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NEPOTISTIC PREFERENCES IN A COMPUTERIZED TROLLEY PROBLEM

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ABSTRACT

Altruism among kin has been a robustly supported phenomenon. Namely, people are more likely to save close kin than distant kin and non-kin. However, most altruism research has utilized questionnaire methodology, which can be subject to participant bias. Therefore, we created a computerized "dangerous situation" task that required participants to choose between saving specific kin members and friends as fast as possible – mimicking actual life-or-death altruistic decision-making. Decisions and reaction time were recorded. Results revealed a strong preference to save siblings over cousins and friends, and a preference to save female friends over cousins and male friends.

INTRODUCTION

Kin selection theory postulates that cooperative behaviors among kin, such as investment in offspring and altruism among siblings, are the product of positively selected genes that promote the overall inclusive fitness of themselves and any other beings that may share copies of this genetic code (i.e., kin members) (Hamilton, 1964). The genes that predispose an individual to behave altruistically towards kin are more likely to be selected and increase in frequency in the population. Hamilton's rule illustrates this concept with the equation $c < br$, which indicates that an altruist will perform an altruistic act when the biological cost (c) is less than the product of the reproductive benefits (b) and the genetic relation (r) shared between the altruist and recipient. Individuals indicate greater altruistic intentions toward close kin (e.g., siblings) than distantly related kin (e.g., cousins, aunts, uncles, nieces, and nephews) and non-kin (e.g., friends and acquaintances) in hypothetical life threatening situations (Bleske,-Rechek, Nelson, Baker, Remiker, and Brandt, 2010; Burnstein, Crandall, and Kitayama, 1994; Fitzgerald and Colarelli, 2009; Fitzgerald and Whitaker, 2009; Kruger, 2001; Neyer and Lang, 2003; Stewart-Williams, 2007, 2008).

Although the basic premise of inclusive fitness theory revolves around the idea that people will engage in nepotistic altruism as a function of genetic relatedness between the altruist and recipient, many other factors have been found to play a role. For instance, past research has found sex differences in the likelihood of saving kin members from life-threatening situations. Specifically, males are more likely than females to help kin in violent scenarios (e.g., when a kin member is being robbed by an armed mugger) (Fitzgerald and Whitaker, 2009). Also, romantic partners who have a biological child together indicate a greater likelihood of saving each other in hypothetical life-threatening scenarios than childless partners as well as partners who have adopted a child together (Fitzgerald, Thompson, and Whitaker, 2010). In fact, these altruistic intentions between romantic partners with adopted children do not differ from those between childless partners (Fitzgerald et al., 2010). Ultimately, people are willing to incur great costs to increase their inclusive fitness and thus the likelihood of passing on these altruistic behaviors – whether these costs consist of giving one's time and/or resources to kin (e.g., raising one's offspring), or risking one's life to save kin (e.g., saving one's sibling from a burning house).

Other research has found that altruism may not be directly related to genetic relation, but rather to emotional closeness between the altruist and the recipient. Korchmaros and Kenny (2001, 2006) found that emotional closeness mediates the relationship between genetic relatedness and altruism. In addition, previous research has found that people tend to be less emotionally close with their siblings than their friends and romantic partners (Fitzgerald et al., 2010; Stewart-Williams, 2008) and these people are more willing to engage in non life-threatening altruism (e.g., giving emotional support, performing household chores, running errands) for people with whom they are more emotionally close (Fitzgerald et al., 2010; Stewart-Williams, 2007, 2008). Although we see this preference to help non-kin in these low-cost situations, when the cost of help becomes life-threatening, people indicate a strong preference to save their close kin over distant kin and non-kin regardless of emotional closeness (Fitzgerald et al., 2010; Stewart-Williams, 2008).

The Trolley Problem

In the study of ethical and altruistic decision-making, philosophers and psychologists have both utilized a thought experiment known as the *Trolley Problem*. This ethical dilemma places a person in a hypothetical scenario in which he or she is asked to imagine that a trolley is speeding out of control and five people are tied to the tracks – directly in the way of this trolley and thus quickly approaching certain death. In this situation, the participant has the ability to flip a switch that would change the direction of the tracks and lead the trolley down a different path; however, there is one person tied to the tracks on this second path. Therefore, the trolley problem asks the participant to choose between saving one life or five lives.

Although the trolley problem was originally used to assess utilitarian ethics, it has been utilized as a means of assessing kin selection theory. Bleske-Recheck and colleagues (2010) altered the trolley problem to incorporate genetic relatedness and reproductive potential, marked by age of the target, into the equation. In their study, the trolley scenario remained the same, but the individual person tied to the second path of tracks was manipulated to either be a close relative, distant relative, or non-relative. No details were given in regards to the five people tied to the first set of tracks. The results indicated that as the genetic relatedness and reproductive potential of the single person increased, the likelihood of people choosing to save that one person – and thus sacrificing the other five strangers – increased.

Present Study

Although several studies have found immense support for Hamilton's (1964) inclusive fitness theory, most studies have used a questionnaire methodology – including the strongly supportive results that Bleske-Recheck et al. (2010) found. Because questionnaire methodology can fall prey to social desirability biases, it may not be the most accurate way to measure altruistic tendencies within people. In fact, people believe they are more altruistic than their friends and family members (Fitzgerald et al., 2010). Other research has found inflated altruism ratings when participants were asked to respond to hypothetical life-threatening situations as well (Fitzgerald and Colarelli, 2009; Fitzgerald et al., 2010; Stewart-Williams, 2008).

Madsen and colleagues (2007) found a way of measuring altruism without utilizing a self-report measure. Their study involved measuring how much pain a participant would endure in order to help someone. Their results also supported kin selection theory – finding that people endured longer durations of pain in order to help close kin and reproductively viable kin. However, no participant or kin member was placed in a life-threatening situation – the instances in which the preferences to save kin are supposed to be the most prevalent. Therefore, the focus of the present study was to measure altruistic decision making in life-threatening scenarios where people do not have enough time to reflect upon, and subsequently bias, their decision.

Because it is unethical and impractical to measure altruistic behavior in actual life-threatening situations, this study creates a computerized dangerous situation and records a split-second reaction – mimicking actual life-or-death altruistic decision-making. The present study builds and expands on Bleske-Rechek et al.'s (2010) utilization of the trolley problem for evolutionary psychological research with some minor changes. This study does not completely mimic the trolley problem, but requires participants to make an altruistic decision in regards to whom they would save from a speeding truck.

METHOD

Participants

Participants (N = 102; 59 female, 43 male; M_{age} = 20.8 years, s = 1.3) were undergraduate students recruited from the online subject pool of a medium-sized university in the Midwestern United States. All participants were required to have a brother, sister, male cousin, female cousin, close male friend, and close female friend. Prior to the the actual experiment, participants were screened to ensure that every participant possessed all six of these familial and social connections (i.e., brother, sister, male cousin, female cousin, male best friend, and female best fried). Participants who did not have all six of these familial and social connections were excused from the study and therefore did not participate. Participants were given extra credit in one of their psychology courses as compensation for their participation.

Materials

The materials consisted of a life-threatening altruism computer game that was programmed using Microsoft Excel. This computer game depicts a situation in which two people (images were of stick people) were in front of a truck, and the participant was forced to choose which one to save. The type of people in trouble were manipulated by genetic relatedness to the participant (i.e., brother, sister, male cousin, female cousin, male friend, and female friend). Although both people were presented in front of the truck, one was on the left side of the screen and the other was on the right side.

The scenarios are presented individually on the computer screen. The participant must view the scenario, decide which stick figure to "save," and press a key on the keyboard corresponding to that figure. If the figure the participant wishes to rescue is on the left side of the screen, the participant presses the left arrow key. If the figure is on the right side of the screen, the participant presses the right arrow key. The placement of the stick figures on the left and right side of the screen was counterbalanced. Therefore, participants were presented with each scenario twice (e.g., they had to choose between saving their brother and sister twice – one time in which the brother figure was on the left of the screen while the sister was on the right, and a second time in which the sister figure was on the left side of the screen and the brother on the right). When the participant makes a choice – by pressing either the left or right arrow keys on the keyboard – the computer program records the reaction time, labels it based on which scenario it was in response to, and stores it in an Excel file. That specific reaction time associated with the participant's choice, then gets assigned to the target who the participant chose to rescue.

The scenario then disappears from the screen, an intermediary screen appears with a message that states "press enter when ready for the next trial." This continues for a total of 10 practice scenarios in order to acquaint the participants with the program. After the 10 practice trials, a window appears notifying the participants that they will begin the actual trials. The participants responded to 30 actual trials in the same format as the practice trials. There were a total of 30 combinations of scenarios (pairing each stick "person" with each other "person" on each side of the screen). All of the trials were presented in random order.

Procedure

Participants were seated in front of a computer and given two consent forms – one for the experimenter's records and one for the participant's records. After signing the consent forms they were presented with the computer program. The initial screen required the participants to enter the names of their brother, sister, male cousin, female cousin, male best friend, and female best friend. If the participants had more than one person for a category (i.e., more than one brother), they were advised to enter the name of the person who was closest to the participant in age. These names would appear under each stick figure during the trials of the game so that the participant would know which figure was representing which kin member or friend.

The participants were also required to enter their age and sex. After entering this information, the participants pressed the "Enter" key and began playing the computer game. Participants were advised to respond as quickly as possible in each trial. Upon completing the computerized task, participants were debriefed as to the nature of the study.

RESULTS

The mean reaction time of participants' responses was M_{RT} = .867 seconds, *s* = .23. The participants' choices of whom to save were recorded and analyzed using nonparametric Chi-square tests for each combination of persons in peril. Reaction times were also recorded and analyzed using Independent-samples *t*-tests.

There were no significant differences between males' and females' choices regarding who to save, nor were there any sex differences in reaction time. When asked to choose between saving one's brother and sister, participants indicated no significant preference for either sibling (p = .123). However, participants chose to save their brothers when they were paired with cousins and friends. Specifically, participants chose to rescue their brother over male cousins, chi-square(1) = 113.26, $p < .001$, female cousins, chi-square(1) = 75.37, $p < .001$, male friends, chi-square(1) = 70.59, $p < .001$, and female friends, and chi-square(1) = 65.96, $p < .001$. The same preference for siblings was found when participants' sisters were paired with cousins and friends. Specifically, participants chose to rescue their sister over male cousins chi-square(1) = 101.65, $p < .001$, female cousins, chi-square(1) = 65.96, $p < .001$, male friends, chi-square(1) = 53.02, $p < .001$, and female friends, and chi-square(1) = 49.02, $p < .001$.

When asked to choose between cousins, participants were just as likely to save their male and female cousins (p = .069). Participants also did not indicate a preference to save their male or female cousin over their male friends, (p = .575 and p = .093 respectively). However, participants chose to save their female friend more often than their male cousins, chi-square(1) = 11.29, p = .001, females cousins, chi-square(1) = 3.84, p = .050, and male friends, chi-square(1) = 15.37, $p < .001$. See Table 1 for the number of decisions made to save each person.

Table 1. Total number of altruistic responses toward each kin member/friend in every scenario ($N_{Responses}$ = 204)†.

	Chosen Kin Member/Friend					
Scenario/Choice Presented:	Brother (B)	Sister (S)	Male Cousin (MC)	Female Cousin (FC)	Male Best Friend (MF)	Female Best Friend (FF)
B-S	101	113	---	----	---	---
B-MC	178	---	26	---	---	---
B-FC	164	---	---	40	---	---
B-MF	162	---	---	---	42	---
B-FF	160	---	---	---	---	44
S-MC	---	174	30	---	---	---
S-FC	---	160	---	44	---	---
S-MF	---	154	---	---	50	---

S-FF	---	152	---	---	---	52
MC-FC	---	---	89	115	---	---
MC-MF	---	---	98	---	106	---
MC-FF	---	---	78	---	---	126
FC-MF	---	---	---	114	90	---
FC-FF	---	---	---	88	---	116
MF-FF	---	---	---	---	74	130

† *Every participant was presented with each comparison twice, thus although the N = 102, the $N_{Responses}$ = 204.*

After assessing preferences in decision-making, mean reaction times were analyzed to examine whether participants would respond faster to saving kin. Independent-samples t-tests did not reveal any significant differences in reaction times for any scenario. However, these analyses were performed on the decisions that participants had already made (see Table 1), so this lack of difference may be due to the uneven sample sizes that were analyzed. See Table 2 for the mean reaction times and *p* values for every scenario.

Table 2. Mean (SD) reaction times (in seconds) for altruistic responses toward each kin member/friend in every scenario

	Chosen Kin Member/Friend						*p*
Scenario/Choice Presented:	Brother (B)	Sister (S)	Male Cousin (MC)	Female Cousin (FC)	Male Best Friend (MF)	Female Best Friend (FF)	
B-S	.85 (.50)	.78 (.38)	---	----	---	---	.41
B-MC	.85 (.43)	---	.65 (.26)	---	---	---	.07
B-FC	.79 (.42)	---	---	.61 (.22)	---	---	.07
B-MF	.84 (.50)	---	---	---	.68 (.19)	---	.15
B-FF	.85 (.53)	---	---	---	---	.77 (.47)	.56
S-MC	---	.86 (.48)	1.05 (.64)	---	---	---	.19
S-FC	---	.82 (.46)	---	.65 (.16)	---	---	.11
S-MF	---	.92 (.51)	---	---	.80 (.13)	---	.52
S-FF	---	.90 (.46)	---	---	---	.84 (.54)	.59
MC-FC	---	---	1.17 (.66)	1.03 (.64)	---	---	.29
MC-MF	---	---	.84 (.49)	---	.92 (.56)	---	.45
MC-FF	---	---	.93 (.49)	---	---	.92 (.60)	.96
FC-MF	---	---	---	.87 (.50)	.82 (.42)	---	.61

FC-FF	---	---	---	.95 (.54)	---	.86 (.44)	.34
MF-FF	---	---	---	---	.85 (.46)	.90 (.54)	.68

DISCUSSION

The purpose of the present study was to examine the potential altruistic responses in split-second decision-making. Because most research into kin selection has capitalized on the questionnaire methodology – which can fall prey to the social desirability bias – this study aimed to investigate nepotistic altruism with a method that required participants to respond in ≈ 1 second. This study has produced – to the authors' knowledge – the first method in which participants must react to a life-threatening event in a matter of seconds – a method that may help eliminate the social desirability bias in altruism research.

The reaction time methodology may not only help in decreasing the social desirability bias and dishonest responding, but also provide a more realistic setting for life-threatening altruism to take place. One of the quintessential life-threatening altruism examples is the *burning house scenario*. This example is given to participants by asking them to imagine that one of their kin members is trapped in a burning house and s/he needs the participant to rescue them. The participants are then asked to rate their willingness to rescue the target on a Likert-type scale (Burnstein et al., 1994; Fitzgerald and Colarelli, 2009; Fitzgerald et al., 2010; Stewart-Williams, 2007, 2008). Although this example has been shown to produce valid and supportive results, the fact that participants are able to think and reflect upon an imaginary situation and have ample time to respond is unrealistic. In the case of most life-threatening altruistic scenarios – especially in our evolutionary past, where life-threatening scenarios were primarily related to fighting off predators and enemies – there is not much time to think and react. If one were to actually have to rescue a kin member from a blazing house, or save someone from a speeding truck, they would only have seconds to react. Therefore, these data reflect a potentially new frontier in studying altruism in a more realistic setting.

Ultimately, the results supported kin selection theory. When forced to choose between saving one's brother and one's sister, there was almost no distinct choice made. However, participants almost always chose to save their siblings over cousins and friends. There was also a significant preference to save cousins over male friends – once again finding support for kin selection theory – but this preference to save female friends more than cousins and male friends warrants further research. This finding contradicts previous findings, which have not found any preference to rescue female friends in life or death situations over distant kin or male friends (Fitzgerald and Colarelli, 2009; Stewart-Williams, 2008). However, other research has found a greater a preference to save female kin and friends over male kin and friends in violent scenarios (Fitzgerald and Whitaker, 2009), so this preference to save female friends in the present study may be the product of participants viewing the scenario as violent. It is also possible that females have much to offer their friends. In the case of fellow female friends, they can offer cooperative social support and emotional closeness (Taylor et al., 2000), which would lend support for other kin selection studies that have found a mediating effect from emotional closeness (Korchmaros and Kenny, 2001; 2006). In the case of males, female friends could be viewed as potential reproductive partners, thus rescuing them would help increase one's reproductive opportunities and overall inclusive fitness. Participants were not required to specify if the female friend they were imagining for the study was a romantic partner, which is one of the limitations of this study.

Limitations and Directions for Future Research

This study possesses limitations that may be remedied in future research. For instance, an adequate sample size was recruited based on a power analysis, but future studies with larger sample size would help produce stronger support. Future research could add certain consequences and perhaps study a learning curve of altruism.

Another limitation to the study focuses on the fact that – although participants were forced to choose between saving kin members and/or friends – they were still able to choose, and therefore unequal response sizes among the trials were formed. This could have led to the complete lack of effects when comparing reaction times of the participants' responses. Future research could rectify this by giving the participants trials in which s/he is presented with a kin member and friend, but the experimenter/program instructs the participants to save a specific person – not allowing the participant to choose. This could produce an equal number of trial responses for each target and allow researchers to reliably analyze and compare reaction times.

Conclusion

The present study provides a new and innovate method to help produce valid and reliable support for kin selection theory. Although this study had some limitations, it may allow for a new movement in creative and realistic methods for studying altruism among humans. From the data produced in this study, we now have empirical evidence displaying that nepotistic tendencies are prevalent even when people respond in less than one second.

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