

EFFECTS OF GROUP IDENTITY AND CONTRIBUTION VARIANCE ON ALTRUISTIC  
PUNISHMENT OF FREE-RIDING

A Dissertation

by

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## ABSTRACT

This research examines how the act of administering altruistic punishment is impacted by group identity and variability in contributions to a public good settings. The decision to punish low contributors involves a cost to the punisher and carries no individual benefit for the action; as such it is an altruistic act. Altruistic punishment is unique because there is not materialistic, rational reasons to employ it, yet we know it is used. Consequently, such punishment is used to uphold norms of exacting revenge. I proposed a six condition experimental study in which I manipulated three factors of group identity (in-group, out-group, and no group identity) and two types of variability in contributions (high and low). I posited that there would be differences in the frequency in decisions to administer altruistic punishment to a non-contributor depending on the combinations of group identity and variance in contributions. Results indicated that these factors were not significant in determining the frequency of utilizing altruistic punishment. The administration of altruistic punishment was significantly related to the level of contribution to the public good. Individuals who contributed more to the public good also administered more altruistic punishment. Sex and variability in contribution were both found to be significant in influencing contributions. Men contributed more and participants in the low variability condition contributed more respectfully. The relationship between sex and altruistic punishment is completely mediated by amount of contributions. While there is a clear and significant relationship between contribution variance and contributions, as well as between contributions and punishment, contributions do not mediate the relationship between contribution variance and punishment because the relationship between contribution and punishment is not significant.

## DEDICATION

To Kennedy and Cairo, all this is for you.

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## 1. INTRODUCTION

Public goods are a type of social dilemma that require individuals to face the conflict between individual short-term incentives and overall group incentives (Dawes 1980). Public goods are communal resources and are characterized by non-excludability. Non-excludability means individuals involved in this decision will receive a portion of the public good regardless of their contribution to the good. However, the problem or dilemma is that if all individuals decide to not contribute, the public good cannot be sustained and everyone is worse off than if they all had contributed to the fullest. Common examples of public goods are public radio, public parks, and public education.

There are different mechanisms that help group members sustain public goods in the face of the temptation to partake but not contribute to the public goods. I am particularly interested in how punishment or the threat of punishment, might prompt group members to sustain public goods. It has been consistently demonstrated that, under certain conditions, punishment does help develop and sustain cooperation. In such cases, one person may have to “step forward” for the good of the group. Although sometimes the administering of punishment may be justifiable in terms of individual reward to the punisher, the focus of this study is on the more curious case of altruistic punishment, the case in which the punisher receives no direct benefits from the punishment of another, and in fact has to sacrifice in order to punish.

This research examines how the act of administering altruistic punishment is impacted by group identity and variability in contributions to a public good. The decision to punish low contributors involves a cost to the punisher and carries no individual benefit for the action; as



such it can be described as an altruistic act. Altruistic punishment is unique because while there is no materialistic, rational reason to employ it, we know it is used. Consequently, such punishment is used either to uphold norms or exact revenge (or both). I propose a six condition experimental study in which I manipulate three levels of group identity (no group identity, in-group identity, and out-group identity) and two types of variability in contributions (high variability and low variability). I posit that there will be differences in decisions to administer altruistic punishment to a non-contributor depending on the combinations of group identity and variability in contributions.

## 2. PUNISHMENT

Punishment is a diverse concept that is studied across multiple social science disciplines. Because of its diversity in conceptualization, each discipline approaches the idea with a different point of emphasis. The concept can also be conceptualized in terms a micro-macro spectrum of focusing on punishment from an individualist approach or from a more societal approach.

### **2.1 Micro-level Perspective**

A micro approach towards punishment focuses on how individual behaviors can be shaped or controlled through the learned association between anticipated stimuli of punishment and reward and behaviors. A psychological approach towards punishment is most often connected to the behavioral branch of the discipline and specifically to theories of learning such as operant conditioning. If a factor has decreased the occurrence of a behavior in the past, it is conceptualized as a punishment (see Molm, 1990 & 1994). This theoretical approach to punishment is anchored by the work of Skinner (1953), who emphasized punishments (and reinforcements) as important forms of situational feedback that promote learning and enhanced performance. By administering punishment, individual behaviors can be manipulated and restructured to decrease the frequency and occurrence of behaviors that are viewed as undesirable. This view of punishment focuses on its ability to alter or change the behavior of the individual who receives the punishment. As with most areas of study within psychology, punishment is addressed at the micro-level of how an individual's immediate behavior is altered in relation to the administration of punishment.

In this behavioral psychological perspective, the costs associated with administering or receiving punishment are not prioritized as a major area of emphasis. The attention within the perspective is placed on the impact of the punishment in creating change, largely benefiting the person or group being punished. Specifically, this fits within the theoretical perspective of Behaviorism, which describes and explains learning and behaviors in terms of stimulus response relationships. There is less concern with the relationship between the societal parameters and relationship involving the individual administering the punishment and the individual receiving the punishment. Additionally, this perspective does not emphasize cognitive aspects involved in the administration of punishment such as strategic motives including reputations, cost of punishment, threats of counter punishment, and effectiveness of punishment.

## **2.2 Macro-level Perspective**

While Psychology takes a micro-level approach to the impact of punishment on an individual's behavior, Criminology takes a macro-level approach to punishment as a societal mechanism for control. Criminology focuses on how societies establish and maintain mechanisms of punishment to keep order and control over large groups of people living within a society. In contrast to Psychology, Criminology is not as concerned with the individual change in behaviors that come from the administration of punishment that fall outside the realm of criminal actions. Instead, Criminology is more generally concerned with how punishment is utilized as a societal tool to maintain control over large groups of individuals. From a Criminological perspective, Garland (2012) discusses punishment as a sanctioning mechanism that demonstrates disapproval in the actions of interacting individuals within a societal institution. This definition emphasizes the societal institution as the source that administers the punishment. Punishment is

often discussed in terms of rules, laws, or customs that are either implicitly or explicitly expressed, and expected to be upheld by all individuals within that societal institution. Instead of focusing on individual behavioral change, punishment is viewed as a societal instrument to enforce dominant group standards and maintain institutionally established order. Punishment is seen as an element of behavioral change but more so emphasized as an element of social control. Punishment is used to maintain the societal status quo in terms of formal and informal mechanisms of control. Formal mechanisms consist of imprisonment, fines, and capital punishment for the violation of established laws. Informal mechanisms consist of stigmatization, ostracism, and chastising that can occur in congruence with formal punishments or occur separately for the violation of cultural standards. Both mechanisms serve to deter behaviors that are counter to the established rules of a society and to sanction individuals who do not comply to those rules. In the case of societal control, punishment can be conceptualized as a process that can be applied, but also can be used as a threat if certain behaviors persist. Both threats of and actual punishments represent societal disapproval for established societal standards.

One of the most extreme components of societal sanctioning is capital punishment; termination of life for individuals who commit certain actions. The termination of life removes all chances of behaviors being altered and instead institutes a sanction eliminating all future behaviors. This fully demonstrates the conceptualization of punishment as a sanctioning tool instead of a tool for behavioral modification as described in Psychology. Punishment allows societies to fully signify disapproval towards individuals violating social rules of conduct and as the administration of these sanctions is publicized, the attention to the sanctions serves as a form of general deterrence for other individuals from repeating offenses in the future. This

conceptualization of punishment demonstrates sanctioning on a macro-level; it addresses how societal institutions are maintained and function in terms of dealing with interactions within the society.

The micro-level approach to punishment taken by Psychology and the macro-level approach to punishment taken by Criminology are on two opposite ends of a spectrum regarding the conceptualization of punishment. However, there are similarities. Similar to Psychology, Criminology generally does not address the social dynamic that occurs between the individual administering the punishment and the individual receiving the punishment. This is in accordance to a macro-level approach where specific individuals are not directly responsible for the administration of punishment, but rather centralized sanctioning institutions are responsible, giving power and authority to the criminal justice system. These centralized authorities represent and uphold the general attitude of members of society who disapprove of the behavior that results in sanctioning. In addition to a detachment from individual connections between the punisher and the punished, Criminology like Psychology give little attention to aspects such as reputations, cost of punishment, threats of counter punishment, and effectiveness of punishment.

### **2.3 Meso-level Perspective**

While Psychology and Criminology conceptualize and study punishment from two different extremes (micro-macro), Economics and Sociology address many of the societal aspects that lay between them and represent a meso-level approach towards punishment. Economics focuses on punishment in terms of how individuals think about the impact that sanctioning will produce. Punishment is seen as one outcome component within a calculated decision to perform a sanctioning behavior. Economic perspectives equate punishments with the

costs imposed to perform a behavior and can be represented, similar to Criminology, by formal sanctions (fines or restrictions of monetary value) and informal sanctions (peer pressure, gossip, or social ostracism) (Homans, 1961; Blau, 1964). An economic approach to punishment focuses on the calculated costs-benefit analysis that results in decisions to administer a sanction. This is supported by the premise that tactical, rational calculations largely influence and shape all actions, including punishment. Rapoport (1967) describes punishment in social situations as being part of the outcome structure, where the costs associated with the outcome of actions and decisions determine the behavior in any given situation. To this accord, punishment is conceptualized as an outcome that is reached in a decision making process, where an individual focuses on the future. The decision making process is complex and individuals must take multiple variables into account before a decision can be made. Punishments would only be administered if the benefits outweigh the costs. This economic perspective generally assumes that actors make rational choices to maximize personal resources or benefits.

Strategic game theory, usually considered as part of the economic perspective, conceptualizes costs and benefits, but also considers what others' in the situation might do in future interactions. The decision maker takes into consideration numerous situational factors such as chances of counter-punishment, necessity of absorbing the cost of administration individually versus letting someone else absorb the cost, effectiveness of punishment impacting change in the individual who is punished, chances of future interactions with the person targeted, opportunities to benefit through future interactions involving future contributions, and how the action of punishing will be perceived by others outside and inside the group. This represents a meso-level approach explicitly illustrating the complex and dynamic strategic process of

determining whether to administer punishment, while still structuring the decision in terms of a rational choice to maximize individual benefits and focus on the future.

Similar to strategic game theory, sociological perspectives focus on the social networks involved when administering punishment. A prominent set of research theories and findings associated with punishment are those of Molm and colleagues. Through her research Molm (1988, 1990) compared reward-based power with punishment-based power and showed that when both are presented as possible tools of promoting cooperation within social exchanges, punishment was weakly used in comparison to rewards. In further research, Molm demonstrated that although actors dislike using punishment, when it is used frequently and consistently, it produces the highest frequency of rewarding exchanges between actors and created the least negative affect towards actors in exchange (Molm 1994). Molm discusses the use of punishment in terms of 'punishment power' indicating that within exchanges punishment can be utilized as an expression of power that an individual can exert over another if they feel that there is an imbalance within the exchange. In this way, punishment is a mechanism that is utilized to create a more balanced exchange among group members in future exchanges. Molm discusses the idea that once punishment power is used, the power involving threat within future exchange is diminished because the sanction is already implemented. Molm's focus on the frequency and strength of punishment being vital to rewarding exchanges between actors is extremely important for many different kinds of interactions.

These diverse approaches to the understanding of punishment can be conceptualized based on where along the micro-macro perspective the disciplines emphasizes. The focus may be on the micro-level, singular interaction occurring, the larger, macro-level, societal mechanism

involved, or the mixed, meso-level, combination of both. I suggest that investigating punishment from a Structural Social Psychological approach might help to bridge the conceptualizations being considered. Structural Social Psychology is a sociological approach to studying social psychology that emphasizes the interconnection between the micro and macro-levels of interactions. Structural Social Psychology stresses that macro-level, societal elements (such as group norms based on identity) impact micro-level personal interactions (such as contributing to a public good) while at the same time micro-level, interaction specific elements (such as variations in contributions) impact macro-level societal elements (such as the development of group norms).



### 3. PUBLIC GOODS

As mentioned, public goods are social dilemmas because they are non-excludable. Non-excludability creates the incentive issue of whether individuals should contribute to the resource or to defer from contributing and ‘free-ride’ off the contributions of others. If we would assume an actor is perfectly rational and cares only about maximizing their own resources, free riding would be the rule; however, research has not supported this proposition (Alfano & Marwell 1980; Brubaker 1975; Isaac, McCue & Plott 1985; Isaac & Walker 1988; Isaac, Walker & Thomas 1984; Marwell & Ames 1979,1980,1981; Schneider & Pommerehne 1981; Bowles & Gintis, 2004; Nowak, 2006).

#### **3.1 Factors that Influence Contributions to Public Goods**

There are a host of factors that can influence when and how group members contribute to public goods. Some of the most prominent factors include payoff properties, one-time vs. repeated interactions, and information that is transmitted among group members (such as group identity). While all of these factors have been shown to impact contributions to public goods, no factor operates in isolation. An important component of this research is examining the impact of multiple factors in combination in terms of influencing contributions to public goods.

Contributions are affected by payoff properties; when the benefits for contributing decrease, contributions also decrease. Additionally, there are large theoretical and empirical differences between the setting in which participants making repeated decisions versus one-time decisions (see Sell and Reese 2014). One-time decisions do not provide an opportunity for rewarding or punishing other actors in a manner that will provide a direct selfish benefit (Sell

and Wilson, 1999; Carlen, 2014). When interactions are repeated, there are a number of different means by which interactions can be sustained. This theoretical idea is sustained through the famous Folk Theorem. This theorem states that when interactions are repeated for sufficiently long periods of time, there are different kinds of mechanisms that can sustain interactions. In other words, as the horizon for the time of interaction in a public good with a group extends over time, the rational calculation of actions adjusts to make cooperation an appropriate option for maximum individual benefit. The Folk theorem only demonstrates that cooperation is possible to sustain, even when only motivated by self interest. It does not allow us to determine what mechanism, among an infinite number, might be used (Fudenberg and Maskin 1986).

Research by Sell and Wilson (1991) demonstrates that an important factor that influences contributions is what group members know about each other and how information is transmitted. When actors have more information about each group member's individual contribution and when they know that others have this information as well, contributions increase.

Importantly for my formulation, group identity, as a specific form of information, influences contributions, with individuals contributing more when they share a group membership characteristics (Yamagishi, Jin, and Miller, 1998; Yamagishi, et al., 2005; Brewer & Kramer, 1986; DeCremer & van Vugt, 1998; Jackson, 2008; Utz, 2004). However, different identities have different effects. One way this is demonstrated is by the fact that status characteristics can be seen as a group identity. When activated, they influence behaviors among group members based on stereotypes associated with those characteristics. An example of this can be seen when men interacting with men, contributions to a public good are at lower levels

compared to men interacting with women. In other words, the stereotypes of gender expectations that the person has of themselves and their other group members to contribute are activated based on status characteristics, impacting decisions to contribute (Sell, Griffith, and Wilson, 1993 and Sell 1997).

In addition, this research showed how gender specifically could operate differently in public goods contexts. They find gender differences do not emerge when group members know the gender of the other group members, but do not receive contribution feedback. However, if group members receive information about each others' contributions, gender effects emerge along stereotypical lines: both men and women contribute less to men than they do to women. Gender has the dichotomous distinction of having the potential for being a strong identity and also a salient diffuse status characteristic (Sell and Kuipers, 2009). It's impact on decision making may be influential in impacting contribution decision based on

Sell and Love (2009) argue that identities impact behaviors because shared group identities activate a sense of 'common fate' among group members. Shared identities lead individuals to contribute more to a public good because individuals feel that the outcome or 'fate' of the group will have the same impacts on all group members who are similar. While 'common fate' can provide a partial explanation for the impact of identity on decision making behaviors in group settings, it is not the only factor. Group identity can also activate stereotypes if the identities are tied to status characteristics that delineate group members and impact expectations of group members. These stereotypical expectations have been seen to directly to influence decision to contribute to a public good (Eckel & Wilson, 2004; Simpson, McGrimmon, & Irwin, 2007).

### **3.2 Punishment within Public Goods**

With a public good, individuals face the dilemma of either contributing to the public good that can benefit a group or free riding on the contributions of others and not contributing. Research has demonstrated that, under certain conditions, people are willing to contribute to public goods and one way that cooperation can be maintained is when punishment of non-contributors is a viable option (Fehr and Gächter, 2000).

Sanctioning and punishment in public goods have received increased attention from researchers. Punishment has been investigated as a mechanism to effect change and as a mechanism to exact revenge or to uphold a particular norm. Empirically these two types of punishment can be separated by whether or not future interaction is anticipated. This methodological difference allows researchers to differentiate between punishment as a mechanism of adjustment that can alter and shape behaviors within a current social dilemma or a mechanism activated purely as a sanctioning tool without impact on altering behaviors within a current situation. This latter conceptualization of punishment is often discussed as altruistic punishment as there are no economic or social benefits from the punishment, and the punishment is seen more as an attempt to regulate future social interactions involving other people rather than the immediate situation at hand or simply as revenge.

### **3.3 Punishment in Repeated Settings**

An important area of emphasis is how information impacts decisions to administer punishment. For example, Sell and Wilson (1999) demonstrate that when individuals are interacting for a series of decisions and if they know that defection by one group member will

result in a trigger or defection by all, cooperation increases. Furthermore, it increases the longer the group anticipates interacting.

Fehr and Gächter (2000, 2002) demonstrate that if punishment is a viable option in ongoing public goods social dilemmas, cooperation increases and when punishment is removed as an option, cooperation decreases. This research helps demonstrate punishment as a tool to monitor and regulate behaviors of individuals in social dilemmas. An important methodological result from this research showed that cooperation fluctuates based on whether sanctioning is added or removed.

Punishment within repeated group interactions has been tied to numerous individual incentives such as gaining a reputation or status. Gaining a reputation as a punisher is usually seen as a benefit to a group in terms of decreasing free-riding. Brandt, Hauert, Sigmund (2003) investigate punishment and reputations in public goods involving spatial settings and state that cooperation is boosted when group members have localized interactions, punishments are directed against free-riders, and reputations are formed to unmask non-punishers. Their findings suggest that if individuals are aware of the location of their group members, can trace defection to the perpetrators and have awareness of individual reputations, cooperation is much more easily achieved.

Research by dos Santos, Rankin, Wedekind (2011, 2013) discuss the implication that long-term benefits for administering punishment can stem from gaining a reputation for being willing to punish non-contributors. One gain that is seen is that the punisher is more likely to receive help in future interactions from individuals who know of their reputation. Shared knowledge about who is willing to contribute to a public good is the first component of

beneficial reputations and information about contributing by punishing free-riders also serves to create positive reputations. Research by Fessler & Haley, (2003) and Barclay, (2006) suggests that when punishing a free rider provides increased overall gains for a group, it signals the punisher's commitment to the group by being willing to sacrifice for the betterment and prosperity of the group. It also demonstrates concern with fairness in terms of not allowing individuals to benefit unfairly off of others contributions and unwillingness to tolerate being cheated. All of these scenarios complied lead to the idea that people trust punishers more than non-punishers, and that trust stemming from the reputation of being a punisher can be transferred to direct, individual benefits for the punisher based on the reputation gained from administering punishment.

When groups anticipate interacting for short periods of time, the cost of altruistic punishment increases. The cost of altruistic punishment is only worth absorbing if the impact of the punishment leads to increased cooperation by individuals once they are sanctioned. When group interact for short periods of time the likelihood of receiving an individual positive impact in terms of change in behavior of non-contributors diminishes. This increases the cost of putting resources towards sanctioning, as the chance to recoup the loses paid towards sanctioning decreases as interactions decrease. Stated another way, as the possibility of producing cooperation through altering non-cooperative behavior that is profitable to all decreases, the cost of punishment increases due to the increased likelihood of free-riding regardless of sanctioning.

### **3.4 Punishment as a Secondary Contribution to a Public Good**

Some researchers (see Fehr and Gächter, 2002 and Heckathorn, 1989 for example) define first and second order contribution problems associated with public goods. The first order

is the contribution decision itself. The second order is the decision to sustain, encourage, or punish others. This is due to the fact that everyone involved in the group will be better off if free riding is deterred, but no one has an incentive to punish free riders, if punishment is costly. Another example of second order contributions consistent with other-based preferences has been discussed in the reputation maintenance through reputation systems (Simpson and Willer, 2015). Maintaining reputations could be considered a secondary contribution to a public good because research has shown that people readily share information about prior exchange partners via gossip, even suffering costs to do so, when the spreading of reputational information could protect others from exploitation (Feinberg, et al., 2014).

Research on punishment has also examined how individuals perceive others who punish non-contributors and those who chose not to punish non-contributors. Kamei & Putterman (2012) and Dickson et al. (2013) conducted public goods experiments with participants able to punish other group members. Similar to previous studies, these researchers found that when group members could see the history of who punished whom, punishment increased cooperation. However, when participants were only informed who previously punished them only and could not see past decisions, cooperation did not increase. This demonstrates that the ability to monitor the actions of others is important for the positive effects of punishment on cooperation. Such findings demonstrate that the relationship between punisher and punished are important in first and second order public good decisions.

### **3.5 Altruistic Punishment in Public Goods Settings**

Altruistic punishment can be investigated by considering settings in which punishment is costly to the punisher and the punisher is not expecting personal gain in terms of reputation,

reciprocity, and expectation of future interaction. In other words, punishment is administered without the expectation to alter an individual's behavior within a current exchange or direct future exchanges. The exploration into altruistic punishment is important as it demonstrates another exception to economic rational decision making. If individuals are willing to suffer significant costs to punish others in exchange, it is a rational paradox.

Compared to typical use of punishment, 'altruistic punishment' is not administered during the on-going decisions associated with the public good. Rather it is administered after the interaction. In this sense the sanctioning is not being utilized to change the behavior of the free-rider within the immediate context. This punishment can be termed 'altruistic' because it contains many of the features that are linked to altruistic behaviors. The punishment provides no benefit to the person performing the action, and the punishment is costly to administer. Why might group members administer it then? One possibility may be to extract revenge for free-riding on the contributions of others. Another possibility may be to demonstrate disapproval for free-riding behaviors, in order to deter free-riding in the future. Both of these motivations may contribute to the idea of upholding a norm of contributing to the group. The importance of the group itself becomes highlighted in this context.



#### 4. THEORETICAL FRAMEWORK

The fundamental question of concern is how characteristics of group interaction influence the administration of altruistic punishment. In particular, I investigate how group identity and the variability of group members' past behavior influence individual decisions about administering punishment.

Previous research has examined group identity and similarities between group members as separate components impacting social dilemmas, but no research has addressed the interaction between these two situational characteristics.

Research by Shinada et al. (2004), conceptualized university membership as a group identity, and they found that participants were less likely to altruistically punish free-riders when they were members of a rival university than when they were members of the same university. Irwin and Simpson (2013) have argued that when group members behave similarly, the behavior can generate social identity for group members. Their interpretation is that conformity pressures arise when behaviors in groups are seen as similar. In this way, high cooperation OR high defection (or free riding), if similar, can lead to group identity.

Research by Mussweiler and Ockenfels (2013) considers how similarity between two participants and group identity affect altruistic punishment. When participants were primed to think of similarity vs. difference, they were more likely to altruistically punish. (Similarity and difference were primed by examining different pictures unrelated to the study itself.) Also, they found that group identity (in terms of collegiate identity) did not increase altruistic punishment. Based on their results, they concluded that group identity does not produce the same sense of

similarity compared to more tangible similarities and thus is less influential on the administration of altruistic punishment because individuals are more lenient towards in-group than out-group members. This means that they are more likely to forgive in-group norm violation, as has been discussed elsewhere (Chen & Li, 2009; Bernard, Fischbacher, & Fehr, 2006).

Mussweiler and Ockenfels thus proposed in-group identity might not be as strong or have the effects demonstrated in other studies. Rather, they argue that similarity might be more important component activated in the use of altruistic punishment. However, their finding about the higher likelihood of altruistic punishment for outgroup member is counter to other research including Shinada et al., (2004) findings that individuals are more likely to punish individuals from their own in-group due to the perception that individuals in the in-group should contribute to the group well-being.

The discrepancies in research findings raise the question of exactly what theoretical properties of the public goods setting are important. Part of the problem rests with conceptualizing strength of group identity and similarity. Not all similarities and not all identities are equally important. So, a theoretical challenge is definitional—how can group identity be conceptualized to address strength; how can similarity be defined in terms of behavioral consistency?

I suggest that in-group identity might vary dramatically depending upon what characteristics of common fate are activated. It is easy to see, for example, that the group identity of survivors of a POW camp would be much higher than the group identity based on attendance at the same university. It is also easy to see that contributions over time would be important to generate a history of similarity, and that history could vary with time.

In this first test I propose to calibrate in-group identity by using an identity that has no connections with past behavior. If it is the case that we conceptualize altruistic punishment as a means to either demonstrate revenge or to demonstrate the importance of the group, then it follows that the importance of the group leads to differences in punishment. Other things being equal, the greater the identification with the group, the more likely is altruistic punishment. If this is true then similarities in behavior and in-group identity should produce considerably high levels of altruistic punishment while activation of dissimilarities in behavior and out-group identity should provide considerably lower levels of altruistic punishment.

High variance in contributions to a public good will result in less altruistic punishment because it does not enable a group norm to develop. So, punishment should be less likely as the norm is not clear. Comparatively, groups that have low variance in contributions will view low contributions as a violation of expectations of a group norm because of a unified pattern of contribution by all other group members. Irwin and Simpson also argue that similarities in behaviors produce a sense of in-group identity, while dissimilarities do not. Based on these findings the combination of similarities in behaviors in the form of contributions and the salience of an expressed in-group identity should produce the most administration of altruistic punishment compared to all other interactions of contribution variance and group identity.

## 5. STUDY DESIGN

An experimental study was utilized for this investigation so that the impact of different factors could be separated or controlled. The study is not meant to directly generalize to public goods settings outside of the laboratory. Rather, the experiment enables the test of the theoretical principles that then can be applied to other settings. In this way, knowledge of principles can help us understand, and perhaps modify settings in which people might sacrifice for the benefit of others.

The study was designed to determine how group identity and similarity in contributions contribute to group members' willingness to engage in altruistic punishment. To examine the effects of each factor separately and together, I designed a 3 (In Group, Out Group, No Group Identity) by 2 (Low Variation In Contributions, High Variation In Contributions) factorial.

### **5.1 Recruitment**

Undergraduate students were recruited from introductory level social science classes at Texas A&M University. At the time of recruitment, students were asked to provide contact information and to sign up for the SONA recruitment system to schedule participation in studies conducted by the Social Psychology Lab. They were also asked to self-identify themselves in terms of race/ethnicity and to select a preference for one of two pictures; one by the artist Paul Klee, and one by the artist Wassily Kandinsky. The preference is often used in experimental studies to create groups that have no other "social" meaning (see Tajfel et al. 1971; Billig and Tajfel, 1973; Oakes and Turner, 1980).

Participants were scheduled in groups based their availability and randomly placed in one of the 6 possible conditions. There were at least 30 individuals in each of the 6 possible conditions. Group identity was determined by participants preference for Klee or Kandinsky in relation to other members of their group.

## **5.2 Procedures**

Participants arrived to participate in the study prior to the beginning of the study. Participants entered the lab at their scheduled date and time and were informed that they are going to do a task related to artistic preferences and decision making. They were informed that they would be working with 4 other individuals that may be in the lab or may be in another part of the building (The 4 other individuals were all actually computerized group members). The individuals were then given instructions on how to play an online public goods game with the 4 other individuals in their group. Each participant was the only active member in the group and all other group members were simulated such that it appeared to the participant that others are making particular decisions. The computer program Z-tree formulated the contributions of the simulated group members based on the contributions of the participant and the specific experimental condition of high variation or low variation. In all conditions, participants were informed that they were ‘Group Member 3’ in the group of five and would be making decisions about how many tokens to invest to a group fund. After making the decision of investing, participants were shown both their own contributions and earnings for that round and the computer generated contributions and earnings of the other fictitious group members for each round. Within this display of information, participants also saw each group members selected picture preference of either Klee and Kandinsky. This preference was displaced each round along

with the group members contribution for the round. Participants in the in-group conditions saw that all group members had the same picture choice as they had. Participants in the out-group condition saw that all other group members had a different picture choice from them. Participants in the no identity condition saw no information about picture preference and were not told that they were involved in a study about artistic preference. They were told the study about simply about group decision making. Variation between participant contribution was manipulated through Z-tree. Participants in the low variation condition saw that ‘Group Member 1’ contributed 0 or 5 token each round and all other computerized group members’ contributions varied between 1 to 5 tokens from the participant's contribution each round. Participants in the high variation conditions saw that ‘Group Member 1’ contributed each round and all other computerized group members’ contribution varied between 10-15, 15-20, and 20-25 tokens from the participant’s contribution each round. Conditions 1-6 were designed based on the combination of information regarding group identity and variation in contributions. The conditions were designed as follows:

Condition 1 consisted of participants seeing no information on group identity and seeing that there was low variation between their contributions and most computerized group members.

Condition 2 consisted of participants seeing no information on group identity and seeing that there was high variation between themselves and most computerized group members.

Condition 3 consisted of participants seeing that all members of the group shared the same identity in terms of visual preference and seeing that there was low variation between themselves and most computerized group members.

Condition 4 consisted of participants seeing that all other members of the group shared different identities from them in terms of visual preference and seeing that there was low variation between themselves and most computerized group members.

Condition 5 consisted of participants seeing that all members of the group shared the same identity in terms of visual preference and seeing that there was high variation between themselves and most computerized group members.

Condition 6 consisted of participants seeing that all other members of the group shared different identities from them in terms of visual preference and seeing that there was high variation between themselves and most computerized group members.

Participants made 7 total decisions using Z-Tree, 3 example decisions to familiarize the participants to the interface and 4 decisions of contributions. After the final round of investments, participants were shown the total number of tokens invested by each group member, as well as each group member's total earnings and each group member's contribution for each round. The information of picture preference accompanied this information regarding contributions, total contributions, and total earnings. While viewing this information participants were asked if they would like to reduce the total earnings from any of the other group members. For each token the participant was willing to contribute towards reducing another group member's earnings, 5 tokens was subtracted from the sanctioned group members total earnings. (For example, a player may have choose to spend 2 tokens to decrease another group member's total earning by 10 or spend 5 tokens to decrease another group member's total earning by 25). Participants were informed that each group member will decide from a range of 'zero to their total earning', how many tokens to contribute towards reducing each group member's total earnings. After making

this decision, the total earnings for each participant were recalculated taking into account the sanctions and costs to sanction, the participants filled out a questionnaire (serving as a manipulations check) and were informed of their final earnings for the study. Upon completion of the study participants were debriefed, paid a standard fee of \$20, and thanked for their time. The total time to complete the study was 60 minutes.

### **5.3 Scope conditions**

To test my theoretical assertions, the following conditions must be met by the experimental setting:

1. Participants must believe that they are participating with four other actual group members.
2. Participants must have a recognized group identity based artistic preferences (unless there is no information about the preference).
3. Participants have information about the variance of past contributions among group members.
4. Ceteris Paribus.

### **5.4 Independent Variables**

There are two independent variables: Group identity (in-group identity, out-group identity, no group identity) and contribution variance (high variance and low variance). Participants will randomly assigned to one of six conditions pairing group identity and contribution variance, creating a 3x2 experimental design.

Participants in the in-group identity conditions visually saw that all other group members selected the same picture preference as them in terms of Klee or Kandinsky. Participants in the



out-group identity conditions visually saw that all other group members selected the alternative choice to their selected picture preference of Klee or Kandinsky. Participants in the no group identity did not see any images of picture preference but simply saw the group number of each individual. Picture preference was displayed whenever participants made decisions.

Participants in the high variance conditions saw that the investments from three other members randomly vary ranging from + or - 35 from their investment. In addition, one computerized group member alternated between invested 0 and 5 tokens across the 4 rounds, thus serving as a free rider. Participants in the low variance condition saw that the investments from three members did not significantly vary from the participants investments. If a participant's investment was X, three other participants' investments were randomly chosen with a range of + or - 5 from X each round. In addition, one group member invested 0 in both rounds, serving as a free rider.

### **5.5 Dependent Variables**

The number of tokens participants were willing to contribute towards reducing other group members total earnings was the measure of altruistic punishment. This is the primary dependent variable. In the questionnaire that follows the task, participants were asked the reason why they decided to reduce another group member's earnings, if applicable. Additionally, there were questions asking how group members felt about the their own group.

### **5.6 Hypothesis**

My hypothesis is that there the amount of altruistic punishment will vary based on the combination of information regarding group identity and contribution variance: all else equal, the most altruistic punishment will be administered under conditions of in-group identity and low

contribution variance (P1); followed by low contribution variance with no group identity (P2); followed by low contribution variance with out-group identity (P3); followed by high contribution variance with in-group identity (P4); followed by high contribution variance with no-group identity (P5); and the condition of high contribution variance with out-group identity (P6) is predicted to draw the least amount of altruistic punishment.

(P1) > (P2) > (P3) > (P4) > (P5) > (P6)

## 6. RESULTS

### 6.1 Demographic Information

The participants consisted of 55 Males (33%) and 111 Females (67%) sampled from the undergraduate population at Texas A&M University. The average age for participants was 19 years old. The racial/ethnic composition of the sample was 53 Latinx (32%), 9 Blacks (5%), 15 Asians (9%) , 1 International (1%), 12 Others (7%), and 76 Whites (46%). 53 participants selected Kandinsky for their artistic preference, 49 participants selected Klee for their artistic preference.

### 6.2 Manipulation Checks

To assess contribution variations, all participants were asked to state whether they believed that the majority of the group's contributions each round showed high variability or low variability. Any participants whose answers did not match the condition they were assigned to were not included in the analysis, as they did not meet the criteria of the manipulation. 35 total participants were excluded on this basis. The number of participants who correctly answered the variance question by condition is provided in the Appendix. Suspicions about the experiment were assessed based upon the responses in the post experimental questionnaire. If any participant voiced suspicions about the study, he or she was excluded. On this basis, 23 participants were dropped from analysis.

### 6.3 Findings

Table A1 within the Appendix demonstrates how altruistic punishment was administered across the six conditions. At the end of the study, participants completed a questionnaire that

asked multiple questions to assess their level of group identity with the other group members. One set of four questions consisted of statements about how participants felt about the group with the following pairs (Distant-Close; Coming Apart-Coming Together; Fragile-Solid; Divisive-Cohesive; Diverging-Converging). A 9-point Likert scale was used to assess how participants felt about their groups. (9 being the highest regarded to the group). The average score and stand deviation on these four questions are displayed in Table A2 within the Appendix.

Analysis of Variance (ANOVA) with planned comparisons were used to see if there there was a relationship between the manipulated variables of identity (specifically ingroup vs. outgroup identity, with the no identity group removed from analysis) and contribution variance and the index on identity. An ANOVA showed that contribution variance was significantly related to average scores on the identity index ( $F=13.72$ ,  $p<.05$ ) and group identity was not significantly related to average scores on the identity index ( $F=0.78$ ,  $p=0.38$ ). Variance was also influential on group identity as suggested by Irwin and Simpson (2013), who have argued that when group members behave similarly, the behavior can generate social identity for group members. Their interpretation is that conformity pressures arise when behaviors in groups are seen as similar.

#### **6.4 Analysis**

Analysis of Variance (ANOVA) with planned comparisons were used to test these hypotheses. The six means were compared, one from each condition of the study, with each condition consisting of a group of approximately thirty individuals. The scores were averaged by condition and compared between conditions. In addition, questionnaire answers will be analyzed to investigate reasons given for decision making regarding sanctioning group members.

To test these hypotheses, I used the number of tokens participants are willing to contribute towards reducing other group members total earnings as altruistic punishment. If group identity and contribution similarity interacted to impact the administration of altruistic punishment as hypothesized, there would be a statistically significant difference in punishment being administered and the extent of punishment across the six conditions within the study. Specifically as hypothesized, not only will there be a statistically significant difference between in punishment across conditions, but there will also be a distinct pattern in terms of which conditions produce the most punishment and which conditions produce the least punishment. Results from a 3 (no group vs. in group vs. out group identity) x 2 (high vs. low contribution variance) analysis of variance (ANOVA) did not show a main effect of group identity or contribution variance on punishment. There were no statistically significant difference between groups as determined by the ANOVA. Table A3 in the Appendix demonstrates the results of an ANOVA for the effect of identity and contribution variance on altruistic punishment.

An additional analysis of variance including sex as a variable of influence showed that sex was in fact related to sanctioning non-contributors. This is demonstrated in Table A4 within the Appendix. Specifically a t-test showed that although males were found to administer more sanctioning on average compared to females, the impact significant at the .06 level. This is demonstrated in Table A5 within the Appendix.

To further explore the relationships, I conducted analysis of the contributions of group members. A linear regression showed that total numbers of tokens contributed to the group fund was statistically significant in relation to sanctioning, while variance, identity, sex, race, and the

interaction between sex and total number of tokens contributed to the group fund were not statistically significant. Table A6 in the Appendix demonstrates these results.

Although I did not specifically hypothesize the effects of contributions, it is important for understanding the dynamics of the interaction. The ANOVA in Table A7 in the Appendix demonstrate a significant effect of contributions based on the variance of others' contributions. Table A8 in the Appendix shows that individuals contributed more in the the low variance condition compared to the high variance condition. As observed in Table A9 located in the Appendix, there is also a significant effect of sex on contributions. Specifically males contribute more total tokens on average compared to females and individuals contributed more when contributions were similar.

To further explore these relationships, I conduct a mediation analysis. I examine the relationship between Sex and Variance on Contributions and then examine the effects of Contributions on Altruistic Punishment. For Sex, a Sobel-Goodman mediation analysis showed that Males administered more altruistic punishment than Females ( $c = -21.84$ ,  $t = -2.07$ ,  $p < .05$ ), and Males contributed more in the study than Females ( $a = -46.51$ ,  $t = -2.73$ ,  $p < .05$ ). Further, when Sex and Contributions are included in the same model, 13% of the effect of Sex on Altruistic Punishment is mediated by Contributions, which is statistically significant ( $b = .13$ ,  $t = 2.85$ ,  $p < .05$ ) and Sex has no direct effect on Altruistic Punishment ( $c' = -15.59$ ,  $t = -1.47$ ,  $p = .14$ ).

For contribution Variance, a Sobel-Goodman mediation analysis showed that although participants in the Low Variance condition administered more Altruistic Punishment than participants in the High Variance condition, the findings was not statistically significant ( $c = -13.17$ ,  $t = -1.31$ ,  $p = .19$ ). Participants in the Low Variance condition contributed significantly

more in the study than participants in the High Variance condition ( $a = -42.75$ ,  $t = -2.66$ ,  $p < .05$ ). Further, when Contribution Variance and Contributions are included in the same model, Contribution has a significant effect on Altruistic Punishment ( $b = .14$ ,  $t = 2.99$ ,  $p < .05$ ) and Variance still has no direct effect on Altruistic punishment ( $c' = -7.10$ ,  $t = -0.44$ ,  $p = .48$ ). Contribution does not mediate the relationship between Contribution Variance and Altruistic punishment because the relationship between Contribution Variance and Altruistic punishment is not significant. However, there is a clear and significant relationship between Contribution Variance and Contributions, as well as between Contributions and Altruistic Punishment. Figures A1-A3 in the Appendix illustrate the relationships between these variables.

Lastly, participants were asked whether or not they reduced another group member's total with four closed-ended options listed in the Appendix. Participants could select multiple options and well as an additional text box option for an open ended response. Open ended responses were coded according to themes. Table A10 displays decisions to punish and reasons based on sex.

## 7. SUMMARY AND CONCLUSION

### 7.1 Summary

The experimental test does not support my hypotheses in regards to the direct effects of group identity and variance of others' contributions on altruistic punishment. Based on previous research I hypothesized that in-group identity and low contribution variance would interact to produce the highest amount of altruistic punishment and that out-group identity and high contribution variance would interact to produce the least amount of altruistic punishment.

However, the data reveals that there was no statistically significant difference in the amount of altruistic punishment that was administered based on the interaction of these characteristics of the setting. While not significantly different, the most altruistic punishment was administered in the out-group, low variance condition (1581 tokens) and the least amount of altruistic punishment was administered in the no group identity, high variance condition (451 tokens).

While there is a large difference between these conditions, the large degree of variance within each condition does not allow us to conclude they were significantly different ( $p=.22$ ).

Given that the predictions were not supported, I must consider plausible alternative reasons for the results. In any experimental design, the first consideration is always the design itself. That is, can we be sure that participants: understood the study; understood the variance on contributions; and, understood the identity of self and others? We can be confident that the experimental design was sound. Artistic Preference was always on the screen where participants' made decisions. Additionally, if participants did not understand the general dispersion of the variance of contributions, they were excluded from the data as this constitutes a violation of



scope conditions. We ensured that participants understood instructions by presenting them both in written and verbal form; further participants had practice sessions in which they could see how the process worked.

Since these predictions were not supported (with the experimental manipulations being sound as indicated through the manipulation checks), it could mean that the administration of altruistic punishment is impacted by these characteristics in ways other than what is predicted by previous literature. Group identity is a difficult factor to create, in part because it has so many variations. This experimental design carefully controlled for the identity, but although people understood what group they were in, it did not have a strong effect on their behavior. This effect of group identity might be very different for different identities, especially those based on past experience or common fate (see Sell and Love 2009).

Contribution variance also did not have a direct effect on punishment. It did, however, have an effect on contributions, with those in the low variance conditions contributing more than those in high variance conditions. And contributions, importantly had a significant effect on punishment: those that contributed more, also punished more. But, it is also the case that men contributed more and consequently punished more.

An unexpected finding from the research showed that sex was a statistically significant in influencing decision to contribute to the public good. Specifically men contributed more than women throughout the study. An important caveat for this finding is that there were more women who participated in the research compared to men (111 vs. 55). While individuals did not actually interact with other group members within the decision making process of the research study, they participated in the research in the same room with other individuals and were made to

believe that the group members that were interacting with were either present in the room or in another room within the building. This means that in each individual research session that was run, the men were typically outnumbered by the number of women in the room. This becomes important because it is likely that sex was activated as a diffuse status characteristic and as such men assumed a more powerful position. As indicated by Sell (1997), when men and women are interacting in mixed sex groups, men tend to contribute more in an effort to influence women in particular. Women, due to their low state of the diffuse status characteristic are not so affected; they do not believe they can be as influential. Individuals with high status characteristics feel that they can affect the rest of the group. This further could explain why men contributed more, which then led to altruistic punishment. It could be suggested that that men are more vengeful as a reason for the discrepancy in the administering of punishment, but this implication is not supported by two important points. First, men contributed more and second, questionnaire items showed that revenge was not a common motivational reason for administering punishment for any participants (male or female).

Further investigating the relationship between contributions and sanctioning showed that both variance and sex were statistically significant in influencing the total contributions by participants and that total number of contributions statistically significant to sanctioning non-contributors. Specifically, men were more likely to contribute to the group. And contributions are more likely to be high when when the contribution variance was low.

Additionally, as total contributions to the group increased, amount of sanctioning administered increased as well. Mediation analysis demonstrates complete mediation between the relationship of sex on sanctioning. Sex and variance of behavior both significantly impact

contributions which influences sanctioning, however variance have no direct effect on sanctioning and when total contributions are controlled for, sex has no direct effect on sanctioning.

## **7.2 Conclusion**

This research contributes to the existing literature regarding group identity, contribution variance, and altruistic punishment in terms of their interactional influence. The hypothesized relationships among variance of contributions and group identity, and altruistic punishment were not supported. However, the research does provide a better understanding of when altruistic punishment might occur. This research attempted to arbitrate among different findings about altruistic punishment. This research lends some support for previous research by Mussweiler and Ockenfels (2013) which suggested that group identity was not a significant factor in influencing altruistic punishment and that individuals are more likely to administer punishment based on ‘pure’ similarity rather than differences. Mussweiler operationalized similarity as cognitive focus on similarities. This research suggests that the most important similarity is the similarity of high contributions to the group fund. In accordance, Mussweiler and Ockenfels found that a group members level of cooperation was more severely punished if the punisher cooperated more in the interaction. This finding was supported through this current research. A major methodological difference between the two studies was that the previous study involved a two-person, single, simultaneous decision constituting a group interaction. In the current study a group interaction is operationalized by a multi-person, repeated, simultaneous decisions.

The major contribution of the paper is the “uncovering” of mechanisms involved in group members’ decisions to punish other groups members, even when that punishment disadvantages

the punisher. The key seems to be how much a particular group member contributes to the group. This is affected by the sex of the punisher (or the status of the punisher vis a vis others in the group) and the variance of others contributions. When contributions were high, and others' contributions were thus relatively high, group members' were more likely to give up individual resources to punish the non-contributor. This would be in line with the idea of administering altruistic punishment being considered a secondary contribution to a public good. Individuals who are more willing to make a primary contribution are more likely to make a secondary contribution in the form of sanctioning . The very acts of contribution creates a sense of common fate and this most likely creates a sense of inequity directed toward the non-contributor to “free ride” off others within the group. The common responses of participants supports this interpretation. The most common reasons for punishing a non-contributor was not revenge per se, but rather “anger” about the free-riding or as an act to equalize outcomes.

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## APPENDIX

1. The number of participants who correctly answered the variance question: Condition1- N=30/38, Condition2- N=31/36 Condition3- N=31/37 Condition4 -N=31/36 Condition5- N=32/40 Condition6- N=30/33

Table A1. Administration Of Altruistic Punishment

	<b>Condition 1 (NoID-LoVar)</b>	<b>Condition 2 (NoID-HiVar)</b>	<b>Condition 3 (InID-LoVar)</b>	<b>Condition 4 (InID-HiVar)</b>	<b>Condition 5 (OutID-LoVar)</b>	<b>Condition 6 (OutID-HiVar)</b>
<b>Punish Admin</b>	N=16/27 (55%)	N=11/27 (41%)	N=14/27 (52%)	N=12/28 (43%)	N=15/29 (52%)	N=12/28 (43%)
<b>Total</b>	<b>906</b>	<b>438</b>	<b>652</b>	<b>583</b>	<b>1187</b>	<b>631</b>
<b>Avg./N</b>	<b>33.48</b>	<b>16.22</b>	<b>24.15</b>	<b>20.82</b>	<b>40.93</b>	<b>22.54</b>
<b>Avg./Pun</b>	<b>56.63</b>	<b>39.82</b>	<b>46.57</b>	<b>48.58</b>	<b>79.13</b>	<b>52.58</b>

Table A2. Average Answer on Post-experiment Survey Question On Group Identity

<b>Condition1 (NoID-LoVar) N=27</b>	<b>Condition2 (NoID-HiVar) N=27</b>	<b>Condition3 (InID-LoVar) N=27</b>	<b>Condition4 (InID-HiVar) N=28</b>	<b>Condition5 (OutID-LowVar) N=29</b>	<b>Condition6 (OutID-HiVar) N=28</b>
<b>3.96 (sd=1.85)</b>	<b>4.12 (sd=1.57)</b>	<b>5.24 (sd=1.75)</b>	<b>3.92 (sd=1.07)</b>	<b>4.79 (sd=2.02)</b>	<b>3.83 (sd=1.37)</b>

Cronbach alpha = .90

TABLE A3. ANOVA for the Effects of Identity and Contribution Variance on Altruistic Punishment

Number of obs = 166                      R-squared = 0.017  
 Root MSE = 65.1866                      Adj R-squared = -0.0138

Source	Partial SS	df	MS	F	Prob>F
<b>Model</b>	<b>11727.802</b>	<b>5</b>	<b>2345.5603</b>	<b>0.55</b>	<b>0.7366</b>
<b>Identity</b>	<b>2586.6768</b>	<b>2</b>	<b>1293.3384</b>	<b>0.30</b>	<b>0.7380</b>
<b>Variance</b>	<b>7028.4076</b>	<b>1</b>	<b>7028.4076</b>	<b>1.65</b>	<b>0.2003</b>
<b>Identity*Variance</b>	<b>6072.4721</b>	<b>2</b>	<b>3036.236</b>	<b>0.23</b>	<b>0.7948</b>
<b>Residual</b>	<b>679887.67</b>	<b>160</b>	<b>4249.298</b>		
<b>Total</b>	<b>691615.48</b>	<b>165</b>	<b>4191.6089</b>		

TABLE A4. ANOVA for the Effects of Identity and Contribution Variance and Sex on Altruistic Punishment

Number of obs = 166                      R-squared = 0.0378  
 Root MSE = 64.696                      Adj R-squared = 0.0014

Source	Partial SS	df	MS	F	Prob>F
<b>Model</b>	<b>26108.737</b>	<b>6</b>	<b>4351.4562</b>	<b>1.04</b>	<b>0.4017</b>
<b>Identity</b>	<b>1565.9891</b>	<b>2</b>	<b>782.99454</b>	<b>0.19</b>	<b>0.8296</b>
<b>Variance</b>	<b>4362.3791</b>	<b>1</b>	<b>4362.3791</b>	<b>1.04</b>	<b>0.3089</b>
<b>Identity*Variance</b>	<b>2516.0866</b>	<b>2</b>	<b>3036.236</b>	<b>0.23</b>	<b>0.7948</b>
<b>Sex</b>	<b>14380.936</b>	<b>1</b>	<b>14380.936</b>	<b>3.44</b>	<b>0.0656</b>
<b>Residual</b>	<b>665506.74</b>	<b>159</b>	<b>4185.577</b>		
<b>Total</b>	<b>691615.48</b>	<b>165</b>	<b>4191.6089</b>		

TABLE A5. t-test for the Effect of Sex on Altruistic Punishment

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Male	55	41.09	10.28	76.24	20.48	61.70
Female	111	19.25	5.43	57.22	8.49	30.02
Combined	166	26.49	5.03	64.74	16.57	36.41
Diff		21.83	11.63		-1.27	44.95

$t = 1.87, df(86), Pr(|T| > |t|) = 0.0637$

TABLE A6. Linear regression for the effects of Identity, Contribution Variance, Contribution Total, Sex, Race and the interaction between Sex and Contribution Total on Altruistic Punishment

Sanction1	Coef.	Std. Err.	t	P> t	95% Conf. Interval	
Variance	-5.98	10.04	-0.60	0.552	-25.81	13.84
Identity	2.44	6.02	0.40	0.686	-9.44	13.84
ConTotal	0.22	0.08	2.77	0.006***	0.06	0.38
Sex	16.52	23.90	0.70	0.484	-30.44	63.97
Race	-1.46	3.14	-0.46	0.643	-7.65	4.74
Sex*ConTot	-0.15	1.00	-1.48	0.141	-0.34	0.05
_cons	-4.05	29.10	-0.14	0.889	-61.53	53.42

\*\*\* =  $p < .05$

$N=166, F(6, 159) = 2.57, Prob>F = 0.021; R^2 = 0.09, Adj R^2 = 0.054$  Root MS = 62.97

TABLE A7. ANOVA for the Effects of Identity, Contribution Variance, and Sex on Contributions

Number of obs = 166

R-squared = 0.0787

Root MSE = 103.426

Adj R-squared = 0.0379

Source	Partial SS	df	MS	F	Prob>F
<b>Model</b>	<b>144389.37</b>	<b>7</b>	<b>20627.052</b>	<b>1.93</b>	<b>0.068</b>
<b>Identity</b>	<b>4442.6751</b>	<b>2</b>	<b>2221.3376</b>	<b>0.21</b>	<b>0.8127</b>
<b>Variance</b>	<b>51093.996</b>	<b>1</b>	<b>51093.996</b>	<b>4.78</b>	<b>0.0303</b>
<b>Identity*Variance</b>	<b>3833.0402</b>	<b>2</b>	<b>1916.5201</b>	<b>0.18</b>	<b>0.8361</b>
<b>Sex</b>	<b>53883.373</b>	<b>1</b>	<b>53883.373</b>	<b>5.04</b>	<b>0.0262***</b>
<b>Sex*Variance</b>	<b>40.478</b>	<b>1</b>	<b>40.478</b>	<b>0.00</b>	<b>0.951</b>
<b>Residual</b>	<b>1690104.2</b>	<b>158</b>	<b>10696.862</b>		
<b>Total</b>	<b>1834493.6</b>	<b>165</b>	<b>11118.143</b>		

\*\*\* =  $p < .05$

Table A8. t-test for the Effect of Contribution Variance on Overall Contributions

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
<b>Low Var</b>	<b>83</b>	<b>221.253</b>	<b>12.16</b>	<b>110.75</b>	<b>197.07</b>	<b>245.44</b>
<b>High Var</b>	<b>83</b>	<b>178.506</b>	<b>10.52</b>	<b>95.82</b>	<b>157.58</b>	<b>199.43</b>
<b>Combined</b>	<b>166</b>	<b>199.88</b>	<b>8.18</b>	<b>105.44</b>	<b>183.73</b>	<b>216.04</b>
<b>Diff</b>		<b>42.75</b>	<b>16.07</b>		<b>11.00</b>	<b>74.49</b>

$t = 2.66$ ,  $df(164)$ ,  $\Pr(|T| > |t|) = 0.009***$ ; \*\*\* =  $p < .05$

TABLE A9. t-tests for the Effect of Sex on Overall Contributions

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Male	55	230.98	14.50	107.56	201.90	260.06
Female	111	184.49	9.62	101.36	165.40	203.54
Combined	166	199.88	8.18	105.44	183.72	216.04
Diff		46.51	17.40		11.99	81.03

$t = 2.67$ ,  $df(102)$ ,  $\Pr(|T| > |t|) = 0.0088$ ; \*\*\* =  $p < .05$

Table A10. Decisions to punish and reasons based on sex.

	Males	Females
1. I decided to reduce a group member's total because I was angry about lack of contributions to the group fund	12	10
2. I decided to reduce a group member's total because I wanted to exact revenge	1	2
3. I decided to reduce a group member's total because I wanted group totals to be more equal among all group members	4	19
Combination of 1 and 2	3	4
Combination of 1 and 3	6	7
Combination of 2 and 3	0	2
Combination of 1, 2, and 3	4	4
Written in reasons for reducing a group member's total: "My total was 11.66 and I wanted to round it down to a "0" so I just spent six tokens because it looks better to me"	0	1
Written in reasons for reducing a group member's total: "i decide to take away the same amount from each group member because i felt as if it was someone else doing the reduction, they wouldve took my tokens away"	0	1
Total Individuals who decided to reduce others total earning =	30	50
Total Individual who decided not to reduce others total earnings =	24	57



Figure A1. Observed Relationship Between Variance, Sex, Contributions and Altruistic Punishment

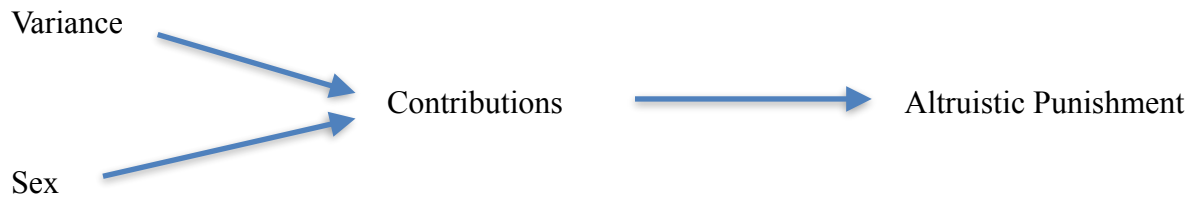


Figure A2. Mediation Effects of Sex on Punishment Through Contributions (Complete mediation)

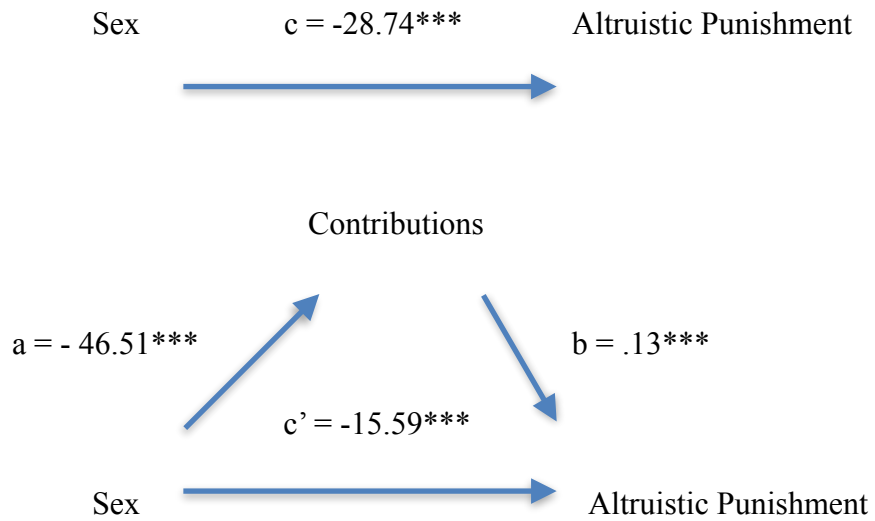


Figure A3. Relationship between Contribution Variance Contributions and Altruistic Punishment (no mediation)

