



Research article

Understanding the influence of power and empathic perspective-taking on collaborative natural resource management

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ABSTRACT

Public engagement in collaborative natural resource management necessitates shared understanding and collaboration. Empathic perspective-taking is a critical facilitator of shared understanding and positive social interactions, such as collaboration. Yet there is currently little understanding about how to reliably generate empathic perspective-taking and collaboration, particularly in situations involving the unequal distribution of environmental resources or power. Here we examine how experiencing the loss or gain of social power influenced empathic perspective-taking and behavior within a computer-mediated scenario. Participants ($n = 180$) were randomly assigned to each condition: high resources, low resources, lose resources, gain resources. Contrary to our expectations, participants in the perspective-taking condition, specifically those who lost resources, also lost perspective taking and exhibited egoistic behavior. This finding suggests that resource control within the collaborative process is a key contextual variable that influences perspective-taking and collaborative behavior. Moreover, the observed relationship between perspective-taking and egoistic behavior within a collaborative resource sharing exercise suggests that when resource control or access is unequal, interventions to promote perspective-taking deserve careful consideration.

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1. Introduction

Natural resource management decisions are inherently difficult because they require input from multiple groups with competing values and divergent interests (Brown and Harris, 2000; Jacobson and Decker, 2006). Collaborative natural resource management by communities, or in partnership with government institutions, has had its share of failures. Egoistic behavior and failed collaborative management can result in a “Tragedy of the Commons” (Hardin, 1968), where common pool resources (e.g., cod in New England, forests in Maine and water in the Southwest and Mexico) are depleted, resulting in the subsequent collapse and closure of fisheries, the loss of forested habitat, and water shortages.

According to Ansell and Gash (2008), the key to overcoming egoistic behavior and promoting collaborative outcomes is to

develop effective participatory processes that build trust, commitment, and shared understanding among participants (Fig. 1). In their review of 137 cases of collaborative governance, Ansell and Gash (2008) described several key starting conditions (i.e., power-resource-knowledge asymmetries, incentives for and constraints on participation, and prehistory of cooperation or conflict) that “set the basic level of trust, conflict, and social capital that become resources or liabilities during collaboration” (p. 550) (Fig. 1). They also identify shared understanding, created during the collaborative process, as a key factor that can transform combative stakeholders into cooperative partners, promote collaborative behavior and resolve public goods management challenges (Ansell and Gash, 2008). Moreover, others have suggested that fragile social connections contribute to collaborative resource failure (Acheson, 2006). Conspicuously absent from this previous work is any mention of perspective-taking within the collaborative process.

Perspective-taking is a critical component of empathy, and a key precursor of shared understanding and positive social interactions, such as collaboration (Berenguer, 2007, 2008; Eisenberg and Miller, 1987; Galinsky et al., 2005). Defined as the ability to see situations through the eyes of others, perspective-taking is often described as

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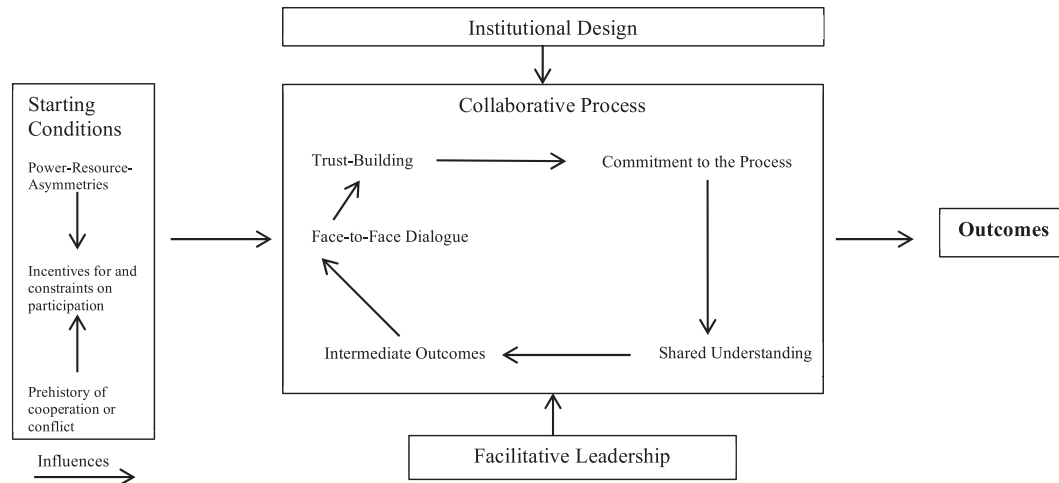


Fig. 1. Simplified version of 'A Model of Collaborative Governance' developed by Ansell and Gash (2008).

a precursor of social coordination, social bonds (Galinsky et al., 2005) and helping behavior (Cialdini et al., 1997). There is a well-established conceptual basis for the relationship between perspective-taking and prosocial behavior (see Eisenberg and Miller, 1987; Berenguer, 2007, 2008; Galinsky et al., 2005). Previous studies have found that asking participants to consider the perspective of others can increase helping behavior (Batson, 1994; Cialdini et al., 1997). Yet our current understanding of how to encourage empathic perspective-taking in the context of natural resource dilemmas is confused at best (Acheson, 2006). Alternative research suggests that perspective-taking, specifically considering others' motivations for self-interested behavior, can encourage selfish behavior (Miller, 1999) and reactive egoism (i.e., where expectations of self-serving behavior by others can contribute to egoistic behavior among participants) (Epley et al., 2006).

If, as previous research suggests, perspective-taking is a precursor of shared understanding and collaborative behavior, and if fragile social connections contribute to resource failure, then it is vitally important to explore the individual factors of the person and contextual variables that may influence whether stakeholders take the perspective of others and develop strong social connections that facilitate collaborative natural resource decisions. Gaps in the current knowledge are a critical barrier delaying collaborative, evidence-based decision-making for resource management, and encouraging the persistence of ineffective interventions. Thus, the objectives of this study are (1) to explore how shifting control of natural resources throughout a collaborative natural resource simulation influences participants' perspective-taking abilities and collaborative behavior and (2) propose a new framework for collaborative decision-making that includes both contextual and individual influences as key factors affecting the collaborative process.

2. Background

2.1. Empathic perspective-taking

Perspective-taking allows us to imagine what a character in a movie is feeling or to imagine what it feels like to walk in someone else's shoes. "To be considerate, even in small ways, one needs empathic perspective-taking" (De Waal, 2009, p. 110). While the full array of empathy can involve multiple components, key among these factors is the skill of perspective-taking, also called empathic perspective-taking (Preston and de Waal, 2002).

Two important components of perspective-taking play a critical

role in promoting collaborative behavior: individual perspective-taking (the cognitive process of imagining the experiences of another) and macro perspective-taking, which includes the social, political, and economic context for the social realities of the lives of other people (Segal et al., 2012). Individual perspective-taking facilitates social bonds with new groups or individuals (Galinsky et al., 2005). Individual perspective-taking is the foundation on which the macro perspective-taking components can be developed (Segal et al., 2012). Macro perspective takers are interested in understanding why people are poor, understanding the political perspectives or opinions of people who are different from them, and helping people of a different race or ethnicity. Both types of perspective-taking are key in decreasing prejudice, facilitating social coordination (Galinsky et al., 2005), and improving intergroup attitudes and relationships (Batson et al., 1997). Without individual perspective-taking, a person is not able to have macro perspective-taking. Both individual and macro perspective-taking skills are individual-level factors that could influence an individual's ability and willingness to collaborate.

2.2. Perspective-taking and prosocial behavior

Within our research, we treat perspective-taking as it has historically been treated in the psychological literature, as a vital and instrumental determinant of successful prosocial behavior (Eisenberg and Miller, 1987). There is strong theoretical and empirical support for the connection between perspective-taking and socially responsible behavior (Eisenberg and Miller, 1987; Hoffman, 2000; Segal et al., 2012). Broadly, empathy can improve intergroup attitudes and relations (Batson et al., 1997; Stephan and Finlay, 1999), promote social interaction (Gerdes and Segal, 2009), civic engagement (Miaskiewicz and Monarchi, 2008), and social tolerance (Segal et al., 2012). More specifically, perspective-taking can increase social competence, generate a sense of psychological closeness between individuals, and increase mimicking behavior, which enhances social bonds (Galinsky et al., 2005), helping behavior (Cialdini et al., 1997), coordinated interactions, and collaborative behavior (Müller et al., 2012; van Baaren et al., 2009). Collaborative behaviors are included in the broad domain of prosocial behaviors, which include voluntary or intentional actions aimed at enhancing outcomes for others and for oneself (Eisenberg and Miller, 1987). Collaborative management of natural resources is a subtype of prosocial behavior.

2.3. Perspective-taking, resource control, and collaborative behavior

The original collaborative governance framework developed by Ansell and Gash (2008) assumes that institutional design (i.e., participatory inclusiveness, clear ground rules, process transparency and forum exclusiveness), facilitative leadership and additional starting conditions (i.e., incentives for and constraints on participation, and prehistory of cooperation or conflict) are also important predictors of collaborative outcomes. Using an experimental approach allows us to focus on each of these components individually. However, manipulating all of these conditions is not feasible. Therefore, we will control institutional design factors and facilitative leadership and focus instead on the starting conditions of the collaborative process that can expedite or discourage cooperation (Ansell and Gash, 2008). Within collaborative natural resource management, *power* is the ability to control resources and influence decision-making (Fiske, 1993; Reed, 2008). Perceived power over resources can also influence incentives to participate in and collaborate during collaborative decision-making processes (Imperial, 2005). When resources are scarce and distributed unequally, collaborative processes are more prone to manipulation by powerful stakeholders, including the exclusion of less powerful stakeholders from the process (Ansell and Gash, 2008; Leach, 2006). Power, particularly perceived social power, is an important starting condition of collaboration that can both increase and decrease empathic accuracy (Côté et al., 2011) and reduce the ability to understand others' thoughts, feelings and point of view (Galinsky et al., 2006). Despite the theoretical significance of social power within collaborative resource management, there is little to no empirical evidence about how this critical component influences perspective-taking during the collaborative process. There is currently no comprehensive framework on power in collaborative settings (Huxham and Vangen, 2005) and minimal empirical data on how individuals and groups respond to asymmetric power dynamics within collaboration (Ostrom, 2011).

To address this gap, this study tests hypotheses about the relationship between resource control, perspective-taking, and collaborative outcomes and explores the following questions about what happens to this relationship when participants start and end with asymmetrical levels of resource control (power).

Research Question 1: To what extent does losing control over natural resources influence perspective-taking and collaboration behavior?

Research Question 2: To what extent does gaining control over natural resources influence perspective-taking and collaborative behavior?

The treatment version of this experiment was designed to arouse perspective-taking, therefore, we expect to see an increase in perspective-taking scores among the treatment groups. However, we also expect to see an interaction between power and perspective-taking. We propose that gaining resources will make players feel more powerful, which will result in lower posttest perspective-taking scores after the simulation.

H1. Participants from groups that gain resources (start low | end high) will report lower posttest perspective-taking scores than groups that lost resources (start high | end low) or maintained the same resource level.

Given the theoretical connection between perspective-taking and prosocial behavior, if shifting power reduces posttest perspective-taking scores, it should also reduce collaborative behavior. We expect this relationship to be particularly important for groups that gained resources during the collaborative situation. There are conflicting examples of elevated social power levels

encouraging increased cooperation (Galinsky et al., 2006) and interacting with social orientations that promote selfishness (Chen et al., 2001). There are few examples of research exploring the connection between power and collaborative behavior; however, in a recent example, researchers found that increasing player wealth within a rigged Monopoly game (i.e., twice the starting paper money, additional dice, and additional resources throughout the game, such as a higher bonus for passing go) led to displays of dominance and aggression among the powerful players (Piff, 2013). While we believe that gaining resources within a collaborative process encourages egoistic behavior, we believe that losing resources encourages participants to imagine what it feels like to walk in someone else's shoes and results in increased perspective-taking and collaborative behavior. We therefore predicted that elevated power levels would reduce perspective-taking scores.

H2. Groups that gain resources (start low | end high) will contribute less than groups that lost resources or maintained the same resource level.

3. Method

3.1. Computer simulation

We tested our hypotheses by measuring perspective-taking and collaborative behavior before and after participation in a computer simulated threshold public goods experiment (CS). The CS artifact was designed as a complement to the WaterSim model, developed by the National Science Foundation-supported Decision Center for a Desert City (Gober et al., 2011; Sampson et al., 2011). WaterSim is a web-based tool for public deliberation on and exploration of urban water planning decisions in central Arizona (Hu et al., 2012). We chose a gamification approach to handle our complex real-world scenarios and engage the user in an interactive experience (Detarding et al., 2011). The game modules were designed as independent and reconfigurable modules, allowing us to add and remove new scenarios or combinations of scenarios easily.² In 2013, we evaluated our CS artifact using pilot experiments to verify the accuracy of the database and logging service, data collection efficiency, and human-centered design requirements. Using field tests, we verified the accuracy of the player events as they are captured through the logging service and data persistence.

Perspective-taking can be manipulated and stimulated using images or videos of people or animals being harmed (Batson et al., 2002; Berenguer, 2007; Shultz, 2000; Shelton and Rogers, 1981). Methods to induce perspective-taking have included "manipulation of observational sets, manipulations of actual physiological arousal, manipulations of attributions regarding one's own arousal, similarity manipulations, ...and empathic mood inductions" (Eisenberg and Miller, 1987, p.93). Picture/story procedures were originally designed to measure empathy in young children (Feshbach and Roe, 1968).³ Previous studies using picture/story

² To develop the scenarios, we used Microsoft's C# programming language and MVC framework, which allowed a simulation that provides real-life experiences to game participants. We used software libraries such as JQuery, HTML5, allowing for asynchronous users.

³ It is important to note that extensive research on empathy and prosocial behavior has been conducted with children. Because our intervention addresses collaboration between adults, we have not described this research in-depth. However, we are familiar with this line of research that suggests that modeling, positive reinforcement and empathic arousal can promote prosocial behavior among children (e.g., Eisenberg and Mussen, 1989; Eisenberg et al., 2006; Hastings et al., 2007). Unfortunately, these results have been mixed and inconclusive, which has contributed to additional gaps in current understanding of how to effectively enhance prosocial behavior.

measures to arouse perspective-taking have found no connection between empathy and prosocial behavior (Eisenberg and Miller, 1987). In addition, most of these measures focus primarily on an affective response to others' emotions rather than a cognitive or perspective-taking response. Our CS artifact was focused primarily on arousing perspective-taking and we used a pre- and post-test survey (see below) to confirm the manipulation.

This study, featuring a controlled experimental design including random assignment to condition, offers a very strong test of our conceptual model and will allow us to better isolate the effects of our proposed independent variables. This strength is crucial because there are several individual differences (e.g., extraversion, trait dominance) that might simultaneously influence empathy and collaboration. By randomly assigning participants to a condition and then isolating and manipulating only our variable(s) of interest, we ensure that the mean level of all other individual differences is evenly distributed across conditions, and thus that our manipulations are responsible for any observed variance in outcomes. This method also enables us to test the causal nature of our proposed relationships. This strength is also critical given that many of our variables (prosocial behavior, empathy), are inherently social, and therefore potentially recursive in nature. It might be argued, for instance, that observed attempts at collaboration foster perspective-taking, rather than perspective-taking driving collaboration, as we have proposed. Our experiments will enable us to manipulate perspective-taking and then observe the causal impact of these changes on prosocial behavior, rendering reverse causality an unlikely explanation for any observed results.

3.2. Survey

Questionnaire measures of empathy have previously been used to infer a relationship between empathy and prosocial behavior (see Mehrabian and Epstein, 1972 - scale of emotional tendency; Stotland et al., 1978 - Fantasy-Empathy Scale; and Davis, 1980, 1983a, 1983b). Previous research using survey measures have found a significant relationship between empathy and prosocial behavior (Eisenberg and Miller, 1987). Eisenberg and Miller (1987) suggest that surveys are a more appropriate measure of the relationship between empathy and prosocial behavior than picture/

story measures because they measure multiple items and situations and are generally designed to distinguish between the affective and cognitive components of empathy and specifically tap perspective-taking. Before and after participating in the simulation, players were asked to complete a survey. The survey instrument, the Social Empathy Index (SEI), assesses levels of empathy influenced by cultural differences, social situations, and political and economic conditions (Gerdes et al., 2011b; Lietz et al., 2011; Segal et al., 2012) and has been previously validated, tested and theoretically supported (Gerdes et al., 2011a; Segal, 2011, 2014; Segal et al., 2012). The SEI includes 22 items measuring interpersonal empathy, including five perspective-taking items and an additional seven items addressing two macro components of empathy, including macro self-other awareness/perspective-taking. To minimize social desirability effects, the instrument is titled "Human Relations Survey." Responses range from 1 (never) to 6 (always).

3.3. Participants

Undergraduate and graduate students from a public university in the Southwestern United States were recruited as participants for course credit ($n = 180$). Participants were randomly assigned to groups (start high resource or start low resource) that were nested within classes and then the classes were randomly assigned to treatment or control conditions (Fig. 2). The experiment was based on a between-participants design with four conditions: control conditions with either high resource groups (start high | end high) or low resource groups (start low | end low) that stay the same and treatment conditions with groups that lose resources (start high | end low) or gain resources (start low | end high). There were 22 control groups split evenly between start high | end high groups and start low | end low control groups and 16 treatment groups split evenly between start high | end low and start low | end high treatment conditions. Groups were composed of 2–5 players.

3.4. Design and treatment

Each experiment included multiple rounds of a variation of a threshold public goods experiment where personal resources are

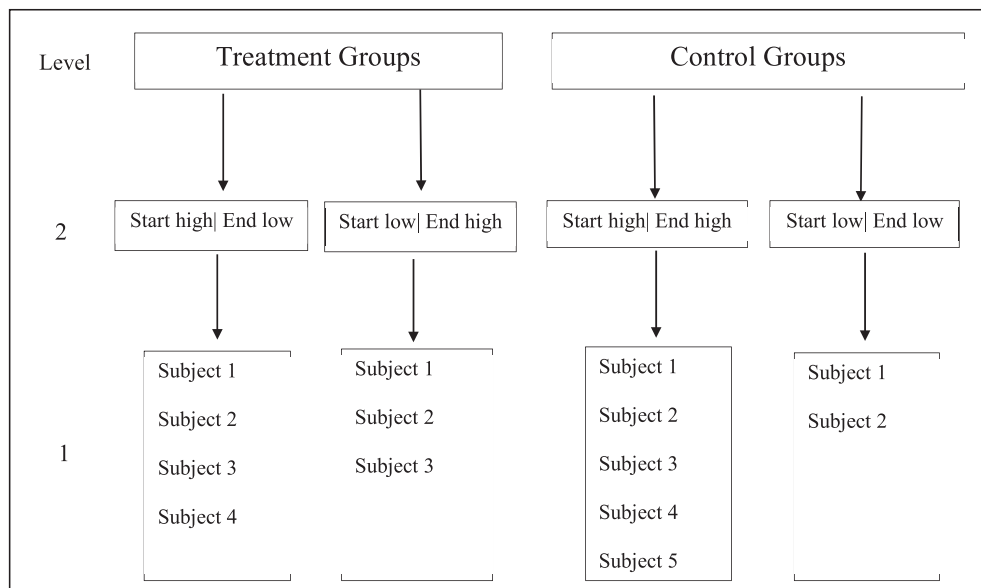


Fig. 2. Diagram of multilevel model of subjects within groups.

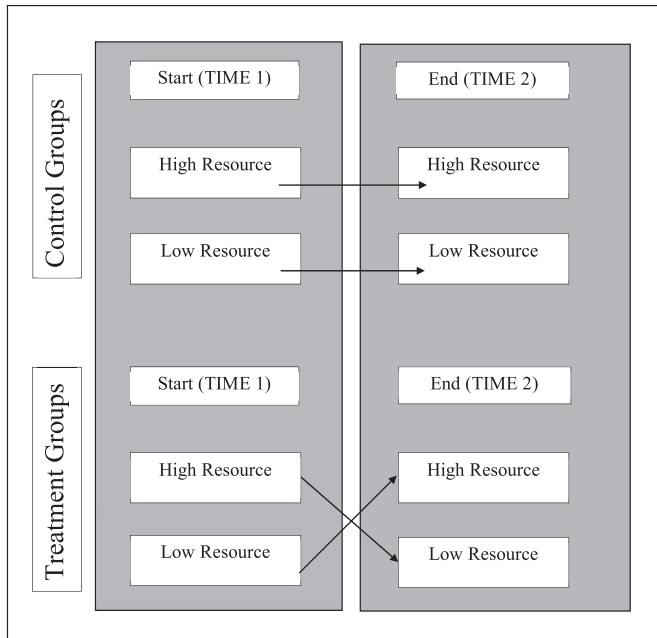


Fig. 3. Group starting and ending resource conditions in the 'joint reservoir project'.

risked for positive collective outcomes. Collective action problems, such as the joint management of natural resources, have traditionally been described as social dilemmas and have been modeled experimentally using prisoner's dilemma games and public goods experiments (Ostrom, 2000). The focus of this natural resource management experiment was joint decisions about water use and management. The intervention began with information about water use in the Phoenix metropolitan area. Both treatment and control classes played the first round of the simulation in the same way. Groups that started with higher resources were told that they represented the city of Phoenix and had a total of 100 water units to allocate. Groups starting with lower resources were informed that they represented the city of Surprise and had a total of 70 water units to allocate (see Fig. 3). In the first exercise, players were asked to allocate city resources (water units) across five water categories: residential, industrial, agricultural, urban development, and environmental. Players did this first as individuals and then as members of their assigned groups/cities (Phoenix or Surprise). Next, players were asked to donate city-owned water resources to support the development of a collaborative water project between the cities of Phoenix and Surprise (the 'Joint Reservoir Project'). Participants were told that the water stored in the Joint Reservoir Project would be used to sustain residential and city services in drought years. A minimum joint contribution of 120 water units was required to establish the reservoir (the threshold) that would benefit all the groups by increasing their overall water budgets in future years. Successful groups, those that reached the threshold, doubled the contributions available for future use. Groups that failed to reach the threshold lost their individual contributions. Groups were encouraged to discuss their decisions within their groups, but not with other groups. Pairs of Phoenix and Surprise teams were intentionally dispersed widely so that they could not interact during the deliberation. All groups submitted their contributions at the same time. The simulation disclosed the results only after all of the groups had submitted their decisions. After completing one round of the threshold public goods game, participants were asked to disclose whether their groups were successful or not.

Prior to round two, treatment classes were told that they would

swap cities in the next round: representatives of Phoenix would move to Surprise and lose resource (water) units (start high | end low) and representatives of Surprise would move to Phoenix and gain water units (start low | end high). While water units changed, group composition, location in the room and membership did not. Control classes remained in the same low resource (start low | end low) and high resource (start high | end high) groups to play the second round (see Fig. 3).

3.5. Group contribution (group-level measure)

Group contribution was measured as the total number of water units contributed in the threshold public goods game (the Joint Reservoir Project) (range 0–120) during the two rounds of play (time 1 and time 2). Because starting resource units (i.e., 70 or 100) varied between groups, we transformed all of the contribution amounts by dividing the responses by the total resource units available at the start of each round. The original dataset included a single contribution level for every player; since this value was the same across groups, we collapsed this item into a single group value.

3.6. Analysis

Perspective-taking items (5 individual and 7 macro) were tested for reliability using Cronbach's α and item analysis; $\alpha > 0.70$ was considered acceptable (Nunnally, 1978; Vaske, 2008).

We used SAS v.9.4 to conduct two three-level models (model 1A and model 1B) to explore how group starting and ending resource levels influenced individual and macro perspective-taking. Individual and macro perspective-taking were the outcome variables for model 1A and model 1B, respectively. We also ran one two-level model (model 2) to explore how group starting and ending power levels influenced group contribution. Group contribution was the outcome variable in model 2. All of the models included time as a repeated measure. Across all of the models, group membership was the top-level experimental unit of the model (2 or 3; see Fig. 4) and start resources and end resources were included as fixed factors at the group level. A restricted maximum likelihood (RML) approach was used to estimate the models. The criterion for statistical significance was $p \leq 0.05$.

4. Results

4.1. Preliminary analyses

Participants were more likely to be female (54%) than male (46%) and the average age was 22. Most of the respondents described their race or ethnicity as Caucasian (54%) followed by Hispanic (15%), Asian (9%), and African American (4%) participants. Participants indicated 21 distinct academic majors, including public policy and administration (18%), criminology (10%), health and medicine (9%), business (8%) and communication (7%).

Residual plots indicated there were no major concerns about normality. Both the 5-item individual perspective-taking scale ($\alpha = 0.715$) and the 7-item macro perspective-taking scale ($\alpha = 0.804$) were reliable. Both perspective-taking scales were collapsed into a single item with a range of 1–6 (Table 1).

4.2. Linear mixed models results

Mean scores for perspective-taking and contribution for all combinations of group start resource and end resource levels suggest that group responses varied between time 1 and time 2 (Table 1). Hypothesis 1 proposed that shifting resource levels

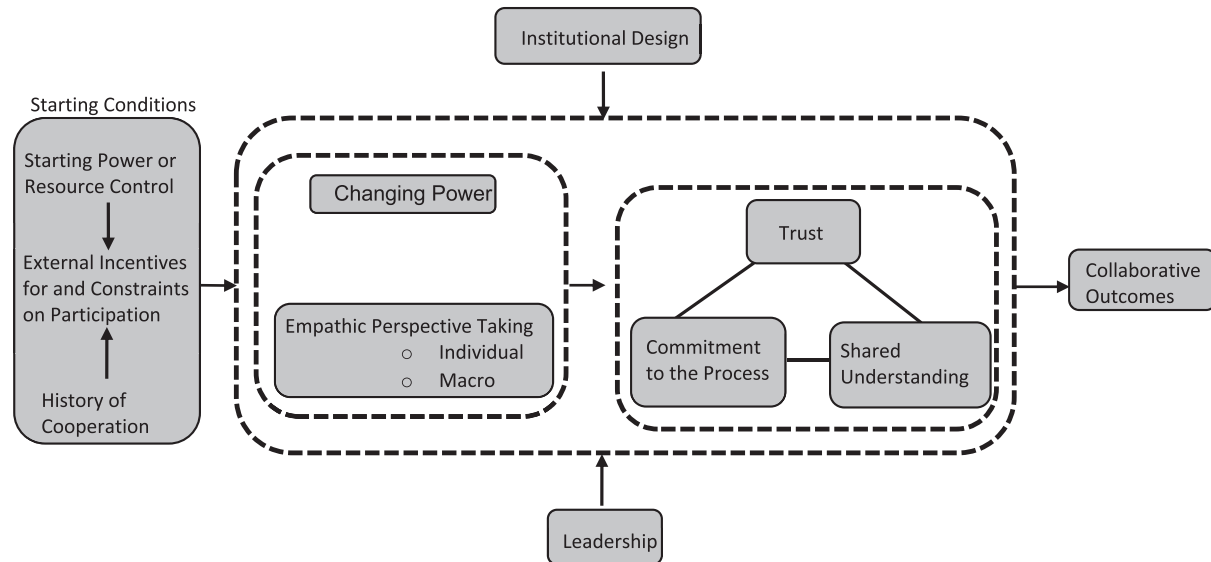


Fig. 4. Integrated intellectual framework illustrating the proposed relationships between two key contextual and individual variables (empathy and power) and the collaborative process.

would reduce perspective-taking; specifically, participants from groups that gained resources would report lower perspective-taking scores after the simulation compared to groups that lost resources or stayed the same. We tested this hypothesis by fitting two 3-level models with the same fixed effects (StartRes, End Res, and Time; Table 2). Our subjects were students and the dependent variables were individual perspective-taking scores (model 1A) and macro perspective-taking scores (model 1B). There was a significant effect of StartRes*EndRes on individual perspective-taking. There were no differences in perspective-taking at time 1. At time 2, the low resource control groups had higher scores on perspective-taking than the treatment groups that lost resources (see Table 1) Estimate(SE) = 0.514(0.159); $t(DF) = 61.64(3,23)$, $p = 0.002$. There were no significant fixed effects of starting resources, ending resources or time on macro perspective-taking.

Hypothesis 2 predicted that treatment group participants who gained resources would decrease their contribution from round 1 to round 2. We tested this effect by fitting a 2-level model with start resources and end resources as group-level covariates, time as a within-group factor and contribution as the dependent variable (Table 3). There was a significant effect of StartRes*EndRes on group contribution. There were no significant differences between the groups at time 1; however, at time 2, there were significant differences in contribution between the control groups and the treatment groups that lost resources. Low resource control groups contributed more at time 2 than the treatment groups that lost

resources Estimate(SE) = 0.247(0.106); $t(DF) = 2.34(21.91)$, $p = 0.0290$. The treatment groups that lost resources contributed less at time 2 than the high resource control groups Estimate(SE) = -0.213(0.092); $t(DF) = -2.32(13.68)$, $p = 0.0364$.

As expected, perspective-taking scores and collaborative behavior changed as a result of participation. However, instead of an increase in posttest perspective-taking scores in treatment groups that lost resources (start high | end low), these groups reported lower perspective-taking scores compared to control groups that maintained the same resource level. Additionally, treatment groups that lost resources (start high | end low) contributed less than groups that maintained the same resource level. Thus, these findings suggest that our CM simulation influenced perspective-taking and collaboration, but did not support the direction of our hypotheses. Instead of improving perspective-taking and collaboration, our simulation reduced these important variables.

5. Discussion

Public engagement in natural resource management decisions will require the use of communication tools that build trust and shared understanding among diverse groups with disparate perspectives and different levels of resource control. This research explored whether a computer simulation could be used to influence perspective-taking and encourage collaborative action and how resource asymmetries during the collaborative process

Table 1
Descriptive statistics for dependent variables.

	Time	Individual Perspective-taking	Macro Perspective-taking	Contribution
		Estimate (SE)	Estimate (SE)	Estimate (SE)
Start High End High	1	4.58 (0.102)	4.65 (0.112)	0.748 (0.063)
Start High End High	2	4.69 (0.106)	4.69 (0.109)	0.840 (0.063)
Start Low End Low	1	4.47 (0.116)	4.51 (0.121)	0.723 (0.073)
Start Low End Low	2	4.39 (0.116)	4.43 (0.123)	0.681 (0.073)
Start High End Low	1	4.36 (0.118)	4.39 (0.127)	0.602 (0.085)
Start High End Low	2	4.18 (0.120)	4.22 (0.129)	0.593 (0.085)
Start Low End High	1	4.49 (0.102)	4.52 (0.111)	0.764 (0.034)
Start Low End High	2	4.43 (0.103)	4.46 (0.111)	0.806 (0.034)
Range		1–6	1–6	0–1

Table 2

Two-level model results predicting perspective-taking.

	Model 1A Individual Perspective-taking	Model 1B Macro Perspective-taking
Fixed-Effect Parameter	Estimate (SE) ^a	Estimate (SE) ^a
β_0 (Intercept)	4.427(0.10)	4.458(0.11)
β_1 (Start Resources)	−0.036(0.16)	−0.032(0.17)
β_2 (End Resources)	−0.245(0.16)	−0.238(0.17)
β_3 (StartRes*EndRes)	0.551(0.22)	0.511(0.24)
β_4 (Time)	0.066(0.11)	0.066(0.11)
β_5 (StartRes*Time)	0.011(0.16)	0.021(0.16)
β_6 (EndRes*Time)	0.108(0.17)	0.114(0.16)
β_7 (StartRes*EndRes*Time)	−0.302(0.24)	−0.244(0.23)
Covariance Parameter	Estimate	Estimate
σ^2_{group}	−0.014	−0.037
$\sigma^2_{\text{subject}(\text{group})}$	0.277	0.471
σ^2_e	0.253	0.232
Model Information Criteria		
−2 REML log-likelihood	626.0	676.6
AIC	642.0	682.6
BIC	646.9	687.5
Tests for Fixed Effects	Type III F-Tests ^b	Type III F-Tests ^b
Intercept	t = 42.77, df = 61, p < 0.0001	t = 40.06, df = 54, p < 0.0001
Start Resources	F = 3.28, df = 1,30.5, p = 0.079	F = 2.79, df = 1,31, p = 0.105
End Resources	F = 0.01, df = 1,30.5, p = 0.921	F = 0.02, df = 1,31, p = 0.899
StartRes*EndRes	F = 4.58, df = 1,30.5, p = 0.040	F = 3.52, df = 1,31, p = 0.070
Time	F = 0.74, df = 1,147, p = 0.392	F = 1.62, df = 1,143, p = 0.206
StartRes*Time	F = 1.40, df = 1,147, p = 0.238	F = 0.78, df = 1,143, p = 0.377
EndRes*Time	F = 0.13, df = 1,147, p = 0.721	F = 0.01, df = 1,143, p = 0.943
StartRes*EndRes*Time	F = 1.63, df = 1,147, p = 0.204	F = 1.15, df = 1,143, p = 0.286

^a SAS zero's out the last category for each categorical variable. Thus, even though Start Resources has two levels, the second level is zero and the estimate in the table for β_1 is for StartResources = 1. The same is true for EndResources and the interaction between StartRes*EndRes.

^b The test reported for the intercept differs from the tests for the other fixed effects in the model.

influence decision-making within the context of a resource-sharing dilemma.

Our results have important implications for collaborative processes, which ask participants to share resources, decision-making authority, or power for the collective good. Results suggest that participants react to the loss of resources, control, or power by turning away from others, becoming less empathic, and more selfish. Therefore, power is not only a starting condition required for collaboration (as it was described by [Ansell and Gash, 2008](#)) but also an important factor within the collaborative process that affects whether collaborative processes result in shared understanding or collaborative failure. Our findings indicate that just as increasing power can, in some cases, promote selfishness ([Chen et al., 2001](#)), losing power can also reduce perspective-taking and encourage egoistic behavior. Disparities in power, ubiquitous in real world governance challenges, are described as key barriers to meaningful collaboration because such disparities prevent less powerful stakeholders from participating in the decision-making process ([Ansell and Gash, 2008](#)). Powerful players can dominate the collaborative process or take self-interested action that excludes important stakeholders and thwarts collaboration ([Ansell and Gash, 2008](#); [Leach, 2006](#); [Leach et al., 2002](#); [Purdy, 2012](#)). When resources are scarce and distributed unequally, collaborative processes are more prone to manipulation by powerful stakeholders ([Ansell and Gash, 2008](#); [Leach, 2006](#)). The common theoretical assumption is that collaborative natural resource processes can overcome these inequalities in power by generating perspective-taking, which promotes shared understanding and leads to prosocial behaviors (i.e., collaborative outcomes). However, by asking participants to share resources for the collective good, the

collaborative process effectively shifts resource control and power dynamics (e.g., losing or gaining resources, access to resources). This research suggests that losing power within the collaborative process can reduce perspective-taking and prevent prosocial behavior and challenges the aforementioned assumption that perspective-taking within the collaborative process automatically leads to prosocial behavior. Thus, we propose a new framework for collaborative governance that treats power and empathic perspective-taking as contextual variables that influence participants' trust, commitment to the process and shared understanding within the collaborative process ([Fig. 4](#)). While additional research is necessary to confirm the proposed framework, the current study suggests that both starting power or resource control and shifting power within the collaborative process are important predictors of empathic perspective-taking and collaborative behavior. Thus, we present these as separate variables in our proposed framework.

Collaboration is described as “a process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible” ([Gray, 1989](#), p. 5). The observed correlation between lower perspective-taking scores and reduced donations to the collaborative threshold public goods game provide support for the theoretical relationship between perspective-taking and collaborative behavior and add to the growing body of evidence identifying perspective-taking as a significant and important precursor of prosocial behavior and collaboration. Our proposed model of collaborative governance recognizes the importance of perspective-taking as another key variable that may directly, or in combination with power dynamics, influence behavior within the collaborative process. The framework is

Table 3
Three-level model results predicting contribution.

Model 2 Contribution	
Fixed-Effect Parameter	Estimate (SE) ^a
β_0 (Intercept)	0.806(0.03)
β_1 (Start Resources)	−0.124(0.08)
β_2 (End Resources)	−0.213(0.09)
β_3 (StartRes*EndRes)	0.372(0.133)
β_4 (Time)	−0.041(0.02)
β_5 (StartRes*Time)	0.083(0.091)
β_6 (EndRes*Time)	0.051(0.110)
β_7 (StartRes*EndRes*Time)	−0.185(0.161)
Covariance Parameter	Estimate
σ^2_{group}	0.011
$\sigma^2_{e,11}$	0.033
$\sigma^2_{e,12}$	0.031
$\sigma^2_{e,21}$	0.047
$\sigma^2_{e,22}$	0.002
Model Information Criteria	
−2 REML log-likelihood	−35.8
AIC	−25.8
BIC	−17.6
Tests for Fixed Effects	Type III F-Tests ^b
Intercept	t = 23.38, df = 9, p < 0.0001
Start Resources	F = 1.15, df = 1,49.1 p = 0.288
End Resources	F = 0.81, df = 1,49.1 p = 0.372
StartRes*EndRes	F = 6.97, df = 1,49.1 p = 0.011
Time	F = 0.26, d = 1,15, p = 0.620
StartRes*Time	F = 0.01, d = 1,15, p = 0.908
EndRes*Time	F = 0.27, d = 1,15, p = 0.612
StartRes*EndRes*Time	F = 1.31, df = 1,49.1, p = 0.270

^a SAS zero's out the last category for each categorical variable. Thus, even though Start Resources has two levels, the second level is zero and the estimate in the table for β_1 is for StartResources = 1. The same is true for EndResources and the interaction between StartRes*EndRes.

^b The test reported for the intercept differs from the tests for the other fixed effects in the model.

presented as a linear relationship, but the authors recognize that these relationships are more likely dynamic and circular. Future research should explore collaborative processes as dynamic systems that involve shifting power dynamics, which influence perspective-taking, trust, shared understanding and commitment to the process.

Previous research has suggested that perspective-taking can, in some cases, lead to egoistic behavior, as it did in this study. In previous experiments involving simulated resource allocation negotiations, Epley et al. (2006) reported that perspective-taking within competitive interactions contributed to a focus on other players' concerns and interests, which increased egoistic (selfish) behavior and led to resource taking instead of sharing. Epley et al. (2006) also found that cooperative conditions in which participants had shared interests did not generate the same reactive egoistic behavior in response to a perspective-taking prompt. In the simulation used for this research, participants who successfully collaborated in the threshold public goods game were rewarded with equal resources, regardless of what they initially contributed. Given the collaborative nature of our simulations, we were expecting the perspective-taking condition to prevent egoistic behavior. Yet despite designing a computer simulation to promote perspective-taking, participants in the perspective-taking condition reported decreased perspective-taking scores over time and groups that lost resources behaved egoistically and decreased contributions to the collaborative game. In the following

paragraphs, we explore several potential reasons why our data failed to support our hypotheses.

Communication is a key predictor of the success and efficiency of collaborative management and collective action (Ostrom, 2000) to conserve a common resource pool (e.g., Dawes et al., 1977; Jorgenson and Papciak, 1981; Ostrom and Walker, 1989). Communication can promote norms that encourage cooperation and facilitate the development of group identity that can motivate prosocial action (Ostrom and Walker, 1989). It is possible that the climate of communication, defined as “an atmosphere within a team characterized by open, supportive communication, speaking up, and risk taking” (Gibson and Gibbs, 2006, p. 456) shifted after treatment participants experienced the perspective-taking condition. The dynamic structural arrangements and shifting rules may have reduced trust and process predictability, which prevented risk-taking activities (e.g., a larger contribution at time 2). Changes in the structure of the game and the rules (e.g., asking participants to swap roles) may have shifted the climate from a psychologically safe space where participants were willing to share opinions, respect other's ideas and perspectives, and take calculated risks (Edmondson, 1999) to a climate that created uncertainty, fear of failure, and heightened perceptions of risk, which reduced participant prosocial behavior in the second round. When outcomes are uncertain, heightened concerns about negative consequences can contribute to greater perceptions of risk and can make management goals and objectives more difficult to achieve (Johnston et al., 2011; Sitkin and Pablo, 1992). Since both treatment groups experienced a shift in the game and the rules but only the groups that lost resources (start high | end low) exhibited egoistic behavior, this alternative explanation seems unlikely.

Ostrom (2000) described a number of factors that influence contributions to a public good that might have affected our experimental results, including the framing of the situation and communication between participants. Framing within public good experiments influences participant behavior (see Andreoni, 1995; Elliott et al., 1998; Cookson, 2000; Park, 2000; Pruitt, 1967, 1970; Willinger and Ziegelmeyer, 1999). Frames that emphasize teamwork can increase cooperation (Sonnemans et al., 1998). Positive framing, emphasizing that a contribution will have a public good, and a positive benefit for other participants, has been found to generate more prosocial behavior than framing a contribution as a prevention of a public bad, which will make the other subjects worse off (Andreoni, 1995; Park, 2000; Sonnemans et al., 1998; Willinger and Ziegelmeyer, 1999). Subjects consistently contribute more under positive framing conditions than negative ones. However, additional research has suggested this gap occurs only within a repetitive game (Willinger and Ziegelmeyer, 1999). Other researchers have suggested that it is not necessarily the perception of public good that induces greater collaboration but perceptions of other players' contributions that drive this response (Willinger and Ziegelmeyer, 1999). Beliefs about other players' potential contributions can generate normative concerns about fairness and reciprocity that encourage an individual to contribute or defect (Dawes et al., 1977; Rege and Telle, 2004). “If the framing of the public good game makes a person more optimistic about other people's adherence to a norm for cooperation, then his dominant strategy may no longer be to defect” (Rege and Telle, 2004, p.1631). It is possible that changing roles shifted treatment group player perceptions from collaborative to competitive. Although in this case, we would have expected to see egoistic behavior in both the lose resource and gain resource treatment groups.

The small number of groups used in this research may have reduced our ability to see a significant effect. Nonetheless, the results indicated an important predictive relationship between perspective-taking and collaborative behavior that has been

observed in other studies and contexts. Also, this study explored these relationships with undergraduate and graduate students who may differ from the general public in ways that limit the generalizability of this research. Future research should explore these relationships with representative samples of the public or natural resource interest groups and explore whether the observed relationships are seen in a repetitive game with multiple rounds.

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