are presented in Table 1.

Separate regression equations of CPS on gambling performance at +1 SD and −1 SD for SES were computed to interpret the nature of the gambling × SES interaction (Jaccard et al., 1990) – see Fig. 1. Results showed that for children with high SES, higher psychopathy scores were associated with more risky decision-making ($\beta = 0.21$, SE = 0.06, $t = 3.52$, $p < .05$), whereas for children with low SES, gambling performance was unrelated to psychopathic tendencies ($\beta = -0.01$, SE = 0.05, $t = -0.21$, $p = .978$).

## Discussion

Results show that risky decision-making is associated with psychopathic tendencies only in children with higher SES. Boys showed higher psychopathic tendencies compared to girls. Findings provide support for a biosocial perspective on externalizing behavior and extend prior biosocial findings on child antisocial behavior to child psychopathy.

As hypothesized, risky decision-making was found in psychopathic-like children living in a high SES family. These findings are consistent with the "social push" interaction hypothesis (Raine, 2002). Conversely, no biosocial interaction was observed for the Porteus maze task, suggesting that biosocial interactions may be more prominent for socially acquired traits (risk-taking) than for more biologically acquired traits (disinhibition/impulsivity).

Few prior studies have controlled for psychosocial influences when examining neurocognition–psychopathy relationships (e.g., Schmitt, Brinkley, & Newman, 1999). In the current study when controlling for SES and gender, all significant effects between neurocognition and psychopathic traits were abolished, with the exception of the biosocial interaction for gambling and SES. Consequently, current findings raise a reasonable control issue for future neurocognitive studies of psychopathy in both children and adults. Prior studies which have failed to observe more risky decision-making in psychopaths have not tested for biosocial interactions, and therefore may underestimate the potential influence of neurocognitive processes as potential markers for psychopathy. Psychosocial risk factors could be usefully taken into account in future biological studies of psychopathic tendencies in children to further clarify these issues.

As expected, boys show significantly higher scores on psychopathic traits compared to girls. Current findings suggest that the gender difference in psychopathic traits may be manifested as early as 11 years, and provide some limited additional construct validity for the CPS.

The present study has several potential limitations. Findings were based on a sub-group with somewhat lower IQs and social class than the larger sample from which they were drawn. While results may not generalize to a completely unselected child population, they may be expected to generalize to populations at risk (low social class, low IQ) for antisocial behavior. Current findings should be viewed as provisional and require replication and extension in future studies.

In conclusion, risky decision-making during a gambling task was associated with psychopathic tendencies only in community children with high SES. This study extends the validity of psychopathic tendencies measured in children and highlights the potential importance of studying biosocial interactions in future biological studies of psychopathy. Together with prior evidence of biosocial interactions in relation to antisocial behavior (Raine, 2002), current findings suggest that it may be useful to explore biosocial interactions for other forms of psychopathology.

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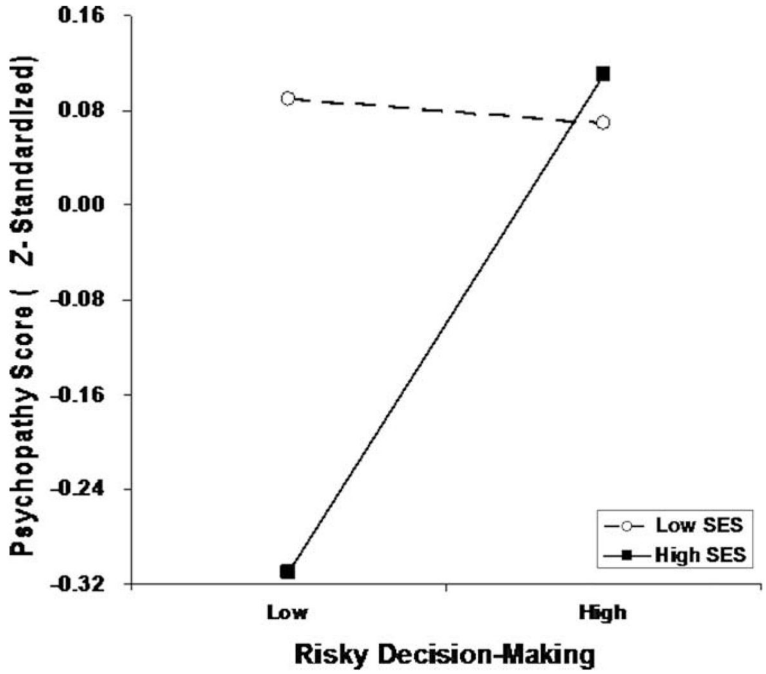


**Fig. 1.**
The interaction of risky decision-making and SES in relation to psychopathic tendencies.

**Table 1**

Comparisons of multilevel models predicting psychopathic tendencies (CPS) in children

| Model | −2 Log Likelihood | Number of parameters | $\chi^2$ Difference test |
|---|---|---|---|
| $M_0$: intercept only | 754.038 | 3 | — |
| $M_1$: $M_0$ + neurocognitive factors (gambling and Porteus Maze Q score) | 748.021 | 5 | $M_0 - M_1 = 6.017^{*}$ |
| $M_2$: $M_1$ + SES and gender | 634.725 | 7 | $M_1 - M_2 = 113.296^{**}$ |
| $M_3$: $M_2$ + gambling × SES (final) | 630.700 | 8 | $M_2 - M_3 = 4.025^{*}$ |
| | | | $M_1 - M_3 = 117.321^{**}$ |
| | | | $M_0 - M_3 = 123.338^{**}$ |

Note: SES = socioeconomic status.

$^{*}p < .05$.

$^{**}p < .01$.