Extrinsic motivators drive children's cooperation to conserve forests

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One Sentence Summary: Extrinsic motivation increases donations for forests among children and adolescents in the United States, China, and the Democratic Republic of the Congo.

Abstract: Forests are essential common-pool resources. Understanding school-aged children and adolescents' motivations to conserve forests is critical for improving conservation education. In two experiments with school age children and adolescents (age range: 6-16; N=1088), we demonstrate that extrinsic, rather than intrinsic motivations lead to successful cooperation in common-pool goods games to maintain a forest. We investigate participants from three nationalities (China, D. R. Congo and U.S.) and find certainty of losing individual payoffs significantly boosts successful cooperative conservation efforts across cultures. Within the U.S. sample, we find two other types of extrinsic incentive, priming discussions of the value of forests and delay of payoffs as punishment also encourage the success of cooperative conservation. Conservation simulations, like those used here, may allow educators to encourage forest protection by allowing groups to experience successful cooperation and the extrinsic incentives needed to motivate forest conservation. Future research will be needed to test if these types of simulations have long term positive impact on participant's attitudes and behavior toward forest conservation.

Introduction

Forests are vital to human and planetary health. They are common-pool goods that require both local and international cooperation to maintain (Van Vugt, 2009). Educating the public to support forest health through personal behavior and policy remains a top priority for governments and conservationists. School aged children and adolescents have long been regarded as a critical audience for this type of education. Positive exposure to wildlife and forests in zoos and parks has commonly been hypothesized to translate into pro-environmental behavior in adulthood (Bowie et al., 2020; Zhang et al., 2019). However, it remains unclear what type of educational experiences might encourage pro-conservation behavior toward forests across diverse populations (Saylan & Blumstein, 2011).

The *Biophilia Hypothesis (BH)* suggests humans evolved intrinsic motivation to care for the natural world (Kellert, 1995; Wilson, 1984). It predicts that universally across cultures our selfish need to interact with life motivates humans to protect natural areas (Kahn, 1997). Early exposure to nature should nurture this intrinsic motivation and result in increased expression while extrinsic rewards may dampen it (Ariely et al., 2009; Warneken & Tomasello, 2008).

In contrast, the *Anthrophilia Hypothesis (AH)* posits that humans evolved intrinsic motivation for prosocial behavior (i.e. beneficial but potentially selfishly motivated social acts as opposed to antisocial interactions; Eisenberg et al., 1983) toward kin ingroup members and strangers, but not more abstract social categories like future-others or forests (Chapais, 2001; Hill & Hurtado, 2017; Moore, 2009; Silk, 2002, 2006; Silk & House, 2011; Singer, 1981; Warneken et al., 2007). Any prosociality toward abstract social categories is an accidental by-product and emergent property of plasticity in our evolved motivation to help other humans. The AH predicts that cross-cultural variability in pro-conservation behaviors toward forests is in large part shaped by ecological and economic uncertainty (Boyd et al., 2010; Eom et al., 2016; Frankenhuis et al., 2016; Henrich et al., 2005; Spence et al., 2012; Van der Linden, 2015). Experiences that incorporate extrinsic rewards and teach the link between material gain, reputation enhancement or punishment and forest conservation are likely needed during childhood or adolescence to internalize the value of these shared resources (Ryan & Deci, 2000, 2020).

School age children and young adolescents provide a strong test of these hypotheses. They are old enough to understand the concept of a common-pool good (children as young as six behave strategically in similar public goods games; (Engelmann et al., 2018; Hermes et al., 2020; Keil et al., 2017; Koomen & Herrmann, 2018; Vogelsang et al., 2014; Yang et al., 2018) but their motivations are not yet fully shaped by adult participation in economic markets. However, little, if any, experimental work has examined the willingness of juveniles, especially children, to help abstract, nonhuman entities like forests (Flanagan & Gallay, 2014; Koomen & Herrmann, 2018).

Adult motivation for conservation has been tested experimentally using a collective-risk common-pool goods game (Milinski et al., 2008). In this game, the entire group is threatened with losing their endowment unless individual donations exceed a threshold needed to maintain a common-pool good. In Western populations the certainty of personal loss, reputation, and the immediacy of the benefit the good delivers largely determine group success (Hauser et al., 2014; Jacquet et al., 2013; Milinski et al., 2008). What is needed to better understand the origin of these preferences is a version of this paradigm designed for cross-cultural use with children.

Previous research has shown that cognitive preferences relating to certain decision making are shaped by considerations of resources within environments (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Bateson et al., 2014). Frankenhuis et al. (2016) identified two ecological factors that influenced decision-making: harshness, defined as the rates of mortality and morbidity caused by factors an individual cannot control, and unpredictability, defined as the change in mean variation in harshness over time. This framework provides a potential explanation for populational differences in decisions about resource distribution. Populations in highly uncertain environments tend to be more vigilant, more risk prone, and steeper temporal discounters than those in less uncertain environments (Ellis et al., 2009; Salali & Migliano, 2015; Mittal & Griskevicius, 2014).

Here we used the paradigm developed by Milinski et al (2008) to test children's cooperative motivations. School aged children and adolescents decided what portion of an endowment they wished to contribute to maintaining the conservation of a local forest. In two experiments, we varied the type and amount of motivation for donating and assessed participants' donation patterns to test the BH and the AH and to examine how children might be introduced to the concept of sustainability through cooperative forest management simulations.

Experiment 1

In experiment 1, we tested how risk of losing one's own rewards influenced motivation for pro-environmental behavior towards a forest in school aged participants from three different countries, the United States, the People's Republic of China, and the Democratic Republic of the Congo. Children and adolescents from the three countries provide a powerful test of our hypotheses because these countries vary on country-wide levels of forest coverage, the types of forest exposure children receive and resource uncertainty. Based on the percentage of land area covered by forest, DRC provides, on average, the highest potential for forest exposure (56.5%), followed by United States (33.9%) and China (22%; *The World Bank Open Data*, 2018). While exposure to forest will still vary greatly within countries this data still helps to understand how dominant forests are in the ecology, economy and culture of each country. Early positive exposure to forests can also be determined by educational system. Children in the U.S. often participate in some form of environmental education (e.g., passive education through park visits with environmental programs or active camp or school classes) while this type of experience is comparatively rare in China and DRC. Based on country-level statistics of life expectancy, health outcomes, and GPD per capita (*WHO's Global Health Observatory*, 2019). DRC is comparatively more resource uncertain, and the U.S. is comparatively less resource uncertain, with China in between.

The BH predicts cooperation will be strongest in response to the level of nature exposure and will only be reduced by extrinsic motivators. Children from the U.S. or DRC should be most likely to be intrinsically motivated to cooperate to protect forests. The AH predicts cooperation will be strongest in response to high extrinsic rewards or punishments regardless of forest exposure or education and will vary cross culturally depending on the level of uncertainty characterizing a group's environment.

Methods

Participants

Participants aged six to sixteen (N=570) from the U.S., China, and DRC took part in this experiment. We decided the sample size basing on the number of children and adolescents we had access to in each testing location. Participants from the U.S. (N = 198; 81 females, 117 males; Age range: 6 to 11; Mean age ± SD: 8.04±1.57) were recruited from a summer camp at Zoo Atlanta in the suburban area of Atlanta, Georgia. Each camp was week-long, and children and adolescents between ages four and fifteen from across the Atlanta area could participate in the camp. The participants were mostly public-school attendees from middle income families in the Metro-Atlanta area that is demographically diverse. However, in the context of the camp it was not viewed as appropriate to collect information on individual participant's race or socioeconomic status. All participants took part in activities at camp that included viewing zoo animals, attending behind the scenes tours and demonstrations by zookeepers and educators, and making nature related art projects. Participants were tested during the camp session at Zoo Atlanta in a space known as the "tree house". It is an approximately 10 x 10 m room situated above one of the small primate exhibits. Chinese participants (N = 216; 108 females, 108 males; Age range: 6 to 14; Mean age ± SD: 9.60±1.84) were recruited from a primary school in a suburb of Beijing. All participants included in the study were from a local primary school that served low to middle-income populations. Participants were tested in a classroom. Congolese participants (N = 156; 89 females, 66 males, 1 did not report gender; Age range: 6 to 16; Mean age ± SD: 11.75 ± 2.20) were children and adolescents from local schools in and around Kinshasa, the capital city of the DRC. Two of the schools served more rural, low-income populations on the outskirts of Kinshasa, while the other two schools served more mid-income families in downtown Kinshasa. Children were tested at their school in a quiet room or outdoor area or in the education center at Lola ya Bonobo sanctuary. The mean age of the DRC participants was older than the other countries largely due to more variation in chronological age within each grade.

Data from an additional 96 participants was excluded from the analysis. Subjects were tested in groups (see below) and in sixteen groups testing was interfered with by instructions from a teacher or conversations between participants (groups excluded: U.S.: N=3; China: N = 4; DRC: N = 9). One group was excluded from the DRC sample due to lack of age information.

Test

We used a between subject design for both experiments. Six age matched peers played together and received tokens after an orientation from an experimenter (see Appendix S1 for the scripts). Groups consisted of participants from the same country and same camp or classroom. Participants learned the goal of the game was for their group to meet a donation threshold required to keep a forest healthy. They were informed that they would anonymously decide to keep the tokens they received until the end and they would be allowed to exchange the tokens for prizes (i.e. toys or candies) or contribute any portion to local forest conservation. They were told they would have a set number of trials to reach the goal. The experimenter added tokens to a Connect Four® board(s) after each trial within a round to display the cumulative number of tokens given over the course of the trials (Fig S1). The board allowed participants of all ages to visually understand how close they were to reaching the threshold.

After being oriented, each child from each country was asked the same set of questions to confirm they understood the task, then they were given two warm-up trials to practice the donation procedure before the test phase (see Appendix S1). Each group was then assigned to one of three motivation conditions with age and sex being balanced across conditions (see Table S1 for the distribution of groups across conditions). The three conditions only differed in the risk of forfeiting their earnings if the group failed to meet the donation threshold needed to care for the forest (Fig 1A; see scripts in Appendix S1):

Loss Condition – Failure to meet the donation threshold results in all participants losing all their tokens earned in the game.

Risk Condition – Failure to meet the donation threshold results in a coin toss giving participants a 50% chance of keeping or losing the tokens earned in the game.

Control Condition – Participants keep the tokens they earn in the game regardless of whether their group meets the donation threshold.

Before starting the game, participants received 24 tokens, learned the risk to their earnings if their group failed to meet the donation threshold, and were told they had six trials to succeed. They could donate 0, 2 or 4 tokens per trial and the donation threshold was 72 tokens per round (requiring 2 Connect Four® boards to display). Success required an average donation of at least 2 tokens per trial per child (6 participants * 2 tokens * 6 trials). For each trial, each participant marked on a pre-printed answer sheet whether they wanted to give 0, 2 or 4 tokens to the Forest Bank. After each trial, the experimenter took each paper from all six individuals, marked on the data collection sheet how many tokens each individual contributed. The experimenter ensured all individuals handed a paper each trial and ensured the anonymity.

Data analysis

We analyzed the donation pattern at both group level and individual level analysis to align with different inferential goals. We used binomial generalized linear regression model for group success to meet the donation threshold where we account for condition, country, and grade level (see full result in Table S4). In the group level analyses which investigated the effects of countries' resource uncertainty on group donation pattern, we treated the group total number of tokens as the response variable. Because participants only chose to donate 0, 2, or 4 tokens each trial, the donations were not continuous and we used Poisson regression models with country, grade level, and condition treated as covariates (see full result in Table S5). We further analyzed individual donation patterns using a mixed effects Poisson regression model with fixed effects for age, sex, country, threshold completion, and accumulated tokens per trial (see full result in Table S6). We include random effects for individual and group to account for potential correlation between donations given by the same individual, as well as the same group. We also calculated the donation pattern by age in each country from results of this model. In all the analyses, the Loss and Risk conditions were contrasted with the Control. Participants from the U.S. and the DRC were contrasted with participants from China. For all results, we include z-statistics, p-values, and 95% confidence intervals on the effect size, which is log odd for the logistic models.

Results and discussion

As AH predicted, results across conditions signaled that extrinsic motivation led to the highest success rate meeting the threshold (Loss condition $z = 3.63$, $p < .001$, 95%CI [1.40 4.46]; Risk condition: $z = 2.61$, $p = .009$, 95%CI [0.44, 2.87]; Fig 2). 90.63% and 74.19% succeeded in Loss and Risk extrinsic conditions, respectively, while only 43.75% of groups succeeded in the Control condition. Countries' resource uncertainty was also linked to success rates. Compared to the Chinese sample, groups from the DRC were less successful in meeting the threshold ($z = -2.34$, $p = .019$, 95% CI [-2.99, -0.30]). However, no significant difference was found between groups from China and the U.S.

Analyses on group donation revealed similar patterns (Fig 3). Groups across all three countries gave more in the Loss ($z = 13.72$, $p<.001$, 95% CI [0.34, 0.46]) and the Risk condition ($z = 8.57$, $p<.001$, 95% CI [0.20, 0.32]) than they gave in the Control condition. Comparisons between countries were partially consistent with resource uncertainty driving lower donations. Groups from DRC donated significantly less compared to the Chinese sample ($z = -7.63$, $p<.001$, 95% CI [-0.39, -0.17]), but groups in the U.S. also gave less than Chinese groups (z = -4.73, p<.001, 95% CI [-0.18, -0.07]).

The individual level analysis assessed individual donations levels once the threshold was met and again found little evidence for intrinsic conservation motives, especially in the U.S. and DRC samples. Results detected that across conditions, individual donations dropped significantly in trials after the donation threshold was met by participants from the U.S. (z = -5.74, p<.001, 95% CI [-1.34, -0.62]) and the DRC (z = -2.12, p = .034, 95% CI [-0.83, -0.12]), but not in China. It is noteworthy that participants from the U.S. were attending a conservation camp and the DRC is the most forested country, but only participants from China continued to donate to aid the forest once the donation threshold was met and their own rewards were secured. It is possible that the relative scarcity of forests in China has increased conservation awareness (Li, 2004). Awareness campaigns may have altered the perception of forest value. Donations made by the Chinese participants, after the group threshold was met, are also likely an expression of collectivist cultural norms (Wagner 1995) or are due to a higher sensitivity to experimenter demand effects (Kagitcibasi, 1997).

The individual level analysis also demonstrated that participants growing up in the more resource certain countries showed increased donation with age, while this same relationship was not observed in the more resource uncertain environment. In the U.S., older participants gave more tokens than younger ones (z = 4.85, p<.0001, 95% CI [0.26, 0.65]), However, the Chinese and Congolese children and adolescents did not show increasing donations with age, even though we sampled a larger age range in China and DRC.

Experiment 2

In Experiment 1, children and adolescents across cultures cooperated when motivated by risk to their own selfish rewards. Experiment 2 tests if we can design an age-appropriate game for children that simulates sustainable forest management using extrinsic motivators to encourage cooperation. Sustainability is often introduced through stories or individual responsibility (e.g., recycling, avoiding straws, turning lights off, etc.) but is less often introduced through activities that require cooperation, assessment of cost-benefit tradeoffs and opportunity costs associated with failed cooperation. Here we further tested the *Biophilia* and *Anthrophilia* hypotheses by having participants play a game in which they experience the types of decisions that are involved in collective action needed to maintain a common-pool resource sustainably.

As in Experiment 1, children are given tokens, but here it is emphasized that this endowment is a direct product of a nearby forest. In the main sustainability condition participants can enhance the productivity of the forest and increase their endowment each round if they cooperate to meet a threshold of donations required to maintain the health of the forest. If the group fails to meet the threshold, the forest becomes less productive and they experience a delay between rounds in receiving their endowment as the forest recovers more slowly from lack of care. Another group of participants experience a delay condition that was highly similar to the sustainability condition except no sustainability framing was given and successful cooperation did not increase productivity. Participants in the two experimental conditions were compared to a paired control group. No incentives were provided to these control groups other than their intrinsic motivation to cooperate (see Fig 1B and 1C for illustration of design).

The BH predicts that children will succeed in the controls based on intrinsic motivation alone (and may be reduced by extrinsic motivators), while the AH predicts cooperation will increase as extrinsic motivators increase the payoff of cooperation.

Methods

Participants

A nai□ve group of children (N=516; 264 females, 252 males; Mean age ± SD: 8.07±1.90) from the same week-long summer camp at Zoo Atlanta participated in this experiment. All participants took part in camp activities described in Experiment 1. This sample was chosen to directly test intrinsic levels of cooperation in participants taking part in an experiential environmental education program (i.e., in the control conditions) versus participants who in addition to camp activities also directly experienced extrinsic incentives for forest conservation (i.e., in the Sustainability and Delay condition). All testing took place in the same location as in Experiment 1.

Test

Participants were distributed into age-matched groups using the same methods as in Experiment 1. Each group was assigned to one of four conditions with age and gender being matched (see the distribution of individuals and groups across conditions in Table S2 and S3; see scripts for each condition in Appendix S2 and S3).

Sustainability condition – Right before participants (N=216) began the game, they participated in an instructor-led discussion. children were instructed to think about nearby forests and responded to six standardized questions which were designed to lead children to think about the value of forests and loss of everyday items they used as consequences of losing forests. It was then explained that in the game their donations would be used to help keep a forest healthy.

During the discussion they were told 1) the tokens they receive represent money made from selling lumber from the forest they were to manage 2) meeting the donation threshold (filling the collection bank with 36 tokens) increased the forest productivity while failing reduced it and 3) success translated into 24 tokens for everyone in the next round while failure reduced the productivity of the forest to 8 tokens per player and required a 90 second waiting period between rounds while the forest recovered on its own (Fig 1B).

Sustainability Control– participants (N=144) did not discuss forest conservation with an instructor and were told they received the same 12 token endowment after each round regardless of whether the group met the threshold. There was never a delay between rounds.

Delay condition – participants (N=78) did not discuss forest conservation with an instructor and were told failure to meet the donation threshold and fill the collection bank would result in a 90 second delay before the next round. Unlike the sustainability condition, they were told they would receive the same 12 token endowment regardless of success or failure at meeting the threshold (Fig 1C).

Delay Control – children (N=78) did not discuss forest conservation and were told they received the same 12 token endowment after each round regardless of whether the group met the threshold. There was never a delay between rounds.

In this experiment, there were three trials per round, with 3 rounds total. Children could donate 0, 2 or 4 tokens per trial, and the donation threshold was 36 tokens per round. The procedure of each trial is same to Experiment 1.

Data analysis

Like Experiment 1, we analyzed the group success pattern using Binomial generalized linear regression models and calculated the contrasts between conditions from the results (Table

S7). We analyzed individual donation patterns using a mixed effects Poisson regression model with fixed effects for condition, age and gender, and accumulated tokens per trial (see full results in Table S8). We calculated individual donation patterns by age from the results. In a separate Poisson regression model, we analyzed individual donation after completing the threshold and compared the patterns across conditions (Table S9).

Results and discussion

The results support the AH with both the sustainability and delay groups having higher success rates in meeting the threshold than the control conditions (Fig. 4). Groups in the Sustainability condition were far more likely to reach the donation threshold than groups in the Sustainability Control ($z = 5.58$, $p<.001$, 95% CI [2.42, 5.00]). Similarly, groups in the Delay condition succeeded in reaching the donation threshold more than those in the Delay Control condition ($z = 2.44$, $p = .015$, 95% CI [0.16, 2.56]). The Sustainability Condition yielded higher success rates than the Delay condition ($z = 3.08$, $p = .002$, 95% CI [0.76, 3.41]), while the controls did not differ from each other significantly.

The individual analysis revealed the same pattern of results. Participants in the Sustainability Condition gave more tokens than those in Sustainability Control condition ($z = 7.47$, $p<.001$, 95% CI [0.40, 0.68]) and individuals in the Delay Condition gave more tokens than those in Delay Control condition ($z =4.28$, $p<.001$, 95% CI [0.23, 0.64]). There was also a trend that participants in the Sustainability condition donated more than the Delay condition ($z = 1.71$, $p = .088$, 95% CI [-0.02, 0.31]). We did not find significant difference between the two control groups.

After the group donation met the threshold, participants in the Sustainability condition still donated more than the Sustainability Control condition ($t = 3.57$, $p < .001$, 95% CI [0.16, 1.42]). Similarly, participants in the Delay condition donated more than the Delay Control condition after meeting the threshold (t = 4.46, p < .001, 95% CI [-0.01, 1.06]). We did not see difference between the Sustainability and Control conditions, or difference between the two controls after the threshold was met. Age did not affect individual donation in the he Sustainability or Delay Condition. However, in the control conditions, older children donated significantly more than younger children (Sustainability Control: z = 2.21, p = .002, 95% CI [1.07, 1.23]; Delay Control: z =4.13, p = .002, 95% CI [1.00, 1.10]).

General discussion

Overall, results of our experiments support the predictions of the *Anthrophilia* Hypothesis. Across all three countries, children were most likely to successfully cooperate to support forest conservation when extrinsic motivation was highest. Even children attending an environmental camp in the U.S. were unlikely to meet the donation threshold without rewards or punishment. Cultural differences and differences in population level resource certainty likely also shape donation preferences. In the second experiment, we demonstrated that even minimal extrinsic motivation boosted cooperation--just the threat of minor time delay between rounds significantly increased success in reaching the threshold in children of all ages. We also found that simulating the costs and benefits of sustainable forest management led to the highest levels of cooperation observed. Children were most successful at working together when they personally experienced loss or gain as a result of their collective decisions around responsibly managing the forest that produced their endowment.

There was limited evidence in support of the *Biophilia* Hypothesis. Intrinsic motives were not strong enough to consistently drive cooperation across nationality or condition. Only a minority of groups succeeded when there was no personal consequence associated with group success or failure. When failure resulted in loss of reward, children in the US and DRC curtailed donations as soon as their own selfish rewards were secured. This suggests children understood how to maximize their individual payoff, but they were only motivated to give minimally when the common-pool good conflicted with their own interest. The exception to this pattern was the Chinese children who donated even after the threshold was met. It may be they understood the rules of the donation games differently. However, all of the children that participated from each country were required to pass the same comprehension check to assure they all understood the game. It seems more likely that the Chinese children's collectivist cultural background encouraged generosity here (Ma et al., 2015). Meanwhile, the perception of forest scarcity, a potential form of resource uncertainty, might have motivated Chinese children higher donations.

Together, these findings suggest that in addition to observing and learning about wildlife and wild places, children benefit from experiencing the decision-making process required to protect common-pool goods like a forest. Future research can better characterize the psychology underlying and developmental trajectory of this form of prosocial behavior directed at nonsocial agent. Infants develop different forms of prosocial helping, sharing and comforting that rely on different types of social cognition and first appear at different time points (Dunfield, 2014). Similarly, the type of donation behavior seen here may rely on a specific set of social cognitive skills. Identifying the associated cognition and understanding its development could help target the time when playing these types of games might have the greatest impact on children. Further, cross-cultural research is also badly needed, especially with children from developing countries with more resource uncertainty or different cultural norms than those tested here. For example, future research will need to replicate the Sustainability condition from Experiment 2 with participants who are not in a conservation related camp and are instead from a range of countries and non-WEIRD cultures. While the results from Experiment 1 suggest a range of children will respond similarly to the extrinsic motivators used in the sustainability condition of Experiment 2, this prediction needs to be tested. It will also be important to test if participation in sustainability simulations translate to participants showing pro-conservation decisions beyond the experimental context (e.g., are participants in these simulations more willing to advocate for conservation initiatives or change their own behavior in real life?). With such knowledge, a powerful new tool will become available to be included in conservation education curriculum. Vital common-pool goods – including forests – will experience enhanced protection. Both people and wild places will benefit.

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Author Contributions: AB and WZ contributed equally to this work and share first authorship. AB is listed first on the paper, but both will each list their names first for this paper on their C.V. AB, JT, WZ, BH designed the study, AB, PW, and WZ analyzed the data. AB, WZ, and BH wrote the manuscript. TS and YS provided resources and supported study implementation.

Supplementary Materials:

Materials and Methods

Figures S1

Tables S1-S9

Appendix S1-S3

External Database S1-S3

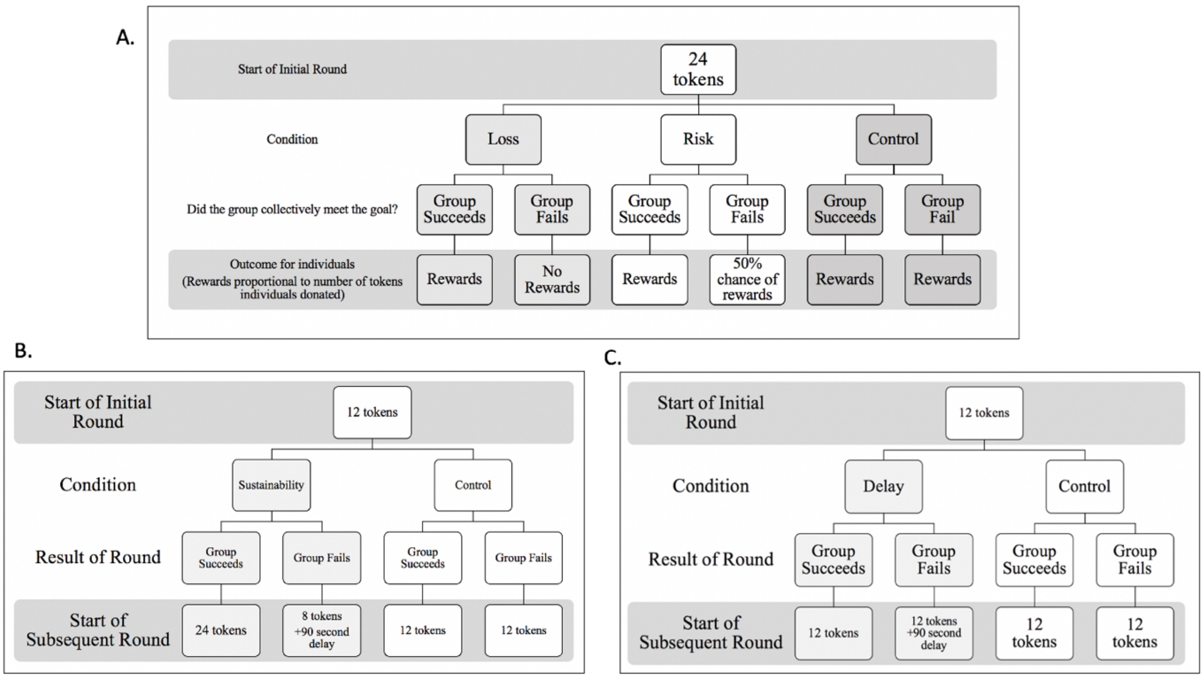

Figure 1. A) Outcomes for conditions in Experiment 1. Group Success indicates if the group collectively gives enough to the collection bank to meet the conservation goal (72 tokens). Reward indicates that individuals in the group can exchange their remaining tokens for rewards. B) Differential outcomes for the Sustainability and Control Conditions in Experiment 2. C) The Delay and Control study in Experiment 2. Success in a round for B and C required the group to collectively donate minimum of 36 tokens.

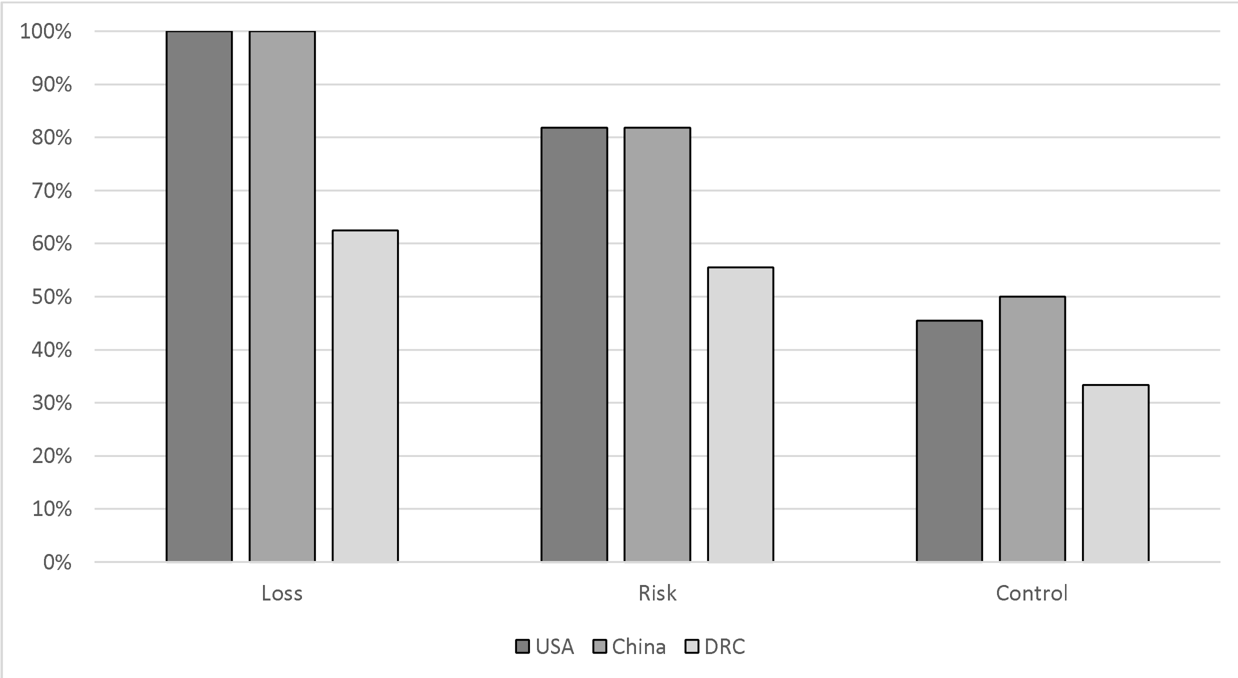

Figure 2. The rate that group donation met the threshold (72 tokens) by condition and country in Experiment 1.

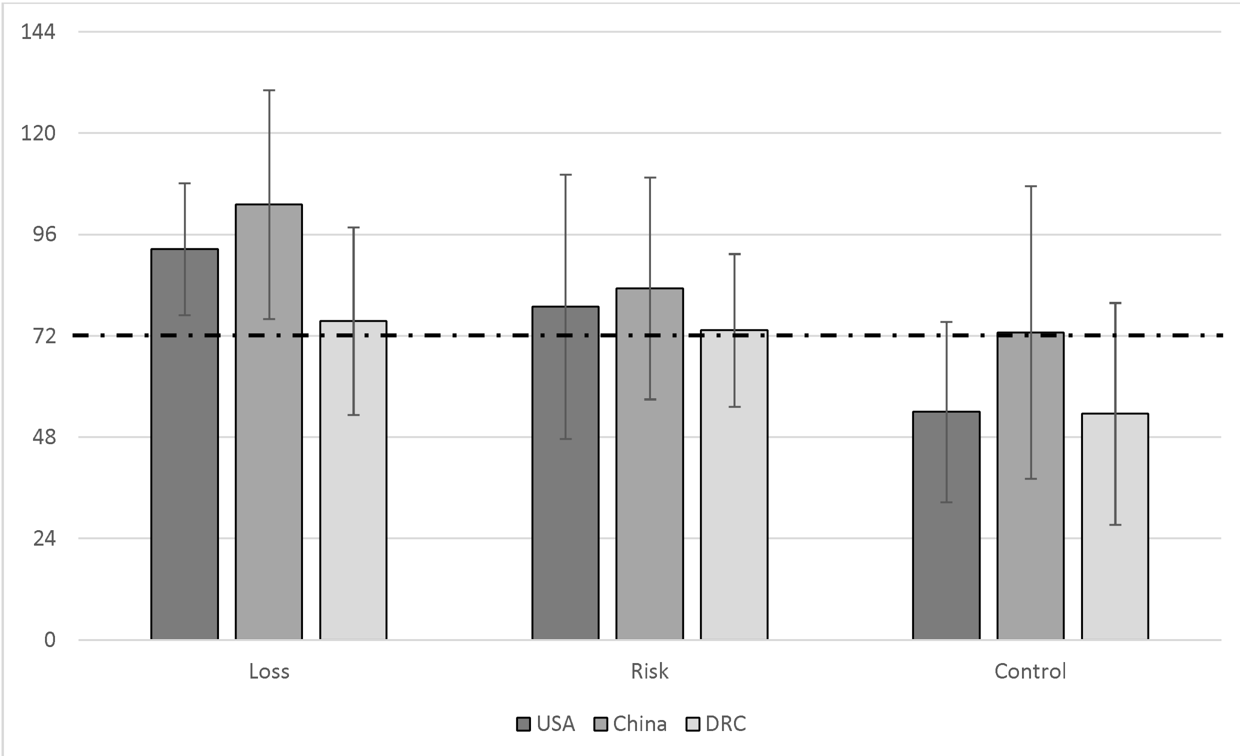

Figure 3. Average group donations by condition and country in Experiment 1. Error bars represent standard deviations. The horizontal dashed line represents the number of tokens (72) needed to reach the conservation threshold.

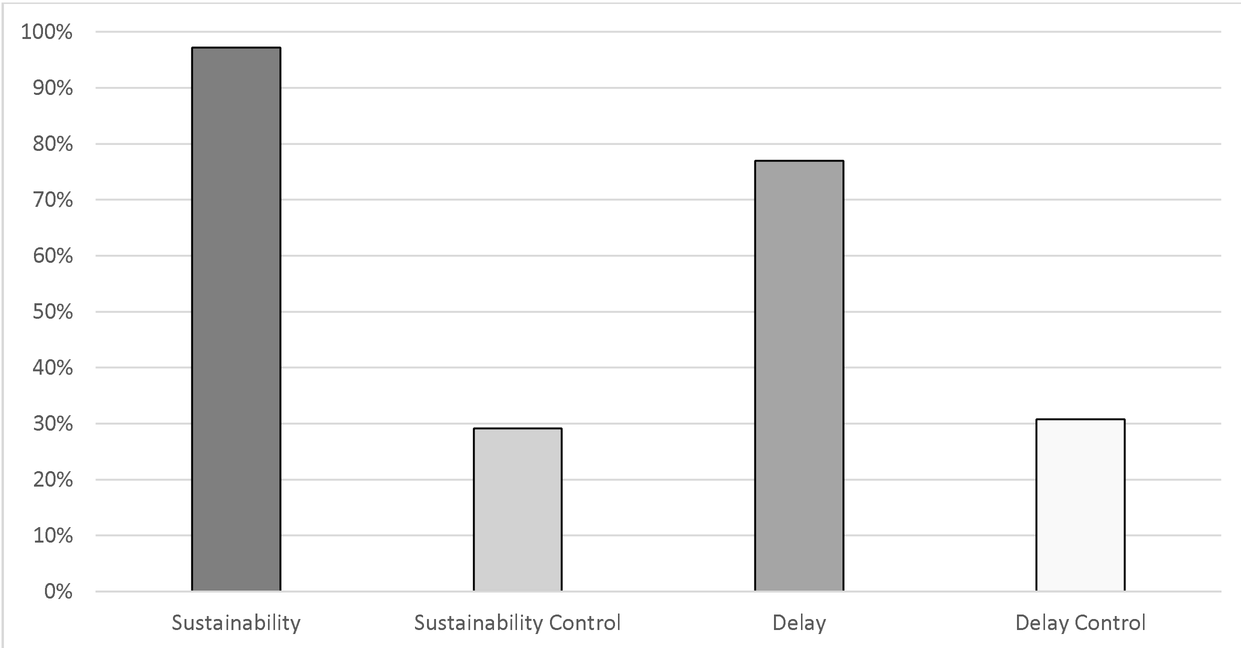

Figure 4. The success rate that group donation met the threshold (36 tokens) by condition in Experiment 2.