

## Effects of Distal and Proximal Variables on Donating Behavior

Cristiane Matinez de Almeida<sup>1</sup> , Vivianni Veloso<sup>2</sup>  & Carla Cristina Paiva Paracampo<sup>2</sup> 

<sup>1</sup>*Centro Universitário do Pará, Belém, PA, Brazil*

<sup>2</sup>*Universidade Federal do Pará, Belém, PA, Brazil*

**ABSTRACT** – Two experiments involving donation were conducted. Experiment 1 examined whether college students would primarily retain tokens for themselves or donate them to relatives and strangers, which could be exchanged for items obtained in a game. The results showed 57% retained more tokens for themselves or donated to relatives; 28% to strangers, and 15% the same amount to themselves and strangers or to relatives and strangers. Experiment 2 examined whether the tendency to donate in a given direction would change after reading a text with justifications for donating to strangers. A significant difference was observed between Experimental Groups 1 and 2 ( $p < 0.003$ ), with fewer tokens donated to relatives or retained for oneself after exposure to the text. It is concluded that human generosity is influenced by the evolutionary history of the species and the human cultural and verbal environment.

**KEYWORDS:** human evolution; donation; retention; rules; cultural and verbal environment.

## Efeitos de Variáveis Distais e Proximais sobre o Comportamento de Doar

**RESUMO** – Foram realizados dois experimentos envolvendo doação. O Experimento 1 verificou se universitários reteriam prioritariamente para si, ou doariam para parentes e desconhecidos, fichas trocáveis por objetos, obtidas em um jogo. 57% retiveram mais fichas para si ou doaram para parentes; 28% para desconhecidos e 15% a mesma quantidade para si e desconhecidos ou para parentes e desconhecidos. O Experimento 2, verificou se a tendência a doar em dada direção mudaria após a leitura de um texto com justificativas para doar para desconhecidos. Observou-se diferença significativa entre os grupos Experimentais 1 e 2 ( $p < 0,003$ ), com menos fichas doadas para parentes ou retidas para si, após exposição ao texto. Conclui-se que a generosidade em humanos sofre influência da história evolutiva da espécie e do ambiente cultural e verbal humano.

**PALAVRAS-CHAVE:** evolução humana; doação; retenção; regras; ambiente cultural e verbal.

In the last five decades, some scientists have sought to analyze phenomena from an interdisciplinary perspective. Genovese (2007) suggests that significant advances in understanding human behavior occur when separate academic disciplines come together by identifying convergent points.

Genovese (2007) attempted to bridge Behavior Analysis and Evolutionary Psychology by analyzing the contributions of these two disciplines regarding learning. According to the author, a divergence between the two approaches lies in the existence of general laws of learning common to all species, a principle adopted by behavior analysts, which diverges

from the principle adopted by evolutionary psychologists, who postulate the existence of specific cognitive/behavioral modules to solve proximal adaptive problems.

However, Genovese gathers evidence that there are similarities in learning patterns through phylogenesis, stating that the basic mechanisms of learning common to all species are probably a result of common descent or parallel evolution, and that these mechanisms cannot be separated from their biological substrates. On the other hand, divergent brain evolution patterns reflect modifications that allow species-specific learning problems to be solved.

Thus, what evolutionary psychologists call modularity would be the result of evolutionary constraints on learning, specific to species.

Sampaio, Otoni, and Benvenuti (2015) addressed the issue of the interrelationships between evolution and ontogenesis by analyzing the example of Niche Construction Theory (the process by which organisms alter their environment and the environment of other organisms through their metabolisms and activities). Sampaio *et al.* emphasize that niche construction, by altering the relevant environment for a particular species, can affect natural selection, with the altered environment persisting for several generations, producing an ecological inheritance. In the case of the human species, niche construction would occur largely through cultural processes, being related to three selective processes: genetics, ontogenetics, and culture, all of which are involved in altering the environment. Considering this, Sampaio *et al.* propose that “learning could guide

niche construction, whose consequences, in turn, could be propagated through ecological inheritance, affecting even genetic evolution,” emphasizing that both Behavior Analysis and Niche Construction Theory understand that there is a dynamic interaction process between the organism and the environment, where both mutually alter each other.

The present empirical research was designed from an interdisciplinary perspective, seeking to integrate methodological and theoretical-conceptual aspects of Evolutionary Psychology and Behavior Analysis in the investigation of donating behavior in humans, similarly to the studies mentioned above but in a theoretical manner. Thus, this research aims to contribute to the understanding of the phenomenon of generosity, starting from the assumption that the expression of generosity involves complementary explanations associated with the evolutionary history of the species and the interaction with the sociocultural environment in which people are inserted.

## EXPERIMENT I

The propensity to cooperate is likely an evolutionarily based trait that contributed to individuals’ survival in solving adaptive problems during evolutionary history (Henrich & Muthukrishna, 2021), such as childcare and food sharing (Markovits *et al.*, 2003). Thus, cooperation has persisted across various species by providing benefits to both the recipient and the donor (Henrich & Muthukrishna, 2021).

There are differences in cooperating when aid is directed towards a genetically related individual compared to when it is directed towards a non-relative or even a stranger. Cooperation among relatives, or Kin Selection, is manifested by investing time and energy in direct genetic relatives (offspring) and in the survival and/or reproduction (*e.g.*, by assisting with childcare costs) of indirect genetic relatives, such as siblings, cousins, etc. (Hamilton 1964a, 1964b).

According to the Theory of Inclusive Fitness, an organism will only invest a benefit in another organism if the cost to the donor is low compared to the benefit received by the recipient (Axelrod & Hamilton, 1981; Fitzgerald, C. J., 2021; Hamilton, 1964). In the case of Kin Selection, the benefit received by the recipient must be multiplied by the coefficient of relatedness, where the higher the coefficient (shared genes), the higher the likelihood of cooperation (Delton, 2016). This relationship can be represented as follows:  $r \times b > c$ , where  $r$  is the coefficient of relatedness,  $b$  is the recipient’s benefit, and  $c$  is the cost to the donor.

The contribution that occurs among related individuals implies high costs that may not be repaid within the donor’s lifetime; however, this behavior persists due to the perpetuation of genetic representation in future generations, which outweighs the costs of the cooperation provided (Axelrod & Hamilton, 1981). However, the benefits are greater in cooperation with genetically closer relatives

(Axelrod & Hamilton, 1981), increasing the likelihood that cooperation efforts will be directed towards offspring and siblings.

Similar to Kin Selection, for cooperation to occur with non-related individuals, the value of the donation must be low-cost for the donor and valuable for the recipient, and the benefit, when reciprocated, is commonly returned during the donor’s lifetime (Trivers, 1971). We refer to Direct Reciprocity as cooperation with non-related individuals in which there is an expectation of favor repayment through the possibility of donor-recipient reunion, allowing for reciprocated cooperation (Sachs *et al.*, 2004; Trivers, 1971). However, the benefit received by the recipient must be multiplied by the coefficient of the time the relationship is likely to last (Delton & Robertson, 2016). This relationship can be represented as follows:  $w \times b > c$ , where  $w$  is the coefficient of the time the relationship is likely to last.

We term Indirect Reciprocity as cooperation with non-related individuals in which the donor has little or no chance of encountering the donation recipient (Hilbe *et al.*, 2018). According to Hilbe *et al.* (2018), “...Indirect reciprocity is a mechanism for cooperation based on shared moral systems and individual reputations. It assumes that members of a community routinely observe and assess each other and that they use this information to decide who is good or bad, and who deserves cooperation.” (p.12241). Thus, the benefit of Indirect Reciprocity is related to the reputation involved in helping or refusing help to someone. This type of cooperation is observed in examples of solidarity with victims of tragedies, who are often in different parts of the world and whose contribution return would be impossible or impractical (Romano *et al.*, 2022).

The concept of cooperation involves the possibility of reciprocity. However, it is known that people donate even without the possibility of a benefit return, a phenomenon termed generosity or simply donation. This phenomenon seems to be an evolutionary paradox as it allows investment without return. Certain environmental cues appear to increase the propensity for donation or desertion in donation. One of these cues is the frequency of interactions with an individual (Krasnow *et al.*, 2013), where a single interaction, with a stranger, for example, seems to be an environmental cue indicating that donation is not worthwhile. However, considering the evolutionary context, the direct and indirect costs involved in losing benefits from cooperative relationships with group members or adjacent groups could be immense, given that in these communities individuals are likely to be born, grow up, and die while maintaining contact with the same people. Delton *et al.* (2011) and Delton & Robertson (2016) suggest that a single encounter with an unknown individual, for example, could be an environmental cue that the probability of benefit return in the future does not exist; however, in the uncertainty of future encounter, it might be less costly to donate even under these conditions.

Thus, without the certainty of benefit return, generosity can be considered a byproduct of Indirect Reciprocity.

Considering the above, Experiment 1 investigated, through a game involving the donation of tokens exchangeable for objects, whether young students, with low personal income, mostly without children but in full reproductive phase, would primarily donate to relatives, strangers, or keep the tokens for themselves. A methodology was employed where participants did not have the possibility of benefit return, thus investigating the propensity for generosity or donation. Due to literature findings indicating greater investment in relatives rather than non-relatives (Bird *et al.*, 2002; Gurven *et al.*, 2004; Johnson & Earle, 2000; Markovits *et al.*, 2003) due to the probability of direct or indirect benefit return, it was assumed that in a context designed to observe donation without the possibility of benefit return, participants would tend to retain resources for themselves and donate resources to relatives, investing directly and indirectly in their reproduction.

Experiment 1 was planned to be a baseline against which the effects of manipulation of immediate verbal environmental variables on donating behavior would be evaluated, based on the understanding that behavior is a product of the interaction between evolutionary heritage and environmental events.

## METHOD

### Participants

One hundred and thirty university students of both genders, aged between 18 and 41 years, from different higher education institutions and different subjects, except Psychology, with no prior experimental history with the experiment's task, participated in this experiment.

### Ethical Considerations

This study was approved by the Ethics Committee of the Behavioral Medicine Center of the Federal University of Pará under opinion number 2.649.852 and CAAE: 83009718.5.0000.5172. All participants agreed to voluntarily participate in the research by signing the Informed Consent Form.

### Instruments and Materials

A form was used to collect personal data, such as age, closest relative, whether they had children, and preference items that could be acquired in a store at the end of the experiment. Additionally, a computer containing memory game software - specifically programmed for this experiment; 40 tokens, 130 white envelopes, 130 yellow envelopes, and 130 green envelopes; a room divider, and a cardboard container with an opening at the top were used.

### Environment

The experiment took place in an air-conditioned room, which contained a table, on which the computer with a memory game displayed on the screen, a chair, and the room divider with the container, where the envelopes could be placed. In another room, there was a table, on which the preference items indicated by the participant were displayed, which could be acquired with the tokens that the participant earned for each correct answer recorded in the memory game.

### Procedure

The invitation to participate in the study was made in person or by social networks. In the first meeting, after signing the Informed Consent Form, the participants were asked to answer the form with personal questions. Then, the participant was taken to the room where the participant's preference items were displayed - stationery items, makeup, food, and jewelry. Each item had a label indicating the number of tokens it was worth. The participant was informed that they would be exposed to a game in which they would earn tokens that could be used to acquire the items of their preference.

Next, the participant was taken to the room where the computer with the memory game was located. The participant's task was to click on the pictures (two at a time) until forming a pair. For each pair formed, the participant earned one point that appeared on the computer screen,

and the pair disappeared from the screen. The game ended when 40 points were obtained. At the end of the game, the experimenter exchanged the points obtained for the same number of tokens, which were handed to the participant along with three envelopes, one of each color. At this point, the participant was told that the tokens obtained should be distributed in the envelopes freely, according to the participant's choice. In the white envelope, the tokens that the participant wanted for themselves were placed. In the yellow one, the tokens that the participant wanted to donate to the closest relative, as indicated in the form of personal questions. In the green envelope, the tokens that the participant wanted to donate to strangers were placed.

It was emphasized that the participant could distribute the tokens as desired, keeping all for themselves, donating all to the relative or to strangers, or distributing them among the available options. The participant was instructed to make the donations behind the room divider and insert only the green envelope into the urn, regardless of whether they chose to donate tokens to strangers or not.

After distributing the tokens in the envelopes, the participant was taken to the room where the preference items were located. Another experimenter received the white and yellow envelopes and helped the participant exchange the tokens for the store's items, in case the participant had kept tokens for himself or donated to the relative.

## RESULTS

Table 1 presents, in percentage terms, personal characteristics of the 130 participants (average age of 22 years), such as: gender, whether they have children or not, the closest relative indicated by the participant, and the number of tokens donated to themselves, to the relative, and to strangers.

In the table, it is observed that 58% of the participants were female and 42% were male. Of these, only 3% indicated

having children, and 79% indicated their mother as the closest relative. Regarding the distribution of tokens, 17% of the participants kept more tokens for themselves, 22% donated more tokens to their relative, and 28% donated more tokens to strangers. When the number of tokens distributed was the same for two out of the three options, 18% of the participants donated a quantity of tokens to their relative, keeping an equal amount for themselves.

Table 1  
*Characterization of Participants (P) and Number of Tokens Donated in Percentage.*

Characteristics of Participants (P)	%
Male Participants (P)	42
Female Participants (P)	58
(P) with Children	03
(P) without Children	63
(P) who did not respond	34
(P) who donated more to themselves	17
(P) who donated more to relatives	22
(P) who donated more to strangers	28
(P) who donated the same amount to themselves and relatives	18
(P) who donated the same amount to themselves and strangers	03
(P) who donated the same amount to relatives and strangers	12
(P) who cited their mother as the closest relative	79
(P) who cited their father as the closest relative	05
(P) who cited other relatives as the closest	16

## DISCUSSION

When we sum the retention of tokens that participants kept for themselves (17%), those donated to relatives (22%), and those where they tied with relatives (18%), we find that 57% of the participants invested more in their direct and indirect benefit. Only 28% donated a larger quantity of tokens to strangers, while the remaining 15% tied either with strangers or with relatives and strangers.

It is assumed that in contexts where the possibility of benefit return is zero, as is the case in the present experiment, it is much more advantageous to retain resources for oneself or to invest in a relative due to the inherent benefits of genetic sharing, even though the relative had no direct interaction during the exchange.

However, if the experiment does not foresee the possibility of reciprocal benefit return due to the anonymity of the donor and considering that encounter frequency is a predictive ecological cue that a donation will bring future benefit, we cannot expect anyone to invest resources in a stranger whose encounter frequency is zero and who is unaware of the donor's identity. It would be more logical to expect all participants to invest resources for their own benefit, which did not occur considering that 28% of the participants donated to strangers. These results were similar to those obtained by Delton *et al.* (2011) and seem to challenge the logic of cooperative events. It is possible that generosity towards strangers is a byproduct of Reciprocal Altruism, meaning that in the uncertainty of future cooperation, nature may have selected organisms that would donate part of their resources even in situations where ecological cues indicate no benefit.

Additionally, we cannot discount the fact that culturally, throughout life, we are exposed to various environments where the behavior of giving, sharing, is encouraged, socially reinforced, and used as a model of behavior to be followed and approved by the group, which may have also contributed to the choice of making donations to strangers, producing interaction between distal and proximal variables.

It is important to highlight that the costs for the donor were always constant (participating in the memory game). If the cost for the donor were variable, it is possible that there would have been greater investment in oneself or in relatives. At the same time, the benefits resulting from performance in the memory game are moderately variable, as the prize could only be chosen after the donation, meaning the reward might not hold value for the recipient. Perhaps facing a procedure where the prize did not vary and was, for example, of high value to a consanguineous recipient,

the donor would make different choices regarding whom to donate, investing in the relative.

Furthermore, since data collection was carried out with a very young audience, it was to be expected that a large portion of the sample would not have children, and indeed, only 3% of the sample declared having children. The absence of children may have been one of the variables responsible for the high investment rate in oneself (17%) as a biological alternative to investing in one's adaptation, through resource allocation towards one's own survival, *i.e.*, through investment in somatic effort (Figueredo *et al.*, 2014).

A variable that may have contributed to the lower percentage of generosity towards strangers is the low access to one's own resources by the investigated population. If we consider that donation to unrelated individuals presents a balance between costs and benefits, where generosity only occurs when the cost of donation is low for the donor (Axelrod & Hamilton, 1981), it is expected that individuals who still have little access to resources, such as young university students in the present study, respond to the game by keeping the resource within their genetic group, as donating resources in a life period where access to them is low can mean a high cost for the donor.

These data could be better analyzed with access to additional socioeconomic information, which could be relevant to understanding how much the participant actually has access to resources. It would also be important to have access to more detailed family information, which could help understand if there were descendants' relatives for whom it would be valuable to invest resources, such as siblings or nieces/nephews. Future studies can address these limitations by collecting this information and contributing to a better understanding of the act of donating in young adults without children.

## EXPERIMENT 2

By cultural selective processes, whether by exposure to rules (Albuquerque & Paracampo, 2010, 2017) or by the production of aggregated products (environmental changes resulting from the recurrence of interactions between two or more individuals) by the group (Sampaio *et al.*, 2015), the human environment is altered, and these changes may impact the tendency to behave in a certain way, interfering with evolutionary inheritance, producing the final behavior from interaction with the environment.

Cultural selective processes occur in a social environment, which, in the case of humans, is essentially verbal. Through verbal behavior, it is possible to expand individuals' repertoires beyond their particular experiences. When the verbal behavior of one or more speakers functions as an environment and affects the behavior of one or more listeners, we call it a rule - verbal antecedent stimuli that possess different formal properties and can alter the probability of

emitting a behavior, making it more or less likely to occur (Albuquerque & Paracampo, 2010, 2017).

When talking about the formal property of a rule, we refer to characteristics of the rule, such as the extent of the rule (measured by the number of behaviors described therein), the form of the rule (whether it takes the form of a question, an order, a suggestion, etc.), and the justifications presented for following the rule, *i.e.*, past or future events, reported in the rule, that describe reasons, motives, for the listener to emit, or not, the specified behavior in the rule. Justifications are constituent variables of a rule that, when manipulated, can interfere with the probability of behavior occurrence (Albuquerque & Paracampo, 2010, 2017).

Examples of justifications include descriptions of potential consequences of following, or not following, a rule, indicating whether the consequences of following rules are aversive, reinforcing, of large or small magnitude, etc.; descriptions

of the eventual approval or disapproval of following a rule, indicating whether the speaker or other people approve or disapprove of the rule being followed; descriptions of the reliability of the speaker, indicating whether the reported consequences will be reliably produced or not; and descriptions of examples of behaviors to be followed or not (Albuquerque & Paracampo, 2010, 2017).

Reports about examples of behaviors to be observed, to be followed, or not, allow behaviors to be learned or altered through the description of others' histories. This type of justification for the emission of certain behaviors is commonly presented in social media and literature and contributes to maintaining cultural practices of a group (Albuquerque & Paracampo, 2010, 2017; Carvalló *et al.*, 2023; Craveiro, Paracampo & Albuquerque, 2019; Paracampo *et al.*, 2009; Albuquerque *et al.*, 2013). Some empirical studies (Albuquerque *et al.*, 2013; Carvalló *et al.*, 2023; Craveiro *et al.*, 2019; Matsuo, Albuquerque, & Paracampo, 2014; Najjar *et al.*, 2014; Paracampo *et al.*, 2009; Paracampo *et al.*, 2013) sought to investigate the effects of different types of justifications on the occurrence and maintenance of behaviors described in rules.

For example, in Experiment 2 of Paracampo *et al.*'s study (2009), the effects of justifications present in children's stories on the behavior of ten children exposed to a task of donating chocolates were evaluated. The experiment consisted of two conditions that differed in the presence or absence, in Phase 2, of a justification for the behavior of donating. In Phases 1 and 3 of both conditions, the amount of chocolates donated was measured. In Phase 2, in one condition, a story presenting justifications for the behavior of donating through the example of the characters' behavior was read. In Phase 2 of the other condition, a story describing characteristics of endangered animals was read. The results showed that in Phase 3 of the condition where the justification was presented, 100% of the participants donated chocolates. In contrast, in Phase 3 of the other condition, only 40% of the participants made donations. The story presenting justifications was more effective in determining the increase in the frequency of the behavior of donating. Paracampo *et al.* (2013) obtained

similar results when investigating the effects of justifications and questions on the behavior of donating.

In the same line of research, Craveiro *et al.* (2019) and Carvalló *et al.* (2023) sought to investigate the effects of justifications present in children's stories on the establishment and maintenance of pro-study and reading behaviors, respectively. The results showed that after reading children's stories with justifications indicating that characters who exhibited pro-study or reading behaviors were successful, participants in both studies increased the time engaged in target behaviors and decreased the time engaged in competing activities.

The results described above indicate that justifications reporting experiences of other individuals or characters can more likely make the emission of behaviors with low probability of occurrence. On the other hand, the results of Experiment 1 of the present study showed that, in the absence of rules with justifications for donating behavior in a certain direction, most participants tended to retain benefits for themselves or donate to relatives, maintaining donations towards their genetic representation.

It is assumed that the expression of acts of generosity in humans depends on interaction with a series of factors present in their immediate environments, such as exposure to rules advocating that we should help others and the consequent social approval for following these rules. In this sense, it is also pertinent to suppose that in a decision-making situation that requires the decision of who will be the beneficiary of a donation, both evolutionary and ontogenetic variables can influence the decision. Considering this, the question was formulated as to whether the tendency to make donations in a given direction would change in a decision-making situation identical to that presented in Experiment 1 after reading a text describing the behavior of individuals who donate to strangers. Experiment 2 sought to answer this question, the results of which may contribute to the literature on generosity in humans as well as to the literature on rule control, allowing the understanding of the phenomenon of generosity in humans from an interdisciplinary perspective.

## METHOD

### Participants

Out of the 130 participants from Experiment 1, 54 agreed to participate in Experiment 2, being distributed into two groups: an experimental group and a control group.

### Instruments and Materials

The instruments and materials used were the same as those in Experiment 1.

Additionally, two texts were employed, one containing justifications - "Bia's Gaze," sourced from an internet site, and one without justifications titled "Flowers," also obtained from an internet site. The "Bia's Gaze" text described a situation experienced by a girl who started helping others as a child and founded the NGO "Bia's Gaze," which had already assisted over

100,000 needy individuals. The "Flowers" text did not include justifications; it solely described characteristics of various types of flowers.

## Environment

The experimental environment was identical to that described in Experiment 1.

## Procedure

Following the conclusion of Experiment 1, the distribution of tokens made by the participants was tallied, and those who allocated more tokens to their relatives, retained tokens for themselves, and/or tied between themselves and their relatives were assigned to the Experimental Group (n=27) and the Control Group (n=27).

Experiment 2 comprised two phases, both conducted on the same day. In Phase 1, texts were presented to the participants in both groups. The text presented in Phase 1 to the Control Group was the “Flowers” text, lacking justifications. The text presented in Phase 1 to the Experimental Group was the “Bia’s Gaze” text. All participants were instructed to read the texts silently and then aloud. Subsequently, Phase 2 commenced.

In Phase 2, participants were informed that they would undergo the memory game once more (as described in Experiment 1). Upon completion of the game, the experimenter provided the same information regarding the distribution of tokens.

## RESULTS

The data were described by comparing the quantity of tokens retained in direct and indirect benefit (sum of the tokens retained for themselves or donated to relatives) and to strangers before (Experiment 1) and after (Experiment 2) reading texts with and without justifications.

Figure 1 illustrates the quantity of tokens retained or donated to relatives (Experimental A1 and A2) and donated to strangers (Experimental B1 and B2) by each participant in the Experimental Groups, both in Experiment 1 (A1 and B1) and in Experiment 2 (A2 and B2). It is observed in the figure that 16 out of 27 participants (P1, P2, P3, P4, P5, P6, P7, P8, P11, P12, P13, P14, P17, P20, P21, and P23) increased the quantity of tokens donated to strangers, with 15 of these 16 participants decreasing the quantity of tokens retained for themselves or donated to relatives in Experiment 2 compared to Experiment 1. Only P23 donated all tokens to strangers in Experiment 2. Participants P9, P10, P15, P16,

P18, P19, P25, and P27 donated the same quantity of tokens to strangers in Experiments 1 and 2. Participants P22, P24, and P26 were the only ones who increased the quantity of tokens retained for themselves in Experiment 2 compared to Experiment 1.

Figure 2 displays the quantity of tokens retained for themselves or donated to relatives (Control A1 and A2) and to strangers (Control B1 and B2) by each participant in the Control Groups in Experiments 1 (A1 and B1) and 2 (A2 and B2). It is observed in the figure that 11 participants (P1, P3, P6, P9, P10, P11, P12, P13, P18, P22, and P24) donated the same quantity of tokens for their own benefit (directly and indirectly) in Experiments 1 and 2, four participants (P4, P20, P25, and P27) increased the quantity donated for their benefit, and 12 participants (P2, P5, P7, P8, P14, P15, P16, P17, P19, P21, P23, and P26) decreased the quantity donated for their benefit in Experiment 2. Twelve participants

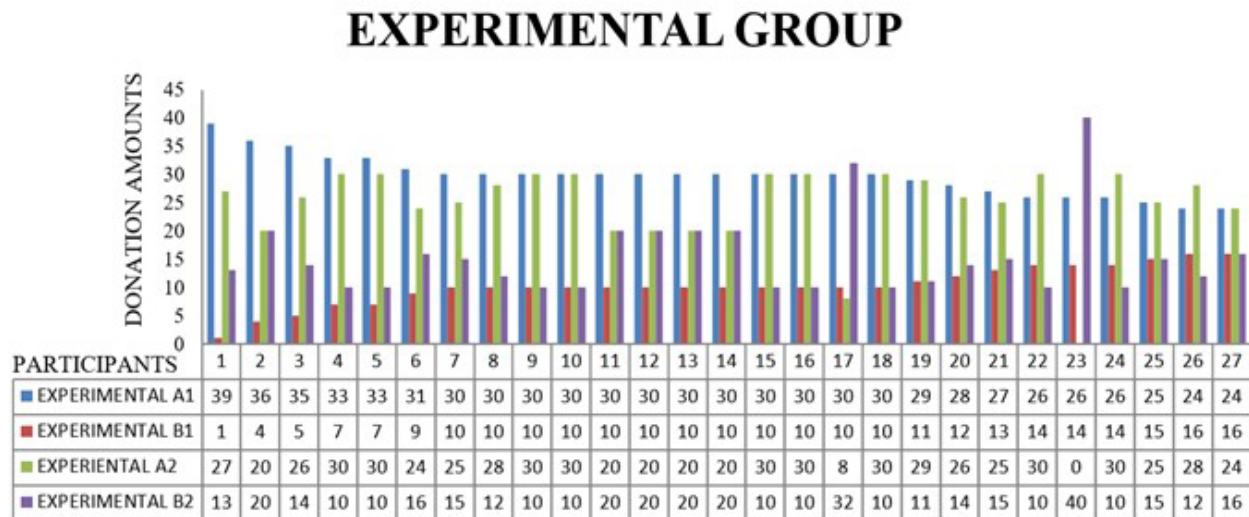


Figure 1  
Number of Tokens Retained for oneself or Donated to Relatives (Experimental A1 and A2) and Donated to Strangers (Experimental B1 and B2) by Participants of the Experimental Groups, in Experiments 1 and 2.

## CONTROL GROUP

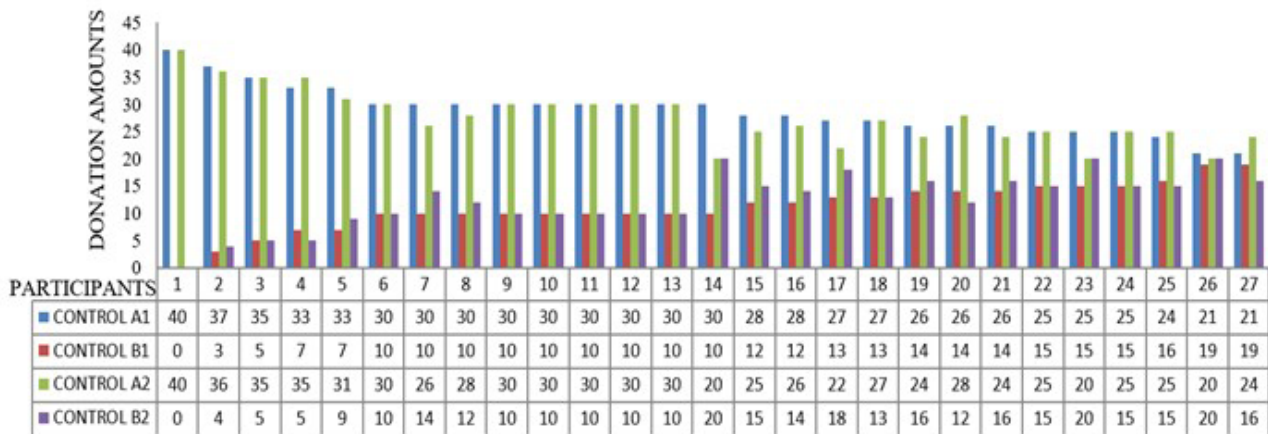


Figure 2  
 Number of Tokens Retained for oneself or Donated to Relatives (Control A1 and A2) and Donated to Strangers (Control B1 and B2) by Participants of the Control Groups, in Experiments 1 and 2.

(P2, P5, P7, P8, P14, P15, P16, P17, P19, P21, P23, and P26) increased the number of tokens donated to strangers in Experiment 2. Comparing the quantity of tokens donated for their own benefit and to strangers in Experiment 2, it is observed that 24 out of 27 participants (P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P15, P16, P17, P18, P19, P20, P21, P22, P24, P25, and P27) retained more for themselves and donated more to relatives than to strangers.

The Wilcoxon test indicated a statistically significant difference between the results of the Experimental Groups in Experiments 1 and 2 ( $p < 0.003$ ), indicating that in Experiment 2, there was a decrease in the retention of tokens for oneself after exposure to the “Bia’s Gaze” text with justifications. On the other hand, the comparison between the results of

the Control Groups in Experiment 1 and Experiment 2 – exposed to the “Flowers” text without justifications – did not show a statistically significant difference ( $p < 0.075$ ). The test also showed a statistically significant difference between the results of the Experimental Groups B1 and B2, in Experiments 1 and 2 ( $p < 0.003$ ), regarding the quantity of tokens donated to strangers, indicating that Experimental Group B2, in Experiment 2, increased the donation of tokens to strangers after exposure to the text with justifications. Conversely, the comparison between the results of the Control Groups B1 and B2, in Experiments 1 and 2, regarding the quantity of tokens donated to strangers, did not show a significant difference in the number of tokens donated to strangers ( $p < 0.20$ ).

## DISCUSSION

The results showing that 16 out of 27 participants in the Experimental Group increased the quantity of tokens donated to strangers in Experiment 2 compared to Experiment 1, after being exposed to the text with justifications, which described the creation of an NGO that had helped over 100,000 needy people. The difference in the quantity of tokens donated in the two experiments was statistically significant, indicating that justifications reporting experiences of other individuals can make the emission of certain behaviors with lower probability of occurrence. Additionally, the results showing that the difference in the quantity of tokens donated to strangers in Experiments 1 and 2 by the participants in the Control Group, respectively, did not show statistical significance, support this conclusion. These results corroborate others found in the literature on rule- following behavior (Albuquerque *et al.*, 2013; Carvalló *et al.*, 2023; Craveiro *et al.*, 2019; Matsuo *et al.*, 2014; Najjar *et al.*, 2014; Paracampo *et al.*,

2009; Paracampo *et al.*, 2013) and extend the generality of the effects of justifications to another context, beyond those investigated in previous studies.

Moreover, the results suggest that presenting rules with justifications for donating to strangers may interfere with the decision of who will benefit from a donation, decreasing the likelihood of investment in relatives or retention, producing a different final behavior from interaction with the environment. However, it is noteworthy that although 16 (59%) participants in the Experimental Group increased the quantity of tokens donated to strangers in Experiment 2 compared to the quantity donated in Experiment 1, only one of them (P23) reallocated all tokens to strangers, and 20 (74%) continued to retain more tokens for themselves and donate more to relatives compared to donations to strangers in Experiment 2 (see Figure 1). These results demonstrate that even after a manipulative experiment, suggesting the

donation of resources to strangers, with the allocation of part of these resources to strangers, participants still invest in their own benefit. This implies that although there was investment in strangers, the act of generosity was relatively inexpensive for the donor (Henrich & Muthukrishna, 2021).

The continuation of donations to relatives can be explained by the indirect benefits inherent in gene sharing; that is, even if the experiment does not allow for direct benefit return by the relative itself, the donor still indirectly benefits by enabling the propagation of shared genes. Since the procedure keeps costs constant for the donor (memory game and reading of the “Bia’s Gaze” text), they do not lose by being a little more generous to strangers after the cultural intervention through reading the text. However, they still have a greater chance of benefiting by donating to relatives or retaining tokens. It is emphasized, however, that even though the tendency to donate to relatives is higher, for the reasons already explained, it is sensitive to environmental events as highlighted by Lieberman *et al.* (2007), who report that the environment provides cues that are individually detected and interfere in the amount of donation.

These results are in line with studies in hunter-gatherer communities and Western societies, which showed that the sharing of goods occurred predominantly with relatives; sharing with non-relatives occurred only when donors had surpluses (Bird *et al.*, 2002; Gurven *et al.*, 2004; Johnson & Earle, 2000; Markovits *et al.*, 2003). Based on these results, it is pertinent to suggest that humans seem to be equally sensitive to proximal and distal variables, modulating their individual potential to help others (relatives or not) according to the variables present in the current environment at the individual level and not only at the species level.

Behavioral flexibility at the proximal level is functional for the survival of the species by allowing the modulation of behaviors as information obtained from the environment is detected, adjusting behavior so that the organism gains advantages in various contexts and environments (Tooby & Cosmides, 2016).

In general, studies on cooperation in the field of human evolution focus on participants with the possibility of direct or indirect investment in genetic descendants, that is, people who have children and/or nephews/nieces. However, most of the sample in the present study consisted of participants who do not have children, and whose quantity of nephews/nieces is unknown. Future studies comparing participants with and without children, or with and without nephews/nieces, may be relevant to investigate how much the possibility of direct and indirect investment interferes with the propensity to donate to ascendants, descendants, and strangers.

Access to resources is another relevant variable. If it is true that cooperation occurs when the cost to the donor is small, variables such as low income and low education may be relevant in such investigations. The present study was conducted with university participants, whose family income was not obtained. Perhaps different results would be obtained with a non-university and low-income population.

Future investigations including the cited variables are relevant as they may contribute to a more detailed understanding of how environmental and individual variables modulate the psychological mechanisms of the species, as behavior is understood to be the result of the interaction between typical species characteristics, environmental contingencies (such as resource availability), and individual experience

## REFERENCES

- Albuquerque, L. C., & Paracampo, C. C. P. (2010). Análise do controle por regras. *Psicologia USP*, 21(2), 253-273. <https://doi.org/10.1590/S0103-6564201000200004>
- Albuquerque, L. C., & Paracampo, C. C. P. (2017). Selection of behavior by justifications constituent of rules. *Trends in Psychology*, 25(4), 2025-2042. <https://doi.org/10.9788/TP2017.4-23En>
- Albuquerque, L. C., Paracampo, C. C. P., Matsuo, G. L., & Mescouto, W. A. (2013). Variáveis combinadas, comportamento governado por regras e comportamento modelado por contingência. *Acta Comportamental*, 21(3), 285-304. Recuperado de [http://pepsic.bvsalud.org/scielo.php?script=sci\\_arttext&pid=S0188-81452013000300002](http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0188-81452013000300002)
- Alcock, J. (2011). *Comportamento animal: Uma abordagem evolutiva* (9ª ed.). Artmed editora.
- Alexander, R. D. (1985). A biological interpretation of moral systems. *Zygon*, 20, 3-20. <https://doi.org/10.1111/j.1467-9744.1985.tb00574.x>
- Axelrod, R. & Hamilton, W. D. (1981). The evolution of cooperation. *Science*, 4489(21), 1390-1396. Recuperado em 22 de junho, 2022 de <http://www.personal.umich.edu/~axe/research/Axelrod%20and%20Hamilton%20EC%201981.pdf>
- Bird, R. B., Bird, D. W., Smith, E. A., & Kushnick, G. C. (2002). Risk and reciprocity in Meriam food sharing. *Evolution and Human Behavior*, 23(4), 297-321. [https://doi.org/10.1016/S1090-5138\(02\)00098-3](https://doi.org/10.1016/S1090-5138(02)00098-3)
- Carvalló, B. N., Albuquerque, L. C., Galvão, O. F., & Paracampo, C. C. P. (2023). Effects of justifications on children’s reading behavior. *Trends in Psychology*, 31(2), 1-17. <https://doi.org/10.1007/s43076-023-00306-7>
- Craveiro, C. C. P., Paracampo, C. C. P., & Albuquerque, L. C. (2019). Effects of justifications presented in children’s stories on students following descriptive rules. *Trends in Psychology*, 27(1), 219-232. <https://doi.org/10.9788/TP2019.1-16>
- Delton, A. W., Krasnow, M. M., Cosmides, L., & Tooby, J. (2011). Evolution of direct reciprocity under uncertainty can explain human generosity in one-shot encounters. *Proceedings of the National Academy of Sciences*, 108(32), 13335–13340. <https://doi.org/10.1073/pnas.1102131108>

- Delton, A. W., & Robertson, T. E. (2016). How the mind makes welfare tradeoffs: Evolution, computation, and emotion. *Current Opinion in Psychology*, 7, 12–16. <https://doi.org/10.1016/j.copsyc.2015.06.006>
- Figueredo, A. J., Wolf, P. S. A., Olderback, S. G., Gladden, P. R., Fernandes, H. B., Wenner, C., Hill, D., Andrzejczak, D. J., Sisco, M. M., Jacobs, W. J., Hohman, Z. J., Sefcek, J. A., Kruger, D., Howrigan, D. P., MacDonald, K., & Rushton, J. P. (2014). The psychometric assessment of human life history strategy: A meta-analytic construct. *Evolutionary Behavioral Sciences*, 8(3), 148–185. <https://doi.org/10.1037/h0099837>
- Fitzgerald, C. J. (2021). *Inclusive Fitness Theory*. In T. K. Shackelford (Ed.), *The Sage Handbook of Evolutionary Psychology: Foundations of Evolutionary Psychology* (pp. 24–33). London: Sage Publications Inc.
- Genovese, J. E. C. (2007). Evolutionary psychology and behavior analysis: Toward convergence. *The Behavior Analyst Today*, 8(2), 187–195. <https://doi.org/10.1037/h0100612>
- Gurven, M., Hill, K., & Jakuti, F. (2004). Why do foragers share and sharers forage Explorations of social dimensions of foraging. *Research in Economic Anthropology*, 23, 19–43. [https://doi.org/10.1016/S0190-1281\(04\)23001-3](https://doi.org/10.1016/S0190-1281(04)23001-3)
- Hamilton, W. D. (1964a). The genetical evolution of social behaviour I. *Journal of Theoretical Biology*, 7, 1–16. [https://doi.org/10.1016/0022-5193\(64\)900](https://doi.org/10.1016/0022-5193(64)900)
- Hamilton, W. D. (1964b). The genetical evolution of social behaviour II. *Journal of Theoretical Biology*, 7, 17–52. [https://doi.org/10.1016/0022-5193\(64\)90039-6](https://doi.org/10.1016/0022-5193(64)90039-6)
- Henrich, J., & Muthukrishna, M. (2021). The Origins and Psychology of Human Cooperation. *Annual Review Psychology*, 72, 207–240. <https://doi.org/10.1146/annurev-psych-081920042106>
- Hilbe, C., Schmid, L., Tkadlec, J., Chatterjee, K., & Nowak, M. A. (2018). Indirect reciprocity with private, noisy, and incomplete information. *Proceedings of the National Academy of Sciences*, 115(48), 12241–12246. <https://doi.org/10.1073/pnas.1810565115>
- Johnson, A. W., & Earle, T. (2000). *The evolution of human societies. From foraging group to agrarian state* (2nd ed.). Stanford: Stanford University Press.
- Krasnow, M. M., Delton, A. W., Tooby, J., & Cosmides, L. (2013). Meeting now suggests we will meet again: Implications for debates on the evolution of cooperation. *Scientific Reports*, 3(1), Artigo 1. <https://doi.org/10.1038/srep01747>
- Lieberman, D., Tooby, J., & Cosmides, L. (2007). The architecture of human kin detection. *Nature*, 445(7129), 727–731. <https://doi.org/10.1038/nature05510>
- Markovits, H., Benenson, J. F., & Kramer, D. L. (2003). Children and Adolescents Internal Models of Food-Sharing Behavior Include Complex Evaluations of Contextual Factors. *Child Development*, 74(6), 1697–1708. <https://doi.org/10.1046/j.1467-8624.2003.00632.x>
- Matsuo, G. L., Albuquerque, L. C., & Paracampo, C. C. P. (2014). Efeitos de justificativas relacionadas em regras sobre o seguimento de regras. *Acta Comportamental*, 22(3), 273–293. Recuperado de [http://pepsic.bvsalud.org/scielo.php?script=sci\\_arttext&pid=S0188-81452014000300003](http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0188-81452014000300003)
- Milinski, M., Semmann, D., & Krambeck, H. J. (2002). Reputation help solve the “tragedy of the commons”. *Nature*, 415, 424–426. <https://doi.org/10.1038/415424>
- Najjar, E. C. A., Albuquerque, L. C., Ferreira, E. A. P., & Paracampo, C. C. P. (2014). Efeitos de regras sobre relatos de comportamentos de cuidados com os pés em pessoas com diabetes. *Psicologia Reflexão e Crítica*, 27(2), 341–350. <https://doi.org/10.1590/1678-7153.201427215>
- Paracampo, C. C. P., Albuquerque, L. C., Carvalló, B. N., & Torres, S. M. (2009). Análise do controle por regras apresentadas em histórias infantis. *Revista Brasileira de Análise do Comportamento*, 5(2), 107–122. <https://doi.org/10.18542/rebac.v5i2.933>
- Paracampo, C. C. P., Albuquerque, L. C., Mescouto, W. A., & Farias, A. F. (2013). Efeitos de perguntas e de respostas às perguntas sobre o seguir regras. *Psicologia: Teoria e Pesquisa*, 29(4), 63–74. <https://doi.org/10.1590/S0102-37722013000400003>
- Romano, A., Saral, A. S., & Wu, J. (2022). Direct and indirect reciprocity among individuals and groups. *Current Opinion in Psychology*, 43, 254–259. <https://doi.org/10.1016/j.copsyc.2021.08.003>
- Sachs, J. L., Mueller, U. G., Wilcox, T. P., & Bull, J. J. (2004). The evolution of cooperation. *The Quarterly Review of Biology*, 79, 135–160. <https://doi.org/10.1086/383541>
- Sampaio, A. A. S., Ottoni, E. B., & Benvenuti, M. F. L. (2015). A Análise do Comportamento no contexto do estudo evolucionista do comportamento social e da cultura. *Estudos de Psicologia*, 20(3), 1–25. <https://doi.org/10.5935/1678-4669.20150015>
- Tinbergen, N. (2010). On aims and methods of Ethology. *Zeitschrift Für Tierpsychologie*, 20(4), 410–433. <https://doi.org/10.1111/j.1439-0310.1963.tb01161.x>
- Tooby, J., & Cosmides, L. (2016). *The Theoretical Foundations of Evolutionary Psychology*. In D. M. Buss (Ed.), *The Handbook of Evolutionary Psychology* (Vol. 1, pp. 3–87). New Jersey: Wiley.
- Trivers, R. L. (1971). The Evolution of reciprocal altruism. In: *The Quarterly Review of Biology*, 1(46), 35–57. Recovered in 22 June 2022 from <http://greatergood.berkeley.edu/images/uploads/Trivers-EvolutionReciprocalAltruism.pdf>
- Workman, L., & Reader, W. (2021). *Evolutionary psychology: An Introduction* (4th ed.). Cambridge University Press

**Conflict of interest**

The authors have no conflicts of interest to declare.

**Data availability statement**

The data supporting the findings of this study can be requested from the corresponding author upon reasonable request

**Editor-in-chief**

Tiago Jessé Souza de Lima

**Associate Editor**

Ederaldo José

**Corresponding author**

Carla Paracampo

Email: cparacampo@gmail.com

**Submitted on**

24/06/2022

**Accepted on**

30/01/2024

This article was extracted from the first author's doctoral thesis.