Bargaining with the devil: Using economic decision-making tasks to examine the heterogeneity of psychopathic traits

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ABSTRACT

We examined the three key dimensions of the Psychopathic Personality Inventory-Revised (PPI-R), Fearless Dominance (FD), Self-Centered Impulsivity (SCI), and Coldheartedness, to obtain a comprehensive view of the implications of the trait components of psychopathy for economic decision-making. 210 university undergraduates completed four economic tasks and five personality instruments with the aim of ascertaining the correlates of different factors of psychopathy. FD, SCI, and Coldheartedness were associated with distinct behavioral responses and personality scores: Coldheartedness and SCI were predictive of economic selfishness, whereas FD was largely uncorrelated with behavioral tasks. Implications for the conceptualization of the factor structure of psychopathy are presented, and a phenotypic approach to psychopathic traits confluent with the recently proposed dimensional restructuring of personality disorders is discussed.

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1. Introduction

The construct of psychopathy, as described in Cleckley's influential book, The Mask of Sanity (1941/1976), is characterized by a constellation of personality traits that includes superficial charm, lack of guilt and remorse, poor impulse control, and emotional detachment, as well as high levels of manipulativeness, dishonesty, and low empathy. Increasing evidence suggests that psychopathy is heterogeneous (Skeem, Polaschek, Patrick, & Lilienfeld, 2011), comprising two to four distinct clusters of personality traits (e.g., Cooke, Michie, & Skeem, 2007). For example, classic conceptualizations of psychopathy often distinguish "primary" from "secondary" phenotypes (Karpman, 1941, 1948). Primary psychopathy is characterized by high levels of the affective and interpersonal traits typical of psychopathy (e.g., low anxiety, lack of remorse, and low empathy), whereas secondary psychopathy consists of the behavioral components of the disorder (e.g., manipulativeness, criminal behavior, aggression, and impulsivity). Thus, rather than examining psychopathy at the construct level, it is often more informative to examine the differential correlates of psychopathy's factors.

The Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld, 1990; Lilienfeld & Andrews, 1996; Lilienfeld & Widows, 2005), a widely used and well-validated self-report instrument designed for use in criminal and non-criminal populations, consists of eight subscales that some authors have grouped into two higher-order factors. Fearless Dominance (FD), similarly to some conceptualizations of primary psychopathy, comprises social and physical boldness, charm, and immunity to trait anxiety, whereas Self-Centered Impulsivity (SCI), similarly to some conceptualizations of secondary psychopathy, comprises aggression, egocentricity, manipulativeness, alienation, and poor impulse control (Benning, Patrick, Blonigen, Hicks, & Iacono, 2005; Benning, Patrick, Hicks, Blonigen, & Krueger, 2003; but see Neumann, Malterer, and Newman (2008), for a competing factor structure). A third factor of Coldheartedness has been identified, and although research on this factor's nature and correlates has been inconclusive, it is closely associated with callousness and lack of deep social emotions. It therefore may be an approximate adult analogue to callous-unemotional (CU) traits in children, which are often identified as precursors to the development of psychopathic traits in adulthood (Frick & Marsee, 2006).

Psychopathy is sometimes placed within a broader nomological network (the "dark triad"; Paulhus & Williams, 2002) of personality dimensions also consisting of narcissism (Raskin & Hall, 1979) and Machiavellianism (Christie & Geis, 1970). Measures of these three constructs correlate moderately to highly with each other and often display similar patterns of correlations with measures of external constructs, such as social dominance, prejudice, and (reversed) agreeableness (Hodson, Hogg, & MacInnis, 2009; Paulhus & Williams, 2002). Notably, the PPI-R factors appear to display differential overlap with the dark triad constructs: FD may overlap to some degree with subclinical narcissism, whereas SCI and Coldheartedness may bear a closer resemblance to Machiavellianism (Lilienfeld & Widows, 2005).

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The implications of psychopathy and its component dimensions for interpersonal decision-making have heretofore received little attention. Different dimensions of psychopathy may hold differential implications for risk appraisal and decision-making. For instance, FD is associated with stress immunity and affective resilience, as well as social adeptness (Patrick, Poythress, Edens, Lilienfeld, & Benning, 2006). Hence, individuals with high scores on FD may be better able to regulate their emotional responses to gambling or risky decision-making scenarios, and might therefore behave in less hostile or reactive ways toward their partners than low-FD individuals. In addition, high FD may facilitate recognition of socially appropriate or advantageous responses. In contrast, SCI is associated with impulsivity and reactive aggression (e.g., Reidy, Zeichner, Miller, & Martinez, 2007). Hence, individuals with high scores on SCI may have more trouble regulating their emotions or recognizing appropriate patterns of response, potentially resulting in increased hostility toward their partners compared with low-SCI individuals.

If these differences bear out, the tendency to classify all psychopaths within a homogeneous group (see review in Brinkley, Newman, Widiger, & Lynam, 2004) may need to be reconsidered with an eye toward behavior as well as etiology. The emergence of clear-cut differences in behavioral and cognitive patterns among these dimensions may necessitate a reassessment of psychopathy as a unitary construct.

1.1. Psychopathy and economic decision-making

To examine these patterns of behavior and cognition, we employed several widely-used interpersonal economic decision-making tasks, including the ultimatum game (Güth, Schmittberger, & Schwarze, 1982), prisoner's dilemma task (e.g., Axelrod, 1980), and dictator game (e.g., Forsythe, Horowitz, Savin, & Sefton, 1994; Hoffman, McCabe, Shachat, & Smith, 1994). These tasks provide a means to assess not only the degree to which players consider their partner's outcome as well as their own, but also how those considerations influence their decision-making. Thus, these tasks can be used to examine some of the processes that influence psychopathic individuals' decision-making, including their use of decision weights and their tendencies for risk-averse or risk-seeking behavior.

Studies examining psychopathy in the context of economic games have yielded mixed findings. Some have found that in ultimatum game scenarios, low-anxiety psychopaths are willing to accept significantly fewer unfavorable splits (i.e., splits in which Player 1 took more money) than high-anxiety psychopaths or non-psychopaths (Koenigs, Kruepke, & Newman, 2010). In contrast, others have found that high-psychopathy individuals play the ultimatum game more rationally, in that they are willing to accept more unfavorable splits of money (Osumi & Ohira, 2010).[1]

In prisoner's dilemma scenarios, there are also mixed findings, with some research suggesting that psychopathy predicts defection (Mokros et al., 2008) and others suggesting that there is no difference in defection between high-psychopathy and low-psychopathy individuals (Widom, 1976). Using the aforementioned distinction between primary and secondary psychopathy, however, Widom also found that primary psychopaths were able to predict their partner's next move on a comparable level to the control group, whereas secondary psychopaths were not. Secondary psychopaths were also less adept than primary psychopaths or controls at predicting defection from their partners after defecting themselves. Additionally, neuroimaging data suggest that individuals with high psychopathy scores may find punishment (i.e., defection by one's partner) less aversive than those with low scores (Rilling et al., 2007), as amygdala activation in these individuals was attenuated when they experienced defection during a prisoner's dilemma scenario.

Information regarding psychopathy and the dictator game is more limited, although what exists is consistent with findings regarding other economic tasks. Namely, primary psychopaths tend to offer significantly lower amounts to their partners than both secondary and non-psychopathic players (Koenigs et al., 2010).

An additional measure of attitudes in interpersonal decision-making games is the ring measure of social value orientation (Liebrand, 1984), which is premised on the theory that individuals possess "motivational vectors" that guide decision-making in social and economic situations. Vectors are represented by the sum total obtained for oneself and for one's partner in a series of economic choices. Little work has examined the relation between social value orientation and psychopathy, although one study (Schug, Matsumoto, Horita, Yamagishi, & Bonnet, 2010) examined the ring measure in conjunction with a version of the ultimatum game. The relationship between responses on these measures was pronounced, with most prosocial ring measure responders (i.e., those whose choices resulted in a positive outcome for their partners) behaving fairly in the ultimatum game, and most pro-self responders (i.e., those whose choices resulted in negative or null outcomes for their partners) behaving unfairly.

1.2. Hypotheses

Behavioral and cognitive differences among the subcomponents of psychopathy have the potential to clarify the heterogeneity of this condition. In light of the aforementioned literature, we aimed to elucidate the behavioral patterns and choices of individuals differing on the three factors of psychopathy, as measured by the PPI-R, through the use of economic decision-making tasks. Several authors have recently argued that psychopathy is a configural construct, comprising a set of traits that interact statistically to produce a qualitatively different clinical presentation than provided by the additive relations among these traits (Lilienfeld & Fowler, 2006; Lilienfeld et al., 2011). Therefore, in addition to examining the PPI-R factors individually, we conducted moderated multiple regression analyses to test the hypothesis that the subcomponent traits of psychopathy interact statistically (i.e., by potentiating each other) when contributing to behavioral outcomes.

Our second aim was to examine the incremental validity of each PPI-R factor over and above narcissism and Machiavellianism in predicting behaviors on the economic tasks. We examined these incremental contributions in the context of a destructive testing approach (Anderson & Anderson, 1996), which establishes an empirical relationship between variables and attempts to "break that relation by adding competitor variables" (p. 740). The goal of such an approach is to parse out the components of each PPI-R factor that may underlie correlations with behavioral tasks.

Third, we aimed to elucidate the personality correlates of all three PPI-R factors, but particularly Coldheartedness, which is as-yet poorly understood. Filling this gap in knowledge may be helpful to a complete understanding of psychopathy, as Coldheartedness is arguably the most theoretically integral factor underlying the disorder, reflecting what McCord and McCord (1964) termed the two key components of psychopathy: guiltlessness and lovelessness. Examining each of the PPI-R factors within the context

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[1] In both of these studies, samples were dichotomized into primary/secondary or high/low psychopathy groups. However, dichotomization tends to result in substantial decreases in variance and consequently in statistical power (Cohen, 1983; MacCallum, Zhang, Preacher, & Rucker, 2002). Analysis of psychopathic traits on a dichotomized scale rather than on a continuum may therefore be less likely to yield significant differences.

of a broader personality instrument could provide further insight into the specific personality processes that underpin choices made by high scorers on the present economic tasks.

We first hypothesized that total scores on PPI-R psychopathy would correlate with total scores on narcissism and Machiavellianism. We expected FD scores to correlate preferentially with narcissism, and SCI and Coldheartedness to correlate preferentially with Machiavellianism. We proposed no hypotheses regarding the incremental predictive validity of each construct or factor above the others for the behavioral economic measures, but we examined these residual associations in exploratory analyses.

We further hypothesized that high-FD scorers, in accordance with their resilience to stress, capacity for strategic decision-making, and social adeptness, would make choices that are more rational and aware of interpersonal decision-making contingencies. Specifically, we predicted that they should accept lower nonzero offers on the ultimatum game and cooperate more on the prisoner's dilemma than high-SCI or high-Coldheartedness scorers. We expected that high-FD scorers would also adopt a more instrumental and individualist approach on the Ring Measure, disregarding their partners' outcomes and focusing only on their own outcomes.

We hypothesized that high-SCI scorers, in accordance with the emotional reactivity and aggression associated with that factor, would tend to make decisions out of anger or revenge toward their partners. Thus, they should reject lower nonzero offers on the ultimatum game and defect more on the prisoner's dilemma than high-FD or high-Coldheartedness scorers. High SCI-scorers would also probably adopt a more competitive approach on the Ring Measure, attempting to minimize their partners' outcomes while maximizing their own outcomes.

The dictator game is a simpler task, and does not involve strategizing about a partner's potential decision. Thus, based on the overarching egocentrism and disregard for others that is characteristic of high-psychopathic individuals, different phenotypes of psychopathy may not be characterized by different strategies or approaches, as predicted in the more complex tasks. Instead, individuals with high scores on any one psychopathy factor, as well as those high on multiple factors, would be likely to respond similarly, namely, to offer a smaller fraction of the money to their partner than individuals lower on psychopathy.

2. Method

2.1. Participants

Data were collected from 215 participants, with the sample drawn from two introductory psychology courses at a moderately-sized Southeastern private university. Participants received two research credits for taking part in the study.

Five participants' responses were excluded from analyses. One of the excluded participants was an extreme outlier on several personality scales. Three of the excluded participants scored highly on either Deviant Responding (greater than 20) or Inconsistent Responding (greater than 40); these thresholds follow convention established in the PPI-R manual (Lilienfeld & Widows, 2005). One participant was excluded based on large amounts of missing data, which is to say, the participant omitted well over 50% of the ring measure, 100% of the prisoner's dilemma, and smaller percentages of several personality measures. Eight other participants omitted 30% or more of the items on the ring measure, but did not have much, if any, other missing data. These participants' missing data were not imputed, and were excluded from analyses involving the ring measure, but were included in all other analyses.

Excluding these five participants left a total of 210 participants for analyses. Remaining missing data were replaced using multiple imputation.[2]

Participants were 68.1% female (*n* = 143), ranging in age from 17 to 22 (*M* = 18.9, *SD* = 1.00). The sample comprised 103 participants identifying as Caucasian (49.0%), 54 as Asian (25.7%), 25 as African–American (11.9%), 10 as Hispanic (4.8%), 5 as Middle Eastern (2.4%), and 13 who did not answer (6.2%).

2.2. Procedure

Study materials consisted of a set of pencil-and-paper questionnaires and a set of computerized measures that typically took up to 45 min to complete. Pencil-and-paper questionnaires included the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Widows, 2005), the Levenson Self-Report Psychopathy scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995), the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979), the Mach-IV scale (Christie & Geis, 1970), and the 33-item Multidimensional Personality Questionnaire (MPQ-33; Harkness, Tellegen, & Waller, 1995).

Participants were assigned to one of two orders: pencil-and-paper followed by computerized measures, or computerized measures followed by pencil-and-paper. There were no significant differences between these orders on any measures, and a Box's *M* test (Box, 1949), indicated that covariance matrices of all measures did not differ significantly by order (i.e., that order did not moderate findings; *p* > 0.60); consequently, the two orders were combined for all subsequent analyses.

2.3. Measures

2.3.1. Psychopathy
Psychopathy was measured using two self-report questionnaires.

2.3.1.1. Psychopathic Personality Inventory-Revised.
The Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld & Andrews, 1996; Lilienfeld & Widows, 2005) is a 154-item self-report scale. It was developed on multiple samples of college students, and is intended to assess subclinical psychopathic traits. The PPI-R contains eight subscales and two higher-order factors (Benning et al., 2003), namely, Fearless Dominance (FD) and Self-Centered Impulsivity (SCI); a third dimension, Coldheartedness, is often treated as a standalone factor. FD and SCI have been demonstrated to have good construct validity. FD has been shown to correlate negatively with anger and depression, and positively with alcohol abuse, whereas SCI has been shown to correlate positively with hostility, impulsivity, and antisocial behavior (e.g., Edens & McDermott, 2010; Lilienfeld & Widows, 2005). In our sample, the PPI-R subscales, factors, and total scores all demonstrated acceptable reliability as measured by Cronbach's α (α_{FD} = 0.90; α_{SCI} = 0.88; α_C = 0.79; α_{Total} = 0.91; see Table 1 for all PPI-R subscale reliability analyses). PPI-R subscales and total scores were very similar to the college and community sample (18–24 age range) on which the measure was developed (see Lilienfeld & Widows, 2005).

2.3.1.2. Levenson Self-Report Psychopathy Scale.
An additional measure of psychopathy, the Levenson Self-Report Psychopathy scale, was administered (LSRP; Levenson et al., 1995). The LSRP is a 26-item self-report instrument designed for use in both criminal and non-criminal populations. It yields primary and secondary psychopathy subscales, as well as a total score. The primary psychop-

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[2] Complete information regarding treatment of missing data is available from first author upon request.

Table 1
Reliability statistics.

Total/factor/subscale	Mean (SD)	Cronbach's α
PPI-R total	248.96 (29.35)	0.91
Fearless Dominance	112.54 (18.51)	0.90
Social Influence	47.72 (8.49)	0.86
Fearlessness	32.96 (8.64)	0.85
Stress Immunity	31.86 (7.68)	0.88
Self-Centered Impulsivity	136.43 (19.25)	0.88
Machiavellian Egocentricity	43.33 (8.41)	0.83
Rebellious Nonconformity	33.31 (7.58)	0.82
Blame Externalization	27.05 (6.11)	0.80
Carefree Nonplanfulness	32.73 (6.69)	0.81
Coldheartedness	28.76 (6.46)	0.79
NPI total	15.76 (6.32)	0.81
Mach-IV total	62.88 (11.53)	0.76
LSRP total	48.68 (9.83)	0.85
LSRP Primary	29.27 (7.28)	0.86
LSRP Secondary	19.42 (4.33)	0.70
MPQ-33 Positive Emotionality	44.64 (6.36)	0.79
MPQ-33 Negative Emotionality	20.88 (4.65)	0.62
MPQ-33 Constraint	31.91 (5.27)	0.73

PPI-R = Psychopathic Personality Inventory-Revised; NPI = Narcissistic Personality Inventory; LSRP = Levenson Self-Report Psychopathy scale; MPQ-33 = Multidimensional Personality Questionnaire, short form.

athy scale assesses "a selfish, uncaring, and manipulative posture towards others," whereas the secondary psychopathy scale assesses "impulsivity and a self-defeating lifestyle" (Levenson et al., 1995, p. 152). These two scales are sometimes viewed as approximate, but not interchangeable, analogues of FD and SCI, respectively. Nevertheless, as noted by Levenson et al. (1995), LSRP primary psychopathy is probably more of an index of coldness or meanness than of social charm and glibness. Thus, it may be more similar to PPI-R Coldheartedness than to PPI-R FD. LSRP primary and secondary psychopathy have demonstrated good construct validity by correlating with antisocial behavior and susceptibility to stress, respectively; both scales also correlate positively with boredom susceptibility and disinhibition (Levenson et al., 1995). Cronbach's α for all LSRP subscales in the present sample were acceptable ($α_{Primary} = 0.86$; $α_{Secondary} = 0.70$; $α_{Total} = 0.85$).

2.3.2. Personality correlates

Machiavellianism and narcissism were assessed using the Mach-IV (Christie & Geis, 1970) and the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979). Both of these scales display good construct validity, correlating with, respectively, agreeableness (negatively), conscientiousness (negatively), and neuroticism (Jakobwitz & Egan, 2006); and hostility, antagonism, and positive self-image (Rhodewalt & Morf, 1995). Cronbach's α for NPI and Mach-IV scores were acceptable ($α_{NPI} = 0.81$; $α_{MACH} = 0.76$).

The 33-item short form of the Multidimensional Personality Questionnaire (MPQ-33; Harkness et al., 1995) was administered to provide further information regarding the personality correlates of the PPI-R factors. In accordance with convention, three higher-order factors were calculated: Positive Emotionality, assessing persuasiveness, desires for social intimacy, positive affect, and goal-setting; Negative Emotionality, assessing vulnerability to stress, mistrust, and hostility; and Constraint, assessing careful decision-making, avoidance of dangerous situations, and adherence to conventional societal standards.[3]

These higher-order factors displayed moderate-to-acceptable reliability as measured by Cronbach's α ($α = 0.79$, $α = 0.62$,

α = 0.73, for Positive Emotionality, Negative Emotionality, and Constraint, respectively).

2.3.3. Economic tasks

Behavioral data were collected using four widely-used economic "games" or tasks. In each of these games, it was made clear that participants were playing a hypothetical partner. Research shows that when asked to imagine that a hypothetical scenario is real and respond accordingly, most participants will do so, producing data that are not statistically significantly different from those of genuine scenarios (Ajzen, Brown, & Carvajal, 2004). In the present study, participants were asked to imagine that they were in the given scenarios and respond accordingly. This strategy has been employed successfully in numerous past studies of economic games (e.g., Mokros et al., 2008; Tompkinson & Bethwaite, 1995).

2.3.3.1. Dictator game. The dictator game (e.g., Forsythe et al., 1994; Hoffman et al., 1994) is classed as a "game" loosely. It involves two players, but only one player makes a decision; the outcomes of both players are contingent on that player's choice, and the non-deciding player has no influence over the outcome. We administered this task to provide a baseline for analyses of individual differences in simple economic decisions, as it does not require consideration of a partner's response. It may therefore aid in the interpretation of more complex decisions in light of one-round, "pie-splitting" decisions.

Participants played one round of the dictator game as Player 1, dividing $10 between themselves and a hypothetical partner. The amount of money allocated to oneself served as the outcome measure.

2.3.3.2. Ultimatum game. The ultimatum game involves two players, a proposer (Player 1) and a responder (Player 2). Player 1 is given a set amount of money (here, a hypothetical $10) and told to divide that amount according to his or her preference, including retaining the full amount or giving away the full amount. Player 2 is presented with Player 1's proposed split and can choose to accept or to reject it. In the latter event, both players receive nothing. Thus, it is in Player 1's best interest to propose a split skewed in his or her own favor, but generous enough that Player 2 will accept.

Participants played four independent rounds of the ultimatum game, all as Player 2, with four different hypothetical partners and four different offers: 70%, 50%, 30%, and 10%. A range of offers was included to examine the possibility that more extreme offers (i.e., 70% and 10%) might be especially discriminating for individuals with extreme levels of certain psychopathic traits. A 50–50 offer was included to establish a baseline sense of fairness among this sample. Research suggests that the cutoff for standard populations playing low stakes ultimatum games (i.e., with reasonably trivial amounts of money) is between 20% and 30% (Dickinson, 2000), so a 30% offer was included with the expectation that it would begin to discriminate among participants differing in their levels of psychopathic personality traits. Each round was analyzed independently, dummy-coded as either 1 ("reject") or 0 ("accept").

2.3.3.3. Prisoner's dilemma. The prisoner's dilemma paradigm involves two players, each of whom must choose, independently of the other whether to "cooperate with" or to "defect on" their partner. Dual cooperation results in relatively high payoffs for both partners, and dual defection results in relatively low payoffs for both partners. The highest and lowest possible payoffs are obtained if one partner defects while the other cooperates; the defector obtains the best outcome here, while the cooperator obtains the worst outcome.

Participants played ten computerized rounds of the prisoner's dilemma, each with the same computerized partner, who played

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[3] Results examining the relations between scores on the 11 lower-order subscales of the MPQ-33 and psychopathy and economic task variables are available from first author upon request.

a tit-for-tat strategy (Axelrod, 1980). The number of times a participant defected in the 10 rounds of the prisoner's dilemma scenario served as the outcome measure for this task.

2.3.3.4. Ring measure. Participants completed the ring measure of social value orientation (Liebrand, 1984; Liebrand & McClintock, 1988), a 32-item forced-choice questionnaire measuring economic preferences in a two-player situation in which participants' responses determine their outcome and the outcome of a hypothetical partner. Items take the following form, in which participants must choose Option A or Option B:

- Option A: Your outcome = +$6.50, Your partner's outcome = −$2.66.
- Option B: Your outcome = +$7.00, Your partner's outcome = $0.00.

This instrument yields a "self" monetary total and an "other" monetary total, calculated by summing participants' response choices. These totals were used as the outcome measure for this task. Reliabilities as measured by Cronbach's α were acceptable ($\alpha_{self} = 0.79$; $\alpha_{other} = 0.80$).

2.4. Data analyses

In addition to correlational analyses of the relations among personality variables and behavioral tasks, multiple regression analyses were performed to examine the relations among personality variables in the context of these tasks. For each task, hierarchical linear regressions were performed with the three PPI-R factors entered in all possible permutations to account for redundancy and potential suppressor effects among the PPI-R factors (Cohen, Cohen, West, & Aiken, 2002). All two- and three-way interaction effects among the PPI-R factors were also examined for each task. Finally, NPI and Mach-IV scores were entered first into multiple regression models, followed by the significant PPI-R predictors for each task, to examine the incremental validity of the PPI-R predictors over and above these other measures.[4]

3. Results

3.1. Validity analyses

As discussed previously, several participants were excluded from analyses based on elevated scores on the PPI-R Deviant Responding and PPI-R Inconsistent Responding scales. Additionally, controlling for the PPI-R Virtuous Responding (VR) scale, which is designed to detect socially desirable responding, did not produce any changes in pattern or significance of our findings. Moderated regressions were also conducted to fully assess for a potential attenuating effect of socially desirable responding, and in all but one of the analyses, the interaction term was nonsignificant, with all R^2 changes below 2% of the variance. In one regression, the R^2 change was significant ($p < 0.01$) but accounted for below 5% of the variance; in this analysis, the direction of the effect was also opposite to the social desirability prediction (i.e., higher VR scorers demonstrated a stronger correlation than lower VR scorers, whereas one would expect higher VR scorers to demon-

strate a weaker correlation). Therefore, it does not appear that social desirability played a major role in moderating our correlational findings.

3.2. Sex differences

Consistent with previous literature (e.g., Cale & Lilienfeld, 2002), there were significant sex differences on both psychopathy measures. Males scored higher than females on PPI-R FD, SCI, Coldheartedness, and total scores ($F_{FD}(1,209) = 14.49$, $h^2 = 0.07$; $F_{SCI}(1,209) = 20.38$, $h^2 = 0.09$; $F_C(1,209) = 16.99$, $h^2 = 0.08$; $F_{Total}(1,209) = 34.66$, $h^2 = 0.14$; all $ps < 0.001$). On the LSRP, males scored higher than females on the primary and total scores ($F_{Primary}(1,209) = 12.66$, $h^2 = 0.06$, $p < 0.001$; $F_{Total}(1,209) = 12.11$, $h^2 = 0.06$, $p < 0.001$), whereas the mean difference on the LSRP secondary scale approached significance ($F_{Secondary}(1,209) = 3.56$, $h^2 = 0.02$, $p < 0.07$). There were also significant sex differences on total NPI score ($F(1,209) = 6.32$, $h^2 = 0.03$; $p < 0.05$) and on the Mach-IV total score ($F(1,209) = 13.23$, $h^2 = 0.06$; $p < 0.001$) such that males scored higher than females on both instruments. The only significant sex differences on any economic measure appeared on the ring measure-other, such that males chose options allotting significantly more money to their partners than did females ($F(1,201) = 10.35$, $h^2 = 0.05$, $p < 0.01$). Controlling for sex resulted in different correlational patterns for the ring measure-other total. In all cases, the magnitude of the correlations between these variables and the "dark triad" measures increased slightly, by an average of 0.05 (range of 0.01–0.1).[5]

3.3. Personality measure correlations

The PPI-R total score and all three PPI-R factors (SCI, FD, and Coldheartedness) were positively and significantly intercorrelated (see Table 2). LSRP total, primary, and secondary scores were also positively and significantly intercorrelated (see Table 2).

Coldheartedness, SCI, and PPI-R total scores were each positively and significantly correlated with LSRP total, primary, and secondary scores, as well as with NPI and Mach-IV total scores (see Table 2). There was a differential pattern of correlations with FD, however: this factor correlated positively and significantly with only the NPI total score and LSRP primary psychopathy scale.

Coldheartedness and SCI both correlated negatively and significantly with MPQ-33 Positive Emotionality, as did the Mach-IV total, LSRP total, and LSRP secondary scores (see Table 3). Conversely, FD and NPI total scores correlated positively and significantly with Positive Emotionality. Significant positive correlations emerged between SCI and MPQ-33 Negative Emotionality. Negative Emotionality also correlated significantly with the Mach-IV total score and all three scales of the LSRP, whereas Positive Emotionality correlated negatively with these variables (see Table 3). The PPI-R total score, all three PPI-R factors, Mach-IV total, and all three LSRP scales each correlated negatively and significantly with MPQ-33 Constraint.

Differential correlations emerged between FD and LSRP secondary psychopathy depending on sex, as these correlations were negative for males ($r = -0.26$, $p < 0.05$) and nonsignificant for females ($r = 0.03$, $p > 0.05$). A test of the difference between dependent correlates was significant ($z = -1.97$, $p < 0.05$).

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[4] Several behavioral tasks used multiple trials for each participant, and analyses thus needed to account for this nesting in a statistically appropriate manner. To this end, we used generalized estimating equations (GEE), with trials nested within task, to examine whether any psychopathy scale interacted statistically with across-trial trends within the ultimatum game and prisoner's dilemma tasks. None of these interactions was significant, suggesting that psychopathic traits do not predict the slopes of changes in decision-making responses across trials.

[5] Controlling for sex and ethnicity did not substantively change the results of any correlational analyses. Controlling for these variables in regression analyses decreased the independent variance contributed by Coldheartedness, but not FD or SCI; this is possibly due to larger main effect differences for sex and ethnicity for Coldheartedness compared with FD and SCI. Full results are available first author upon request.

Table 2
Personality correlations.

	PPI-T	FD	SCI	C	LSRP-T	LSRP-1	LSRP-2	NPI	MACH
PPI-T	–								
FD	.74***	–							
SCI	.79***	.21**	–						
C	.55***	.24***	.36***	–					
LSRP-T	.60***	.11	.76***	.45***	–				
LSRP-1	.55***	.17*	.60***	.49***	.91***	–			
LSRP-2	.44***	−.03	.70***	.21**	.73***	.40***	–		
NPI	.41***	.48***	.17*	.19**	.23***	.36***	−.08	–	
MACH	.50***	.08	.63***	.37***	.70***	.68***	.43***	.22**	–

Note: PPI-T = Psychopathic Personality Inventory-Revised (PPI-R) total; FD = PPI-R Fearless Dominance; SCI = PPI-R Self-Centered Impulsivity; C = PPI-R Coldheartedness; LSRP-T = Levenson Self-Report Psychopathy (LSRP) total; LSRP-1 = LSRP primary psychopathy; LSRP-2 = LSRP secondary psychopathy; NPI = Narcissistic Personality Inventory total; MACH = Mach-IV total.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 3
Correlations with Multidimensional Personality Questionnaire (MPQ-33) factors.

	PPI-T	FD	SCI	C	LSRP-T	LSRP-1	LSRP-2	NPI	MACH
PosE	.08	.42***	−.17*	−.27***	−.23**	−.12	−.33***	.48***	−.22**
NegE	.04	−.35***	.42***	−.07	.41***	.28***	.46***	−.02	.28***
Constr	−.64***	−.52***	−.50***	−.22***	−.31***	−.17**	−.43***	−.04	−.25***

Note: PPI-T = Psychopathic Personality Inventory-Revised (PPI-R) total; FD = PPI-R Fearless Dominance; SCI = PPI-R Self-Centered Impulsivity; C = PPI-R Coldheartedness; LSRP-T = Levenson Self-Report Psychopathy (LSRP) total; LSRP-1 = LSRP primary psychopathy; LSRP-2 = LSRP secondary psychopathy; NPI = Narcissistic Personality Inventory total; MACH = Mach-IV total; PosE = MPQ-33 Positive Emotionality; NegE = MPQ-33 Negative Emotionality; Constr = MPQ-33 Constraint.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 4
Correlations among economic tasks.

	Dictator	UG-70%	UG-50%	UG-30%	UG-10%	RM-S	RM-O	Prisoner
Dictator	–							
UG-70%	−.07	–						
UG-50%	.02	.23**	–					
UG-30%	−.02	.07	−.04	–				
UG-10%	−.06	.13	.03	.35***	–			
RM-S	.13	.03	.06	−.02	.00	–		
RM-O	−.31***	.04	−.16*	−.11	−.08	−.13	–	
Prisoner	.16*	.01	.16*	.20**	.13	.08	−.31***	–

Note: Dictator = Dictator Game; UG = Ultimatum Game; RM-S = Ring Measure-Self Total; RM-O = Ring Measure-Other Total; Prisoner = Prisoner's dilemma.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

3.4. Economic task correlations

Correlations among the economic tasks were small to moderate, but statistically significant (see Table 4).

Responses on the dictator game spanned the full possible range of $0–$10 ($M = 5.99$, $SD = 1.92$). The self-allocation amount correlated positively and significantly with Coldheartedness, NPI total score, Mach-IV total score, and LSRP primary and total scales (see Table 5).

The first, second, and fourth rounds of the ultimatum game (in which participants were offered, respectively, 70%, 50%, and 10% of the total available) did not correlate significantly with total scores on any personality measure.[6]

In the third round of the ultimatum game, participants were offered 30% of the total available and 44.8% of participants rejected the offer. The rejection rate for this round correlated positively with SCI, FD, and PPI-R total scores, and there was a trend toward significance with Coldheartedness. There were also positive correlations with NPI total scores, as well as with all three LSRP scores (see Table 5).

Because the dictator game is essentially an abbreviated ultimatum game, correlations were re-conducted controlling statistically for responses on the dictator game, but no results changed substantively.

The total number of defections in the prisoner's dilemma was tallied for each participant ($M = 3.30$, $SD = 3.24$). Significant positive correlations emerged for Coldheartedness and SCI, as well as with Mach-IV total and LSRP primary, secondary, and total scores (see Table 5).

Ring measure-self ($M = 21.35$, $SD = 7.92$) and ring measure-other ($M = 7.36$, $SD = 9.78$) total scores were calculated. Ring mea-

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[6] The ranges of responding for the first and second rounds of the ultimatum game were extremely restricted, with only 10 participants (4.8%) and 6 participants (2.9%) rejecting the offer in each round, respectively. In contrast, in the fourth round 160 participants (76.2%) rejected the offer.

Table 5
Correlations between personality scales and economic tasks.

	Dictator	UG-70%	UG-50%	UG-30%	UG-10%	RM-S	RM-O	Prisoner
PPI-T	.11	−.03	.02	.21**	.04	.06	−.09	.13
FD	−.01	.01	−.08	.15*	−.01	.06	.02	−.03
SCI	.12	−.06	.09	.17*	.09	.03	−.09	.18**
C	.22**	.02	.06	.13	−.03	.06	−.24**	.16*
LSRP-T	.27***	−.07	.08	.18**	.09	.05	−.17*	.32***
LSRP-1	.31***	−.10	.04	.15*	.06	.09	.20**	.31***
LSRP-2	.08	.02	.11	.15*	.09	−.04	−.05	.21**
NPI	.19**	−.09	−.04	.17*	.01	.08	−.06	.00
MACH	.35***	−.05	.01	.08	.04	.07	−.18*	.28***

Note: Dictator = Dictator Game; UG = Ultimatum Game; RM-S = Ring Measure-Self Total; RM-O = Ring Measure-Other Total; Prisoner = Prisoner's Dilemma; PPI-T = Psychopathic Personality Inventory-Revised (PPI-R) total; FD = PPI-R Fearless Dominance; SCI = PPI-R Self-Centered Impulsivity; C = PPI-R Coldheartedness; LSRP-T = Levenson Self-Report Psychopathy (LSRP) total; LSRP-1 = LSRP primary psychopathy; LSRP-2 = LSRP secondary psychopathy; NPI = Narcissistic Personality Inventory total; MACH = Mach-IV total.
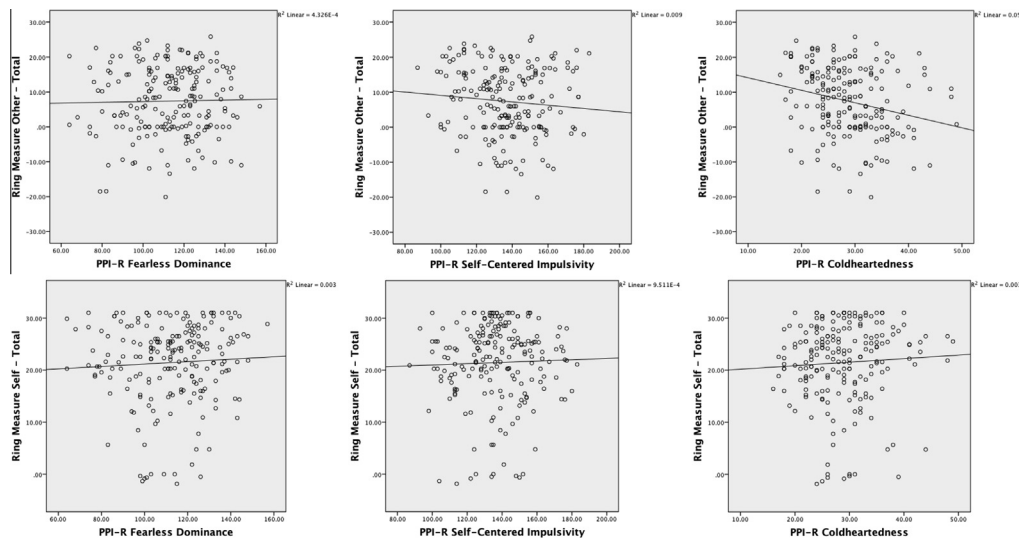* $p < .05$.
** $p < .01$.
*** $p < .001$.

Fig. 1. Correlations of PPI-R factors with ring measure self and other totals.

sure-self totals did not correlate significantly with any personality measure. Ring measure-other totals correlated significantly and negatively with Coldheartedness, Mach-IV, and LSRP total and primary scores (see Table 5 for these findings, and Fig. 1 for ring measure self and other total scatterplots with PPI-R factors).

3.5. Regression analyses

3.5.1. Incremental validity of PPI-R factors

One aim of this study was to ascertain the incremental validity of each PPI-R factor above and beyond the others. To this end, hierarchical linear regression analyses were conducted for all economic tasks. Additionally, regressions were conducted on all economic measures using interaction terms among the three PPI-R factors to determine whether interaction effects were present above main effects.[7]

In the dictator game, Coldheartedness was the only significant predictor of amount retained for oneself above and beyond the other PPI-R factors. However, the Coldheartedness × SCI interaction term was significant; decomposition of the interaction re-

vealed that for low Coldheartedness scorers, SCI did not predict amount retained for oneself, but that for high Coldheartedness scorers, high SCI scores predicted a higher number of selfish decisions (R^2 change = 0.03, $F(1,207) = 5.69$, $b = 0.002$, SE = 0.001, $b = 1.54$, $p < .05$). In the third round of the ultimatum game, regression analyses indicated that SCI was the most robust predictor above and beyond the other PPI-R factors. On this task, the Coldheartedness × SCI interaction term was also significant; decomposition of the interaction revealed that for low Coldheartedness scorers, high SCI predicted rejecting offers, but for high Coldheartedness scorers, high SCI predicted accepting offers (R^2 change = 0.02, $F(1,207) = 4.34$, $b = −0.001$, SE < 0.001, $b = −1.33$, $p < .05$). On the prisoner's dilemma, regression analyses indicated that SCI was again the most robust predictor of the PPI-R factors, and that no interactions were significant over and above main effects. The three-way interaction among all PPI-R factors was not a significant predictor of any economic tasks above and beyond the individual factors and two-way interactions.

3.5.2. Incremental validity of PPI-R factors above and beyond the NPI and Mach-IV

As a further indicator of the incremental validity of Coldheartedness, SCI, and FD over and above narcissism and Machiavellian-

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[7] Only economic tasks yielding significant results are discussed here; full results are available upon request from the first author.

Table 6
Hierarchical regressions of personality constructs on economic tasks.

	Dictator game					Ultimatum game – 30%					Prisoner's dilemma					Ring measure – other				
	β	ΔR²	t	p	df	β	ΔR²	t	p	df	β	ΔR²	t	p	df	β	ΔR²	t	p	df
MACH	.35	.12	5.36	<.001	208	.08	.01	1.19	.24	208	.28	.08	4.17	<.001	208	−.18	.03	−2.55	.01	208
FD	−.04	.00	−.54	.59	207	**.14**	**.02**	**2.06**	**.04**	**207**	−.05	.00	−.72	.47	207	.04	.00	.52	.60	207
SCI	−**.17**	**.02**	−**2.08**	**.04**	**207**	**.19**	**.02**	**2.13**	**.04**	**207**	.01	.00	.13	.90	207	.04	.00	.40	.69	207
C	.11	.01	1.53	.13	207	.11	.01	1.52	.13	207	.07	.00	.93	.36	207	−**.20**	**.03**	−**2.66**	**<.01**	**207**
NPI	.19	.04	2.83	<.01	208	.17	.03	2.50	.01	208	.00	.00	.01	.99	208	−.06	.00	−.85	.40	208
FD	−.13	.01	−1.65	.10	207	.09	.01	1.11	.27	207	−.03	.00	−.42	.68	207	.06	.00	.80	.43	207
SCI	.09	.01	1.25	.21	207	**.14**	**.02**	**2.03**	**.04**	**207**	**.19**	**.03**	**2.71**	**<.01**	**207**	−.09	.01	−1.19	.23	207
C	**.19**	**.04**	**2.81**	**<.01**	**207**	.10	.01	1.42	.16	207	**.17**	**.03**	**2.39**	**.02**	**207**	−**.23**	**.05**	−**3.31**	**.00**	**207**

Note: MACH = Mach-IV total; FD = PPI-R Fearless Dominance; SCI = PPI-R Self-Centered Impulsivity; C = PPI-R Coldheartedness; NPI = Narcissistic Personality Inventory total. Bolded results indicate significant variance contributed by PPI-R factors above and beyond each of the other personality constructs.

ism, and vice versa, separate hierarchical linear regressions were conducted including Mach-IV and NPI total scores.

Hierarchical regression analyses indicated that on the prisoner's dilemma, the factors of the PPI-R did not contribute above and beyond Mach-IV total scores. However, SCI emerged as a significant predictor beyond Mach-IV scores on both the dictator game and the third round of the ultimatum game. FD and Coldheartedness were each significant beyond Mach-IV scores on only one task; for FD, this was the third round of the ultimatum game, whereas for Coldheartedness, this was the ring measure-other total score. Additionally, although FD was never significant above and beyond the NPI total score, Coldheartedness and SCI both contributed significant variance beyond NPI scores on multiple tasks. For SCI, these tasks were the third round of the ultimatum game and the prisoner's dilemma, whereas Coldheartedness was a significant predictor above and beyond NPI scores on every task *except* the third round of the ultimatum game (see Table 6 for full regression findings).

4. Discussion

These results support some, but not all, of our hypotheses, and offer insight into the heterogeneity of self-reported psychopathy. In addition, they suggest several avenues for further investigation regarding the subcomponents of psychopathy.

The expected positive correlations among members of the "dark triad" were found. However, regarding the economic tasks, our hypotheses regarding FD were not supported; rather than predicting instrumentalism and unemotional, rational decision-making, FD was largely nonpredictive of scores on each task. Instead, Coldheartedness and SCI emerged as the primary predictors of behavior on these tasks, indicating that the processes ostensibly underpinning these decisions may be more related to aggression, impulsivity, manipulativeness, and callousness.

4.1. Predictors of economic decision-making

Past studies of economic decision-making and psychopathy have, in large part, used instruments other than the PPI-R (see above, including Osumi & Ohira, 2010, and Koenigs et al., 2010) to assess psychopathy, and when the PPI-R was used, the three overarching factors were sometimes not included in analyses (e.g., Mokros et al., 2008). In addition, few researchers have administered measures of overlapping personality constructs to ascertain the unique correlates of each construct. In this study, we begin to fill these gaps.

Of the PPI-R factors, SCI and Coldheartedness were the more robust predictors, with FD typically contributing no unique variance above and beyond other variables. However, when Mach-IV and NPI were included in regression analyses, some patterns emerged in the significant variance contributed by the PPI-R factors. Specif-

ically, SCI appeared to be most consistently significant beyond Mach-IV scores, with each of the other PPI-R factors only contributing incremental variance on one task. Coldheartedness appeared to be most consistently significant beyond NPI scores, with SCI contributing incremental variance on two tasks, but FD never remaining a significant predictor of economic task outcome beyond NPI scores.

Notably, the LSRP primary and secondary psychopathy factors displayed similar patterns of correlation with, respectively, PPI-R Coldheartedness and PPI-R SCI (although, interestingly, both subscales correlated more highly with SCI than with any other subscale of the PPI-R). These similarities corroborate the conceptualization of LSRP primary and PPI-R Coldheartedness as indices of "meanness" (Patrick, Fowles, & Krueger, 2009; Sellbom & Phillips, 2013), and key components of the psychopathic trait constellation. Furthermore, although some of our findings may suggest that PPI-R FD is less relevant to psychopathy due to its lower predictive significance compared to Coldheartedness and SCI, we propose an alternative interpretation. Namely, FD may assess key traits of psychopathy, such as interpersonal charm and sensation seeking, that fall largely outside the network of traits relevant to decision-making in the economic games used here.

The 30%-offer round (round 3) of the ultimatum game was one of two indices on which the interaction of two PPI-R factors contributed a significant amount of variance above either factor alone. In both cases, the interaction term was Coldheartedness × SCI, suggesting that individuals with high levels of both of these factors present with a different behavioral profile than either factor alone. Namely, they seem more likely to respond in a selfish, but not hostile, fashion: they played round 3 of the ultimatum game "rationally" by accepting the unfair offer, in contrast to individuals with elevated SCI scores only, who were much more likely to reject the offer. Supplementary analyses also revealed that when controlling for SCI, the correlation between Coldheartedness and round 3 of the ultimatum game became nonsignificant. This finding further suggests that Coldheartedness, perhaps because of its close links to affective detachment, may buffer individuals against reactive hostility and temper their reactions to unfair proposals. Although Coldheartedness alone did not predict acceptance of unfair proposals, as might be expected based on the characteristic affective nonreactivity of individuals with high scores on this factor (Lilienfeld & Andrews, 1996), its nonsignificant correlations with all rejection rates, in addition to its significant interactions with SCI, indicate that high-Coldheartedness individuals may make decisions that are saturated with less emotion than those decisions of high-FD or high-SCI individuals.

4.2. Additional personality correlates of the PPI-R factors

Correlations with the three higher-order factors of the MPQ-33 (Positive Emotionality, Negative Emotionality, and Constraint) pro-

vide some insight into the traits that underlie each of the PPI-R's three factors. It is unsurprising, given the known correlates of SCI and FD (e.g., Blonigen et al., 2010; Poythress et al., 2010), that the former correlated positively with Negative Emotionality and negatively with Positive Emotionality, whereas the latter displayed the opposite pattern. Yet all three factors correlated negatively with Constraint. This dimension is often considered to be antonymous with disinhibition, an externalizing trait associated with irresponsibility, impulsivity, distrust, and reactive aggression (Nigg, 2000). Thus, these negative correlations provide support for the view that disinhibition is a key component of psychopathy (Patrick et al., 2009).

4.3. Dimensional and phenotypic conceptualizations of psychopathy

The findings from the present moderated multiple regression analyses suggest that high-SCI, high-Coldheartedness individuals appear to display a different pattern of behavior than individuals high on either factor alone. These former individuals largely lack the charm, social adeptness, and manipulative skill possessed by high-FD individuals, yet some may meet criteria for psychopathy using such measures as Hare's Psychopathy Checklist-Revised (PCL-R; 1991/2003). Our results may help to clarify the potential heterogeneity of psychopathy, and whether certain dimensions of the construct, if any, are the more critical or requisite features of psychopathy. For example, does the absence of Fearless Dominance traits render such individuals non-psychopathic? By a similar token, an individual may possess high-FD and high-Coldheartedness traits, but lack a history of antisocial behavior. Is this person also non-psychopathic because of the absence of these behaviors? Such questions remain unresolved, but further studies parsing the factors of psychopathy may contribute to their resolution.

Notably, recent academic arguments have stalemated at fundamental differences in understanding core psychopathic traits and interpreting the empirical literature (Hare & Neumann, 2010; Lilienfeld et al., 2011; Miller & Lynam, 2011; Skeem & Cooke, 2010). A dimensional model, as is currently slated for inclusion in Section 3 (dedicated to preliminary diagnostic proposals worthy of further research) of DSM-5, may provide a new perspective on these issues. These proposed new criteria, along with the dimensional model itself, may one day allow for increased flexibility in diagnosing individuals with a personality disorder. Importantly, this change in diagnostic criteria may eventually open the door to a new focus in psychopathy research; namely, greater understanding of the etiology of the constituent psychopathy factors themselves and their differing phenotypic expressions – which, as demonstrated in the economic tasks used here, can manifest in different behavioral patterns.

Indeed, increasing evidence indicates that psychopathy is a dimensional rather than taxonic construct (Edens, Marcus, Lilienfeld, & Poythress, 2006). Most self-report psychopathy scales, including the two used in the present study, are premised on a continuous, rather than a dichotomous, conceptualization of psychopathy. Moreover, in variable-centered approaches, most self-report measures presume the existence of two or more factors within the construct. In addition to differing behavioral patterns when isolated, the different factors also display substantially different correlations with other personality variables. Studying these factors individually, as well as in combinations (e.g., high-Coldheartedness and high-SCI vs. high-Coldheartedness and high-FD), will probably contribute a great deal to the understanding of psychopathy, above what might be revealed through examination of only individuals who score highly on all factors. The extension of these separable psychopathy factors to a person-centered approach examining the heterogeneity of the construct's phenotypes may lead to a better theoretical understanding of the disorder and, ideally, implications for appropriate intervention targets.

4.4. Limitations

One limitation of this study was the hypothetical nature of the behavioral tasks, which may have engendered ecologically invalid responding (e.g., socially desirable or undesirable responding). Despite the widespread use of this hypothetical paradigm in other studies (e.g., Mokros et al., 2008; Tompkinson & Bethwaite, 1995), the only way to ensure that participants respond validly is to use non-hypothetical situations. Supplementary analyses controlling for scores on the PPI-R Virtuous Responding scale, a proxy for socially desirable responding (Lilienfeld & Widows, 2005), did not change the overall patterns or significance of findings. Thus, although some bias in responding may have been engendered by the hypothetical nature of the task, this bias does not appear related to impression management. It is possible, however, that these tasks were less engrossing and engaging than they would have been had participants played with an actual partner. Therefore, replication of the present study either in real scenarios or with specific instruction about hypothetical bias will be important to determine the direction and magnitude of the effect.

An additional limitation was the study's reliance on undergraduates. This choice of sample may have led to a restriction of range on some measures, especially those assessing personality constructs, than would be found in either a more general sample or a clinical sample. If so, it may imply that our findings provide conservative estimates of the magnitudes of the relations between psychopathy dimensions and economic decision-making.

A further limitation of this study was the restriction of range for some rounds of the ultimatum game. More informative results may have been obtained through the use of additional rounds with finer gradations of offers (e.g., offers in each round decreasing by 10% increments instead of 20%).

Additionally, some authors (e.g., Borsboom, Mellenbergh, & van Heerden, 2004) argue that a determination of the validity of personality measures requires the establishment of causal validity, that is, a demonstration that variations in a construct causally result in variations in the measurement of that construct. The causal validity of self-report psychopathy instruments is presently unclear, due, in part, to the aforementioned lingering uncertainties regarding the boundaries and components of the construct of psychopathy. Further, although questionnaire measures of psychopathy demonstrate substantial predictive validity for certain outcomes (e.g., violence; Edens, Poythress, Lilienfeld, Patrick & Test, 2008), our research design cannot provide information regarding the causality of our observed associations. It is possible, for instance, that psychopathy dimensions as measured by the PPI-R and related instruments are merely proxies for broader underlying constructs (e.g., disinhibition and reward sensitivity), and are not themselves causally related to external variables.

Finally, we assessed personality exclusively using self-report measures. As a consequence, mono-method bias may have inflated the magnitudes of some of the correlations. Nevertheless, method covariance is unlikely to account for the differences in relative magnitudes of the correlations between psychopathy and personality measures on the one hand, and the economic tasks on the other. In future studies these traits should be assessed using not only self-report, but other modes of assessment, including interview, other-report, or behavioral observations, to minimize method covariance.

4.5. Conclusions

These findings bear implications for current conceptualizations of the factor structure of psychopathy. Although it has been the subject of relatively little research, Coldheartedness emerged in this study as a significant predictor of selfish behavior. In contrast,

Fearless Dominance predicted little variance in most economic tasks, with a notable exception of one trial of the ultimatum game, which activated what appeared to be a sense of narcissistic entitlement in addition to impulsivity and reactive aggression.

These results indicate that Coldheartedness, a largely-overlooked factor of the PPI-R, and of psychopathy more generally, contributes substantially to economic decision-making. Its correlations with other personality measures also illuminate some of the sub-facets comprising the trait itself, and suggest that, if classical criteria and clinical descriptions (Cleckley, 1976; McCord & McCord, 1964) are at all reflective of the disorder, the construct of coldheartedness may be an especially important dimension in assessing and understanding psychopathy.

Finally, evidence emerged supporting the consideration of psychopathy as a condition comprising several separable core traits, as reflected by the differing affective and behavioral contributions of each of the PPI-R factors to economic tasks. This dimensional "core traits" model must be further examined to ascertain its clinical and empirical utility. Ultimately, these approaches may provide fresh perspectives and the potential to uncover important information about the etiology of key features of psychopathy.

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