The Impact of Individual Differences and Community Factors on Altruistic Behavior

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Abstract

Research using economic decision-making games has examined factors that influence prosocial cooperation and punishment behavior. However, none of this research used individuals who actually engage in real world antisocial behavior. The present study administered six economic games to an unselected community sample enriched for antisocial behavior. Personality pathology, as well as concentrated disadvantage and exposure to violence, were the primary factors of interest. Results revealed that the game decisions clustered into two principal components: prosocial cooperation and prosocial punishment. Antisocial personality disorder was positively related to prosocial punishment. Additionally, exposure to violence, specifically being a victim, was a robust predictor of engaging in higher levels of prosocial punishment. Together, results suggest that individuals with antisocial personality or who were exposed to violence were more willing to punish others who behaved antisocially (i.e., who did not cooperate). It is possible that these individuals are, therefore, primed to engage in punishment either because this behavior mirrors what they see in themselves or what they see in their environment. Given these specific punishment-related factors, more attention should be paid to integrative strategies that promote an ethos of cooperation. This may be particularly important among individuals whose development of this ethos has been stifled by complex personality-environmental factors that militate against cooperation.

Key words: antisocial, prosocial, cooperation, personality, environment

Recently, there has been a surge in research on prosocial and antisocial behavior. Evolutionary theory posits that the creation of the social norm of altruism is rooted in the importance of establishing patterns of reciprocal altruism, which aids in survival (Trivers, 1971). Thus, it may be adaptive for groups of individuals to cooperate with each other despite the fact that an individual may incur short-term losses when cooperating with another. Social norms of punishment are inextricably tied to cooperation. Specifically, the ability to identify and punish non-cooperators, and the subsequent threat of punishment of wrongdoing, is thought to drive the maintenance of human social cooperation (Henrich & Boyd, 2001). Punishment and threat thereof thus serves as a primary mechanism of the enforcement of cooperation and can be seen as prosocial in situations in which punishment is used to drive further cooperation (Carpenter, Matthews, & Ong'ong'a, 2004). Individuals who do not cooperate and do not prosocially punish non-cooperators are said to be antisocial. Though discussion of antisociality is present in cooperation research, little work has investigated cooperation and prosocial punishment in individuals who engage in antisocial behavior in the real world.

Research on prosocial behavior in healthy individuals

Previous research has investigated the situations under which humans do cooperate with and prosocially punish others. Studies have shown that healthy humans are willing to cooperate with others more than expected in a rational-actor model (Fehr & Fischbacher, 2003; Gintis, Bowles, Boyd, & Fehr, 2003; Henrich et al., 2005; Henrich et al., 2006; Marlowe et al., 2008) and that individuals will cooperate with others even when it is not in their immediate best interest to do so (Güth, Schmittberger, & Schwarze, 1982; Hoffman, McCabe, & Smith, 1998; Ostrom, 1998). These tendencies were initially

thought to be stable across groups of individuals; however, more recent work reveals that tendencies to behave prosocially do vary across individuals in different countries and cultures (Henrich et al. 2005; Sapienza, Zingales, & Guiso, 2006, Herrmann, Thöni, & Gächter, 2008; Gächter, Herrmann, & Thöni, 2010; Henrich et al., 2010; Ellingsen, Herrmann, Nowak, Rand, & Tarnita, 2012; Cappelen, Moene, Sørensen, & Tungodden, 2013). Though a group of individuals who engage in antisocial behavior would not constitute a separate culture from those who do not, this research suggests that human cooperation and prosocial punishment are not monolithic and may vary systematically depending on personality and environmental differences.

Neural basis of prosocial behavior

The neural mechanisms of prosocial cooperation and punishment are as of yet unknown, but recent work has focused on neural response to unfair offers. Crockett and colleagues (2008) found that a temporary decrease in serotonin levels increased rates of prosocial punishment, suggesting that serotonin is implicated in regulating response to antisociality in others. Similarly, low platelet serotonin level is associated with higher rates of prosocial punishment (Emanuele, Brondino, Bertona, Re, & Geroldi, 2008), implicating this neuromodulator in regulation of antisociality in others. Brain regions that have been linked to tasks involving acceptance or rejection of antisociality in others include the dorsolateral prefrontal cortex (DLPFC), which is selectively activated when rejecting antisocial behavior (Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003) and is associated with an increased acceptance of antisociality (i.e., less prosocial punishment) when its functioning is disrupted (Knoch, Pascual-Leone, Meyer, Treyer, & Fehr, 2006). Likewise, the ventral prefrontal cortex (VPFC) has been implicated in regulating reaction

to unfair offers (Tabibnia, Satpute, & Lieberman, 2008), and patients with disrupted VPFC functionality show an increased rejection of antisocial behavior (Koenigs & Tranel, 2007). Similarly, in tasks of punishment of antisocial behavior, reward regions in the brain are activated, suggesting that rejection of antisocial offers (i.e., prosocial punishment) is intrinsically rewarding in some way (Strobel et al., 2011). Taken together, these results suggest that multiple brain regions are involved in the regulation of reaction to prosociality and antisociality in others.

At the genetic level, the promoter-region functional repeat polymorphism in the monoamine oxidase A gene (MAOA) has been implicated in tasks of prosocial giving, with low activity gene carriers cooperating significantly less than high activity gene carriers when information about the prosociality of others was unknown (Mertins, Schote, Hoffeld, Griessmair, & Meyer, 2011).

Brain regions such as the DLPFC and VPFC have shown to be both structurally and functionally deficient in antisocial individuals (see Yang & Raine, 2009). Likewise, low serotonin levels (Castrogiovanni, Capone, Maremmani, & Marazziti, 1994; Moore, Scarpa, & Raine, 2002; Krakowski, 2003) and the low activity MAOA gene (Raine, 2008) are associated with antisocial behavior. Given their apparent role in the response to antisociality in others, it is plausible that these structural and functional deficiencies will translate to differential behavior on these tasks in antisocial individuals as compared to healthy individuals. However, no work has investigated the connection between these potential mechanisms of cooperation and prosocial punishment in individuals who engage in real world antisocial behavior. This lack of research makes it impossible to

specify the personality and environmental factors that may influence prosocial cooperation and punishment in both healthy and antisocial populations.

Antisocial subtypes and prosociality

Despite this recent surge in work on cooperation and prosociality, little work in this area has been conducted within individuals who engage in antisocial acts in the real world. Disinhibitory psychopathology is a construct that encompasses a broad range of antisocial traits and behaviors that are epitomized by psychopathy and other personality disorders (Gorenstein & Newman, 1980; Krueger, Markon, Patrick & Iacono, 2005; Patrick, Zempolich & Levenston, 1997; Patrick & Zempolich, 1998; Poythress, & Hall, 2011; Zuckerman, 1978). Psychopathic individuals are characterized by their difficulty establishing genuine relationships, minimal and superficial affective experience, an impulsive behavioral style, and a chronic antisocial lifestyle that entails great costs to society as well as for the affected individual (e.g., incarceration). Psychopathy affects about 1% of the general population but about 25% of incarcerated male offenders (Hare, 2006; Neumann & Hare, 2008).

Alternatively, individuals with antisocial personality disorder (APD) exhibit a pattern of antisocial attitudes and behaviors (e.g., aggression, impulsivity, irresponsibility) that begins before the age of 15, demonstrated by chronic lying, fighting, and bullying (American Psychiatric Association, 2000). As a core part of its diagnosis centers on childhood antisociality, APD is rooted in the presence of conduct disorder (CD), a childhood psychopathology characterized by interpersonal aggression and violation of social norms before the age of 15 (American Psychiatric Association, 2000).

The prevalence of APD (50-80%) is more than double that of psychopathy in male prisoners (Baskin-Sommers & Newman, 2013).

Borderline personality disorder (BPD) is characterized by disruptions in self-image, self-regulation, and interpersonal functioning. Like individuals with APD, individuals with BPD are characterized by impulsivity (American Psychiatric Association, 2000). This disorder affects about 5.9% of the population (Grant et al., 2008).

Narcissistic personality disorder (NPD) is characterized by a pervasive pattern of grandiosity, need for admiration, and an unwillingness or inability to feel empathy for others (American Psychiatric Association, 2000). NPD affects about 6.2% of the population, though it disproportionately affects men (7.7% versus 4.8% in women; Stinson et al., 2009).

Though antisocial behavior is measured through diagnostic categories, it can also be conceived along the externalizing spectrum. Externalizing individuals often display excessive reward seeking, hostility, reactive aggression, and poor impulse control (Gorenstein & Newman, 1980; Newman & Lorenz, 2003; Krueger et al., 2005; Pridmore, Chambers, & McArthur, 2005; Buckholtz et al., 2010). Externalizing behaviors include substance use, impulsivity, and antisocial behavior (Krueger, Markon, Patrick, Benning, & Kramer, 2007).

Despite a relative paucity of studies, there appears reason to believe that individuals with these subtypes of antisocial behavior will perform less prosocially on economic game tasks. Related research, reviewed below, suggests differential task performance depending on the specific subtype of antisocial behavior.

Psychopathy. To date, a handful of studies examining psychopathy and psychopathic traits have generated somewhat conflicting results. For example, individuals high on psychopathy were more likely to defect in Prisoner's Dilemma games (i.e., less likely to act in a prosocial manner; Rilling et al., 2007). Additionally, Koenigs, Kruepke and Newman (2010) found that individuals high on psychopathy are both more likely to offer lower amounts in a Dictator Game (i.e., less likely to behave prosocially) and less likely accept unfair offers in an Ultimatum Game (i.e., more likely to reject antisocial behavior in others). However, Osumi and Ohira (2010) found that individuals with high psychopathy scores were more likely to accept unfair offers in an Ultimatum Game. And yet, Vieira and colleagues (2014) found that individuals who scored high on psychopathic traits rejected unfair offers at the same rate as those who scored lower on these traits but perceived the offers as less unfair.

On the trait level, healthy individuals who score higher on psychopathy, as measured by a self-report scale, are both less likely to cooperate in a single-shot Prisoner's Dilemma game and less likely to either initiate or reciprocate cooperation in an iterated Prisoner's Dilemma paradigm (i.e., less likely to behave prosocially in both scenarios; Curry, Chesters, & Viding, 2011). This can lead to higher individual gains for those people who are high on this trait over a series of games (Mokros et al., 2008), suggesting a more utilitarian approach to these tasks. Supporting that notion are findings that individuals high on psychopathic traits, as measured by self-report, have been shown to display both deficient moral decision-making (Glenn, Koleva, Iyer, Graham, & Ditto, 2010) and more utilitarian moral decision-making (Kahane et al., 2015; Bartels & Pizarro, 2011).

These inconsistencies may stem from methodological issues such as a lack of diversity of cooperation and punishment games or a failure to account for the environmental factors that may influence prosocial behavior. Through use of multiple decisions across a variety of economic games and a consideration of the complex environmental factors that influence prosocial behavior, the present study will help to clarify these inconsistencies.

Borderline personality disorder. To date, two studies have investigated the role of borderline personality disorder (BPD) in economic game performance. Both found that individuals with BPD were less likely to trust that a partner would cooperate in a social interaction (King-Casas et al., 2008; Bartz et al., 2010), which is a salient finding given the interpersonal deficits that characterize BPD. Additionally, while endogenous oxytocin increases trust in healthy controls (Kosfeld, Heinrichs, Zak, Fischbacher, & Fehr, 2005), it decreases trust in individuals with BPD (Bartz et al., 2010). Though more research is needed, the present studies suggest that BPD plays an important role in performance on economic games, particularly ones involving trust of a social partner.

Antisocial and narcissistic personality disorders. To date, no studies have been conducted on prosocial behavior in individuals with antisocial personality disorder or narcissistic personality disorder. This suggests a strong need for future research on prosociality in individuals with these disorders.

Externalizing. Though no research to date directly examines the relationship between externalizing traits and performance on economic games in adults, one study shows that adolescent males with externalizing problems generally are less prosocial on giving tasks but do not trust other children less (Sharp, Ha, & Fonagy, 2011). Though the

impact of externalizing on economic game prosociality has not been extensively studied, a few studies have examined correlates of externalizing and their impact on economic game prosociality. For example, low levels of serum omega-3 plasma polyunsaturated fatty acids (PUFAs) are a significant predictor of externalizing in boys (Stevens, Zentall, Abate, Kuczek, & Burgess, 1996). Depletion of serum omega-3 PUFAs is associated with higher rejection of unfair offers (Emanuele, Brondino, Re, Bertona, & Geroldi, 2009), implying that boys high on externalizing will be more likely to prosocially punish others.

Taken together, these studies represent the lion's share of research on prosocial and antisocial behavior in antisocial individuals. While these studies represent an important first step in this line of research, most of these studies only examined one personality trait (e.g., psychopathy) and how that trait influenced decision-making in one type of context. Therefore, little is known about the influence of different subtypes of antisocial behavior on economic laboratory task behavior.

Environmental factors and prosociality

Beyond personality traits, no research has examined the potential environmental factors that may impact prosocial and antisocial behavior, despite research suggesting that environmental factors play a role in the development and maintenance of antisocial behavior (e.g., Rhee & Waldman, 2002) and that environmental factors play a larger role in explaining antisocial behavior in individuals who come from low socioeconomic backgrounds (Tuvblad, Grann, & Lichtenstein, 2006). The substantial role of environment in real world antisocial behavior implicates it as an important factor of antisocial decision-making in laboratory tasks.

One such factor that has been shown to most robustly predict future antisocial behavior is exposure to violence in both direct (i.e., victimization) and indirect (i.e., witnessing) forms (Miller, Wasserman, Neugebauer, Gorman-Smith, & Kamboukos, 1999; Shahinfar, Kupersmidt, & Matza, 2001; Guerra, Huesmann, & Spindler, 2003; Sousa et al., 2011). Similarly, perceived neighborhood disorder (i.e., physical and social decay) is associated with higher rates of antisocial behavior (Sampson, Raudenbush, & Earls, 1997; Brody et al., 2003; Ingoldsby et al., 2003) and is a particularly important risk factor during middle childhood (Ingoldsby & Shaw, 2002).

Very few studies had investigated the relationship between these environmental factors known to be associated with antisocial behavior and prosociality. Higher perceived level of neighborhood norm violations was positively associated with theft in an economic game but negatively associated with expectation of punishment, suggesting that environments with high levels of perceived disorder may promote antisocial behavior and decreased punishment of antisocial behavior (Schroeder, Pepper, & Nettle, 2014). Similarly, it was found that exposure to violence was associated with less prosocial behavior in boys as rated by teachers (van der Merwe & Dawes, 2000). Though this study did not employ an economic game paradigm, measures of real world prosociality may reflect performance in these games, which would imply that individuals with high exposure to violence would be less prosocial in these tasks. However, following a natural disaster, individuals in neighborhoods with higher devastation were found to be more prosocial, rather than less (Rao et al., 2011), suggesting that social decay may play a larger role in dictating norms of cooperation and punishment than physical decay. Alternatively, it could be that long-term exposure to neighborhood disorder is a more

important factor than temporary neighborhood disruption. Further research is needed to specify the relationship between perceived neighborhood disorder and prosociality.

The present study

The purpose of this study was to identify and specify the individual differences and environmental factors that influence prosociality on economic decision-making tasks. More specifically, we examined the nature of cooperation in individuals with antisocial tendencies using six one-shot economic games, detailed below. Use of these economic games allowed for the exploration of decision-making in the context of both prosocial giving and prosocial punishment (i.e., punishment of non-cooperators), providing a much wider range of behaviors than previous work, which has generally used only one or two of these economic games to assess pro- or antisociality in these populations. This approach allows for more robust examination of cooperative and punishing decision-making in this population through a wider variety of economic games. Additionally, questionnaires were used to assess environmental factors, which have been previously understudied in research that examines the impact of individual differences on prosocial behavior.

Methods

Participants

Participants were 57 adults recruited from the New Haven community through flyers. Participants ranged from 18 to 56 years of age with an average age of 39.04 years (SD = 10.94). The sample was 78.9% male and included 54.4% African American and 40.4% Caucasian participants. The population was enriched for antisocial behavior. 5.3% of the sample met threshold criteria for NPD, 10.5% met threshold criteria for BPD,

45.6% met threshold criteria for CD, and 40.4% met threshold criteria for APD. Estimated IQ scores ranged from 82 to 123 with an average estimated IQ of 106 (SD = 10.60).

Procedure

All participants completed a prescreen phone interview and an in-person assessment in order to determine eligibility for the study. Excluded individuals were younger than 18 or over 55 years of age, performed below the fourth-grade level on a standardized measure of reading (Wide Range Achievement Test-III; Wilkinson, 1993), had an estimated IQ score of less than 70 on the Shipley Institute of Living Scale (SILS; Zachary, 1986), had diagnoses of schizophrenia, bipolar disorder, or psychosis, not otherwise specified (Structured Clinical Interview for DSM Disorders; First, Spitzer, Gibbon, & Williams, 1997), or had a history of medical problems (e.g., uncorrectable auditory or visual deficits; head injury with loss of consciousness greater than 30 minutes) that may have impacted their comprehension of the materials or performance on the tasks. All participants provided written informed consent according to the procedures set forth by the Yale University Human Subjects Committee.

Once eligibility for the study was confirmed, participants were assessed for DSM-IV diagnostic criteria in an interview that lasted about 2 hours. In a separate visit, participants were administered a battery of economic games (see below for details) and filled out questionnaires to assess environmental factors.

Assessment Measures

Structured Clinical Interview for DSM-IV

The Structural Clinical Interview for DSM-IV (SCID-IV; First & Gibbon, 2004)

is a semi-structured diagnostic instrument for assessing the major Axis-I and Axis-II disorders as categorized by the DSM-IV. The SCID-IV is organized into modules (A through F), and assesses Mood Episodes, Psychotic Disorders, Mood Disorders, Substance-Use Disorders, and Anxiety Disorders. Clinicians rate each participant on severity of symptoms for each disorder, using a scale of 1-3 for each question (1 = Absent or false; 2 = Subthreshold; 3 = Threshold or true). Participants must meet threshold for a specific number of symptomatic criteria in order to receive a diagnosis.

Questionnaires.

SRP-III. The Self-Report Psychopathy Scale (Paulhus, Hemphill, & Hare, 2007) is a 64-item measure looking at four subscales of psychopathic behavior: Interpersonal Manipulation (IPM), Callous Affect (CA), Erratic Life Style (ELS), and Anti-Social Behavior (ASB). Participants are asked to rate the degree to which they agree with each statement using a 5-point Likert scale, where 1 means "Disagree Strongly" and 5 means "Agree Strongly". To score, the 16 items in each subscale are averaged to get the mean. The overall SRP-III score is the mean of the four subscales. A higher score indicates a greater level of psychopathic behavior. Total scores range from 4-20. Participant total scores ranged from 5.38 to 13.94 with an average score of 9.63 (SD = 2.17).

ESI-Brief. The Externalizing Spectrum Inventory-Brief (ESI-Brief; Hall, Bernat, & Patrick, 2007) is a 100-item self-report measure that assesses a range of behavioral and personality characteristics associated with the externalizing spectrum of psychopathology on both broad- and individual-factor levels. Participants are asked to choose which option describes them best in regard to each statement: True (1), Mostly True (2), Mostly False (3), or False (4). Of the 18 subscales, examples include: alcohol problems,

externalization, boredom proneness, drug use, and empathy. Each is scored as an average of the questions asked within that facet, with higher scores indicating greater levels of externalizing. Total scores range from 100-400. Participant total scores on the ESI-Brief ranged from 100 to 356 with an average score of 189.26 (SD = 66.33).

ETV. The Exposure to Violence scale (ETV; Selner-O'Hagan et al., 1998) is a 13-item self-report measure of experienced lifetime violence, either through personal victimization or witnessing of an event. Participants are asked to circle Yes or No for each item. Examples of items include "Have you been hit, slapped, punched, or beaten up?" and "Have you seen someone else get attacked with a weapon, like a knife or bat?" If Yes is endorsed, participants must indicate the number of times they have experienced this situation in their lifetime. Total scores range from 0-13, with higher scores indicating a greater lifetime exposure to violent situations. Participant scores ranged from 0-13 with a mean of 5.42 (SD = 4.44).

PND. The Perceived Neighborhood Disorder Scale (Ross & Mirowsky, 1999) is a 15-item self-report measure of physical and social order in one's community. Physical and social disorder are conceptualized on a continuum; subscales include physical order or disorder and social order or disorder. Items are rated on a 4-point Likert-type scale (1 = "Strongly Disagree" to "4 = Strongly Agree"). Higher scores indicate higher levels of perceived community disorder. Total scores range from 15-60. Participant scores ranged from 15-53 with an average of 30.20 (SD = 9.77).

Tasks

Subjects completed a series of seven one-shot games, adapted from Peysakhovich, Nowak, & Rand (2014): the Dictator Game, the Trust Game, the Public Goods Game,

and the Ultimatum Game (each of which involves the transfer of money to another individual and thus measures prosocial behavior; see Camerer and Fehr, 2004), a Third-Party Punishment Game, a Second-Party Punishment Game (each of which measures prosocial punishment, the tendency to punish others for behaving antisocially), and the All Play Game (which measures competitive tendencies). Participants were paid $10 per hour spent in the laboratory and had the chance to earn up to an additional $10 depending on choice in the Dictator Game, where individuals received the amount that they chose to give to the other person (i.e., participants were rewarded for prosocial behavior).

Task administration. Participants were first administered a verbal set of instructions informing them of general game procedures and compensation. Participants were instructed that each game had an equal chance of being the one chosen to influence an unfixed extra compensation in order to encourage participants to play each game as it if were the decision that would "count" in the experiment. All instructions were administered by a trained research assistant who remained in the room during task completion in order to ensure smooth functioning and to answer questions that the participant may have had about the rules of each game. Each of the games was administered in a fixed order. Subjects were instructed that they were matched with a new player from the community for each interaction, and each subject was instructed to make choices from the perspective of both players in an interaction in order to assess a wider variety of economic decisions.

Once comprehension of the initial set of instructions was established, participants were verbally instructed on the rules of each game. After confirmation of verbal comprehension, participants were told to read a set of written instructions to ensure

complete comprehension. After that, subjects completed a set of practice questions to determine that the rules for the interaction were clear and understood. If the practice questions were answered incorrectly on the first attempt, subjects were read the instructions again and required to complete the same set of practice questions again. Regardless of comprehension demonstrated on the second set of practice questions, participants were required to make decisions in each of the games. Each economic game is described in more detail below.

Dictator Game. In the Dictator Game (DG), one player serves as the dictator and starts with an endowment of 10 dollars while the other serves as the recipient and starts with nothing. The dictator then chooses how much of this 10 dollars he or she would like to transfer to the recipient. The recipient makes no decisions in this interaction and cannot retaliate in any way to the decision of the dictator. This game serves as a measure of prosocial giving. Participant scores ranged from $0 to $10 with an average of $3.60 given (SD = 3.10).

Trust Game. In the Trust Game (TG), one player serves as the trustor and one serves as the trustee. Both players begin with an endowment of five dollars. First, the trustor chooses whether to give this five dollars to the trustee or not in a binary choice. If the trustor does choose to transfer the five dollars, then that is tripled to 15 dollars and given to the trustee. The trustee then chooses how much of that 15 dollars he or she would like to transfer back to the trustor. Any money that is transferred back to the trustor is not tripled (i.e., the trustor receives what the trustee gives). This game measures both prosocial giving and trust that the trustee will return a portion of the endowment.

71.9% of the sample chose to give money to the trustee. Trustee giving ranged from $0 to $15 with an average of $8.56 given (SD = 3.96).

Third-Party Punishment Game. In the Third-Party Punishment Game (3PP), players interact in groups of three. Each player is initially endowed with 10 dollars. One player serves as the seizer, one serves as the punisher, and the third serves as a recipient and does not make any decisions in the interaction. First, the seizer chooses whether he or she wants to take all of the recipient's 10-dollar endowment or not in a binary choice. If the seizer does choose to take the recipient's endowment, then the punisher can choose how much of his or her own 10-dollar endowment to pay to make the seizer lose money. For every one dollar that the punisher pays, the seizer loses five dollars, meaning that a small cost to the punisher can incur a relatively great cost to the seizer. The money paid and lost in this part of the interaction is not transferred to any of the players. It is simply removed from the total amount that each player has. Thus, this game assesses prosocial punishment (i.e., willingness to punish the antisocial behavior) of third-party actors. 19.3% of the sample chose to take money from the other person in the initial choice, meaning that 80.7% acted in a prosocial manner (i.e., chose not to take the recipient's money). Punisher payment amount ranged from $0 to $4 with an average of $1.81 paid (SD = 1.58).

Second-Party Punishment Game. In the Second-Party Punishment Game (2PP), each of two players starts with an endowment of five dollars. In the first stage, each player chooses to either give up his or her five-dollar endowment in order to ensure the other player receives 10 dollars or not in a binary choice. Once that decision has been made, each player receives an additional endowment of four dollars that can be spent to

make the other player lose money. Decisions on how much money the other player should lose are contingent upon the other player's choice in the first stage. For every one dollar that a player spends, the other player loses four dollars. As in the 3PP, the money spent and lost in this part of the interaction is not transferred to either of the players. It is simply removed from the total amount that each player has. This game assesses willingness to punish actors who have behaved prosocially or antisocially toward the participant him- or herself. 49.1% of the sample chose to give up their endowment in order to give the other person money (i.e., behaved prosocially). When the other player did cooperate (i.e., did give up their five dollars), punisher payment amounts ranged from $0 to $4 paid with an average of $1.27 paid (SD = 1.57). When the other player defected (i.e., did not give up their five dollars), punisher payment amounts ranged from $0 to $4 with an average of $1.62 paid (SD = 1.62).

All Play Game. In the All Play Game (APG), each of two players begins with an endowment of five dollars. This interaction features a prize worth an additional five dollars. Simultaneously, each player chooses how much of their endowment to spend on winning this prize. The player who spends the most of his or her endowment wins the prize. Each player gets to keep the portion of their endowment that they do not spend on winning this prize. This game assesses competitiveness, as more competitive individuals will bet more of their endowment to win the prize. Participant spending ranged from $0 to $5 with an average of $3.46 (SD = 1.88) spent trying to win the prize.

Public Goods Game. In the Public Goods Game (PGG), each of four players starts with an endowment of five dollars. Each player then chooses how much of this five dollars he or she would like to contribute to a group project and how much he or she

would like to keep. Subjects are told that all four players will contribute their chosen amount at the same time, meaning that participants do not know how much money the other players will transfer at the time they make their decision. Once the money has been transferred, the amount contributed is doubled and split evenly among the four players. In this game, it is only beneficial to give to the group under the assumption that other members of the group will contribute a generous portion of their endowment given that players who choose to keep all of their own endowment earn the largest amount of money for themselves. This game assesses prosocial giving in a group context. Participant giving ranged from $0 to $5 with an average of $2.74 given (SD = 2.08).

Ultimatum Game. In the Ultimatum Game (UG), one player serves as a proposer and starts with 10 dollars while the other player serves as the responder and starts with nothing. The proposer first chooses how much of this 10-dollar endowment to offer to the responder. The responder can then either accept or reject this offer. If the responder accepts the offer, then he or she receives the money that the proposer offered, and the proposer receives whatever they did not choose to offer. If the respondent rejects the offer, then both the proposer and the responder receive nothing, meaning that the responder can choose to incur a cost to punish the proposer. To complete this task, subjects first chose how much he or she would like to offer. Then, each subject indicates his or her lowest acceptable offer, which is the lowest amount of money that her or she would choose to accept if the proposer offered it in this interaction. The first decision in this game assesses prosocial offering while the second decision in this game assesses willingness to punish unfair offers (i.e., prosocial punishment). Participant offers ranged from $0 to $10 with an average of $4.81 offered (SD = 2.57). Lowest acceptable offers

ranged from $0 to $10 with an average of $3.91 (SD = 2.72) serving as the lowest acceptable offer. Thus, on average, participants offered more than the lowest amount that they themselves would be willing to accept.

Three of these games, the DG, the TG, and the PGG, require the participant to incur a cost while benefitting others (i.e., prosocial giving). Three of these games, the 3PP, the 2PP, and the UG, involve paying a cost to impose a cost on another (i.e., prosocial punishment of another). One of these games, the APG, assesses competitiveness. See Table 1 for a summary of findings.

Table 1 – Summary of Game Results

Game – Decision	**Mean**	**Standard Deviation**
DG - Dictator	3.60	3.10
TG - Trustee	8.56	3.96
3PP - Punisher	1.81	1.58
2PP – Punishment of cooperators	1.27	1.57
2PP – Punishment of Defectors	1.62	1.62
APG - Player	3.46	1.88
PGG - Giver	2.74	2.08
UG - Proposer	4.81	2.57
UG - Responder	3.91	2.72
Game - Decision	**Percentage chosen**	
TG - Trustor	71.9% gave to Trustee	

3PP - Seizer	19.3% chose to seize	
2PP - Giver	49.1% chose to give	

Table 1 shows a summary of game results. Continuous decisions are listed at the top and reported in terms of means and standard deviations. Binary decisions are listed at the bottom and reported in terms of the percentage that chose one option.

Results

Factor Analysis

In order to look for relationships between decisions in the games, we conducted a principal components factor analysis, using varimax rotation. Decisions from six of the seven economic games (11 decisions used in total) were included in the factor analysis. The decision from the APG was excluded due to its measurement of competitiveness, not prosociality. Two factors emerged: one suggesting a "cooperation" factor that consists of decisions made in the DG, PGG, and TG as well as the first decision in the UG and the first decisions in both the 2PP and the 3PP, and a "punishment" factor that consists of punishment decisions in the 2PP and 3PP as well as UG lowest acceptable offer (see also Peysakhovich et al., 2014).

Table 2 – Component Matrix

Game – Decision	Component	
	1	2
DG – Dictator	**.699**	-.257
TG – Trustor	**.622**	-.462
TG – Trustee	**.417**	-.505
3PP – Seizer	**.089**	.069

3PP – Punisher	.463	**.346**
2PP – Giver	**.300**	-.130
2PP – Punishment of cooperators	.270	**.810**
2PP – Punishment of defectors	.467	**.619**
PGG – Giver	**.497**	-.246
UG – Proposer	**.381**	-.141
UG - Responder	.423	**.515**

Personality Factors

Given the small sample size (about half of the size needed to statistically power the analyses), it is impossible to draw firm conclusions from the results reported. At the time of writing, none of the personality variables assessed appeared related to the cooperation or punishment factors. A diagnosis of APD is related ($r = .210$, $p = .116$), but not significantly, to higher levels of prosocial punishment. Continued data collection will statistically power these results and allow for better understanding of these relationships.

Table 3 – Correlations between factors and personality variables

	NPD	**BPD**	**CD**	**APD**	**SRP**	**ESI**
Cooperation Factor	-.093	.015	.011	.020	-.038	.061
Punishment Factor	-.141	.062	.170	.210	.063	.028

Linear regression analyses were also performed to see if these personality variables predicted cooperation and punishment scores. At the time of writing, none of these variables significantly predicted cooperation or punishment scores, but APD was somewhat related to predicting punishment ($b = .094$, $t(55) = 1.60$, $p = .116$) and explained 4.4% of the variance in punishment scores ($r^2 = .044$).

Environmental Factors

Despite the small sample size, some of the studied environmental factors were in fact significantly related to punishment. Higher exposure to violence was significantly related to higher punishment scores ($r = .269$, $p = .010$). This relationship was carried by victimization of violence ($r = .291$, $p = .028$) rather than witnessing of violence ($r = .236$, $p = .078$).

Other Behavioral Factors

Several behavioral factors were also examined. Incarceration and arrest records were found to be related to the punishment factor. Participants who had previously been incarcerated were significantly more likely to punish others ($r = .280$, $p = .037$). Additionally, participants who had previously committed a violent crime were significantly more likely to punish others ($r = .274$, $p = .041$). Longer time spent incarcerated (as measured by comparisons of individuals' single longest time incarcerated [in days]) was related to higher punishment ($r = .265$, $p = .050$). Additionally, though not significant, a higher number of separate incarcerations was associated with lower cooperation ($r = -.236$, $p = .080$). More data is needed to fully understand these relationships, though this relatively small sample size does reveal significant positive correlations between ETV, victimization, commission of a violent crime and punishment.

Table 4 – Correlations between factors and environmental/behavioral variables

	Cooperation Factor	Punishment Factor
Perceived Physical Disorder of Neighborhood	-.040	.087
Perceived Social Disorder of Neighborhood	-.226	.109
Perceived Neighborhood Disorder Total Score	-.165	.108
ETV Witnessed Total Score	.063	.236
ETV Victimization Total Score	-.028	.291*
ETV Total Score	.027	.269*
Arrested – Yes/No	.123	.188
Number of Arrests	-.144	.185
Incarcerated – Yes/No	.117	.280*
Number of Incarcerations	-.236	.181
Longest Incarceration	-.079	.265
Committed Violent Crime – Yes/No	-.022	.274*
Committed Non-Violent Crime – Yes/No	.004	.095

Note: * indicates significant correlation ($p < .05$).

Linear regression analyses were also performed to see if these environmental variables predicted cooperation and punishment scores. ETV total score significantly predicted punishment scores ($b = .060$, $t(55) = 2.07$, $p = .043$) and explained 7.2% of the variance in punishment scores ($r^2 = .072$). Similarly, ETV victimization total score significantly predicted punishment ($b = .155$, $t(55) = 2.25$, $p = .028$) and explained 8.4% of the variance in punishment scores ($r^2 = .084$).

Likewise, incarceration and commission of violent crime significantly predicted punishment scores ($b = .523$, $t(55) = 2.14$, $p = .037$ and $b = .592$, $t(55) = 2.10$, $p = .041$, respectively) and explained 7.8% and 7.5% of the variance in punishment scores, respectively ($r^2 = .078$ and $r^2 = .075$).

Discussion

The present study sought to elucidate the personality and environmental factors that influence prosocial behavior in a sample enriched for antisocial behavior. General personality factors were not significantly related to either cooperation or prosocial punishment while environmental factors were found to significantly predict prosocial punishment, but not cooperation.

Personality Factors

Personality factors such as NPD, BPD, psychopathy, and externalizing were not found to significantly predict either cooperation or punishment in these economic games. APD, and to a lesser extent its childhood counterpart CD, was related to the punishment factor such that individuals higher on APD were more likely than individuals without APD to prosocially punish non-cooperation. Interestingly, this suggests that individuals

with APD actually punish the non-cooperation of others more harshly than those who do not have APD.

Given the lack of statistical power due to our relatively small sample size at this time, all conclusions and discussion surrounding personality factors are limited. Data collection remains ongoing in order to statistically power these analyses in the future.

Environmental Factors

Despite lacking the statistical power to draw firm conclusions, we present clear indication that exposure to violence significantly predicts likelihood to punish others for antisocial behavior. More specifically, individuals who are the victim of violence, as opposed to witnesses of violence, are significantly more likely to punish the antisocial behavior of others on these tasks. Relatedly, individuals who have previously committed violent crimes are also significantly more likely to punish antisocial behavior, as are individuals who have previously been incarcerated. This suggests that environmental factors, more so than personality factors, are significantly related to prosocial punishment on these tasks.

Limitations

First, the proposed study is limited by the potential lack of generalizability to groups of individuals who might more chronically engage in antisocial behaviors (e.g., prisoners). Second, the study uses a mono-method approach to assessment of individual differences. Future work may wish to both examine performance in incarcerated individuals as well as combine the use of biological measures to characterize individual differences.

Future Directions

Once the present data set is fully collected, more advanced statistical analyses should be conducted in order to draw conclusions about the relationships between personality factors, environmental factors, and cooperation and punishment.

Future research may want to incorporate biological measures, particularly in light of findings that brain activation differs depending on personality factors (see "Neural basis of prosocial behavior", above). For example, it may be that individuals high on APD, like individuals high on psychopathy (Koenigs, et al., 2010), show differential brain activation during these tasks. Use of imaging in these tasks will further clarify the brain-based mechanisms of cooperation and prosocial punishment. Further, understanding of the neural mechanisms that undergird prosocial behavior in healthy individuals as well as the discrepancies between neural activation in healthy individuals and antisocial individuals may point to more specific sites of interventions and treatments for antisocial behavior.

Future work should also examine the translation of these results to real world behavior. Though there is some doubt about the validity of inferring real world behavior based upon economic game performance (e.g., Levitt & List, 2007), others have argued for the ecological validity of these games (e.g., Fehr & Gächter, 2000; Camerer & Fehr, 2004). Research done with an antisocial population could help to elucidate the relationship between game performance and real world prosocial behavior. Further, ecological momentary assessment (EMA) could be employed in order to assess prosocial behavior in the real world and its relationship to task performance. Future work should incorporate novel methods such as EMA to assess the ecological validity of these tasks.

Interestingly, these results suggest that environment, not personality, plays the largest role in explaining cooperation and prosocial punishment. Previous work has suggested that cooperation is a function of culture, one element of environment, and as such can be modified (e.g., Peysakhovich & Rand, 2016). Indeed, Peysakhovich and Rand (2016) found that a brief cooperation prime causes healthy individuals to perform more prosocially on a set of economic games. Thus, future research should assess the modifiability of cooperation in a population enriched for antisocial behavior. Indeed, we are currently collecting data to answer that question and, once data is fully collected, will be able to examine the effect of a cooperation prime on individuals who engage in antisocial behavior in the real world. If those results do suggest modifiability of prosociality, there could be implications for treatment design. More specifically, treatment could focus on the creation of cooperative cultures, through lab tasks or otherwise, to encourage real world prosocial behavior. If it is found that cooperation in antisocial individuals is modifiable, future work can use EMA to assess real world cooperation and prosociality after having completed the cooperation prime. The duration of the efficacy of this cooperation prime can be measured and enhanced to encourage real world cooperative behavior in this antisocial population.

Ultimately, this study serves as the first piece of research that begins to disentangle the intricacies of prosocial behavior in antisocial individuals. Using economic game tasks typically used to measure prosocial behavior in healthy individuals, we assessed cooperation and prosocial punishment in a sample enriched for antisocial behavior. Results showed that, while certain environmental and personality factors such as APD and exposure to violence do not increase cooperation in this subset of

individuals, they do in fact increase prosocial punishment. The precise mechanism underlying this behavior is yet unclear. One theory may relate to the looking glass self theory, which proposes that perception of self is the internalization of perception of the views of others (Cooley, 1983). It is plausible that these individuals punish more due to what they themselves are exposed to in their social interactions, which would imply the need for treatment and interventions that support community and individual cooperation. The present study begins to attempt specification of the mechanisms undergirding prosocial punishment and highlights the need for future cooperation research in antisocial individuals.

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