RESEARCH ARTICLE

Intervener trustworthiness predicts cooperation with conservation interventions in an elephant conflict public goods game

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Abstract

1. Conservation conflicts exist in complex socio-ecological systems and are damaging to both people and wildlife. There is much interest in designing interventions to manage them more effectively, but the importance of who does the intervening remains underexplored.

2. In particular, conflicts are influenced by perceptions of the trustworthiness of natural resource managers and conservation organizations. However, experimental studies of how the different facets of trustworthiness shape responses to interventions are rare in conflict settings.

3. We develop an experimental, framed public goods game to test how support for otherwise identical elephant conflict interventions varies with perceptions of the trustworthiness of two different intervening groups—a community group or a conservation organization—and compare game behaviour to pre- and post-game interviews.

4. Results from three agro-pastoral communities ($n = 212$ participants) in northern Tanzania show that participants cooperate more with interveners they perceive to be more trustworthy. Results also suggest that different aspects of trustworthiness matter differentially—with perceptions of interveners' integrity and benevolence more strongly predicting cooperation than perceptions of their ability.

5. The findings suggest that trust-building and greater consideration of who is best placed to intervene in conflicts may help improve natural resource management and increase stakeholder support for conservation interventions. This study also further demonstrates how experimental games offer opportunities to test behaviour change interventions and help to inform evidence-based conservation.

KEYWORDS

behaviour change, community-based conservation, game theory, human–wildlife conflict, natural resource management, Tanzania

1 | INTRODUCTION

Conflicts can occur wherever conservation and other human objectives clash (Redpath et al., 2013). Although they often revolve around wildlife impacts or resource-use restrictions, they exist within complex socio-ecological systems (Mason et al., 2018), which are shaped by evolving ecological processes, behaviours and stakeholder relations (Elston, Spezia, Baines, & Redpath, 2014; Mason, Keane, Redpath, & Bunnefeld, 2017; Redpath, Bhatia, & Young, 2015). Different stakeholders respond differently to different actors and interveners within conservation conflicts (Marshall, White, & Fischer, 2007; Mishra, Young, Fiechter, Rutherford, & Redpath, 2017). One important factor known to mediate these relationships is trust (Sharp & Curtis, 2014; Stern, 2008a; Young, Searle, et al., 2016). In particular, levels of stakeholder trust—in other resource users, managers and institutions—have been shown to influence many behaviours relevant to conservation management, from cooperation (Andersson et al., 2018; Davenport, Leahy, Anderson, & Jakes, 2007; Rudolph & Riley, 2014; Smith, Leahy, Anderson, & Davenport, 2013) and compliance (Hamm, Hoffman, Tomkins, & Bornstein, 2016; Rudolph & Riley, 2017; Schroeder, Fulton, Lawrence, & Cordts, 2017) to support for interventions and resolution (Cvetkovich & Winter, 2003; Sjölander-Lindqvist, Johansson, & Sandström, 2015; Young, Thompson, et al., 2016). These conservation-specific examples complement a rich wider literature demonstrating the importance of trust in shaping cooperation with interveners and institutions (e.g. Hough, Jackson, Bradford, Myhill, & Quinton, 2010; Pirson & Malhotra, 2010; Siegrist, 2000; Terpstra, 2011).

Conceptualizations of both trust and trustworthiness vary by approach and context (Colquitt, Scott, & LePine, 2007; Thielmann & Hilbig, 2015; Young, Searle, et al., 2016). However, a widely accepted definition in conservation (Riley, Ford, Triezenberg, & Lederle, 2018; Young, Searle, et al., 2016) describes trust as a product of social relationships whereby actors *accept vulnerability based upon positive expectations of the intentions or behaviours of others'* (Rousseau, Sitkin, Burt, & Camerer, 1998, p. 395). This definition draws specific attention to the role of trustworthiness, which is itself defined in terms of an actor's beliefs about others (Sharp, Thwaites, Curtis, & Millar, 2013). Trustworthiness encompasses perceptions of an actor's ability to carry out an action, their benevolence (i.e. their intention to act in the interest of the trustor) and their integrity (i.e. their adherence to an acceptable set of principles; Mayer, Davis, & Schoorman, 1995). Alongside risk, these perceptions of trustworthiness are thought to shape the levels of trust in both individuals (interpersonal trust) and organizations (organizational trust; Davenport et al., 2007; Pirson & Malhotra, 2010; Riley et al., 2018). Stern and Coleman (2015) identify four forms of trust: dispositional trust (i.e. the general tendency to trust others), rational trust (i.e. trust based on calculated decision-making), affinitive trust (i.e. trust based on relationships between trustor and trustee) and procedural trust (i.e. trust based on interactions and systems governing between trustor and trustee).

Perceptions of a resource manager's ability are considered formative in assessments of rational trust, whereas perceptions of their integrity and benevolence tend to inform assessments of affinitive trust (Stern & Coleman, 2015). Likewise, trustworthiness is considered an important determinant of perceptions of procedural justice, which alongside perceptions of competence, is thought to dictate the levels of organizational trust (Riley et al., 2018; Rudolph & Riley, 2017). In one study, perceptions of the trustworthiness of fishery management (including perceptions of deception) predicted the rates of compliance (Shirley & Gore, 2019), and in another, trust in a state wildlife agency was more strongly predicted by the perceptions of procedural fairness than technical competence (Riley et al., 2018). Hence it appears likely that the different components of trustworthiness influence trust and conflict-related behaviours differentially. However, experimental evidence testing the relationship between trustworthiness and responses to interventions remains rare in wildlife conservation settings. Such studies are important for testing behavioural theory and management assumptions while providing much-needed evidence to inform conservation interventions (Pollard et al., 2019; St. John, 2014; Sutherland & Wordley, 2017).

The purpose of this study is to experimentally test the importance of three components of trustworthiness—ability, benevolence and integrity (Stern & Coleman, 2015)—in shaping stakeholder support for conflict-reducing conservation interventions. To do so, we use a novel experimental public goods game, framed around elephant conflict interventions, in a Tanzanian Community Wildlife Management Area (WMA). Our game draws upon classic games in behavioural economics (Cookson, 2000; Hasson, Löfgren, & Visser, 2010) and recent games in conservation research (Redpath et al., 2018). Specifically, we test whether cooperation with interventions is linked to the identity of the intervening group (organization) and perceptions of their trustworthiness measured in pre-game surveys. These results are then contextualized using post-game individual and group debrief interviews to help to inform conflict intervention best practice.

1.1 | Study area

We conducted our study across three villages in Enduimet Wildlife Management Area (WMA), northern Tanzania—a wildlife corridor in the Amboseli-Kilimanjaro ecosystem where conflicts between local communities and elephant *Loxodonta africana* conservation are rife and damaging (Bluwstein, Moyo, & Kicheleri, 2016; Homewood, 2017). Here, communities derive some material benefits from conservation-related income, and a local conservation organization works with the government to administer the WMA (Wright, 2017). Conflict interventions range from WMA officers using vehicles to deter wildlife, to them distributing torches and firecrackers to local young men of the 'Moran' age-set—who in Maasai culture are the traditional defenders of villages from both people and wildlife. Moran frequently form small groups to guard village crops from elephants and other herbivores at night, but crop-raiding is still common. Compensation payments have been promised for

wildlife-related damage or human deaths, but none have been delivered (Homewood, 2017) and there is a history of distrust and resentment towards tourism operators and the WMA among some residents (Wright, 2017).

2 | MATERIALS AND METHODS

2.1 | Game design

To ease game and participant organization in the rural field setting and maximize statistical power, our experimental public goods game employed a within-subject design ($N = 212$) with four players assembled around a physical board. Following classic public goods games (Cookson, 2000), players were instructed that the total amount of tokens they each amassed during each game would determine their earnings. In each of five rounds, participants were endowed with five crop-tokens, and one additional token that they could choose to a) contribute towards elephant guarding (at a personal cost in income, but to a group benefit in reduced crop loss) or, to b) keep for themselves (personal benefit, group cost). The two treatments differed only in the description of the group providing the elephant guarding: government-led WMA or community-led Moran (Supporting Information, Game design). Although per-round there was a 50% chance each player incurred crop-raiding, the damage incurred (i.e. number of tokens lost) decreased in proportion to the total elephant-guarding contribution (Equation 1).

$$C = P(5 - N), \qquad (1)$$

where C is the expected loss from crop-raiding, P is the probability of crop-raid (0.5) and N is the number of cooperators (represented as number of guarders).

For any one player, the expected personal benefit from cooperating—public marginal per capita return ($MPCR_{public}$; Hasson et al., 2010)—was half a token, which was less than the expected personal benefit of not cooperating ($MPCR_{private}$), which was one token. Both were less than the total group benefit of any one player's cooperation ($n \times MPCR_{public}$) which were two tokens. Hence, the game satisfies the conditions for a social dilemma (Equation 2), since for rational individuals maximizing short-term earnings, it pays less to cooperate (Table 1).

$$MPCR_{public} < MPCR_{private} < n \times MPCR_{public}, \qquad (2)$$

where n is the number of players.

Each group played the game twice (with the order of the treatment rotated). Players were able make comments to each other within the group throughout the game (such as commiserating losses or wishing for luck), but they were asked not to discuss their previous or intended cooperation decisions, and this rule was observed without problem throughout the games. Cooperation decisions were made anonymously, and were never disclosed (Aswani, Gurney, Mulville, Matera,

TABLE 1 Game pay-off table showing that each player (in groups of four) were given five tokens representing crops, and one token representing resources which they could choose to (a) contribute towards elephant guarding (at a personal cost in income but group benefit in reduced crop loss), or to (b) keep for themselves (personal benefit, group cost). For any one player, regardless of what others do, the individual pay-off from cooperation was half a token (realized by reduced crop loss risk), but the cost of cooperation was one token (MPCR = 0.5). Accordingly a Nash equilibrium is formed at no cooperation, which is less than the Pareto Optimum (full cooperation)

	Endowment			Cooperate (i.e. contribute to crop protection)					Don't cooperate (i.e. don't contribute to crop protection)				
No. other co-operators	crops (5)	resources (1)	Risk of crop-raid	Cost of cooperation	Cost of crop-raid	Expected loss	Individual pay-off	Group pay-off	Cost of cooperation	Cost of crop-raid	Expected loss	Individual pay-off	Group pay-off
0	6		0.5	−1	−4	−2	3	15	0	−5	−2.5	3.5	14
1	6		0.5	−1	−3	−1.5	3.5	16	0	−4	−2	4	15
2	6		0.5	−1	−2	−1	4	17	0	−3	−1.5	4.5	16
3	6		0.5	−1	−1	−0.5	4.5	18	0	−2	−1	5	17

& Gurven, 2013). Players were compensated 5,000 Tsh (approximately 2.20 USD) for participating, and received an additional 100 Tsh per token amassed (max 6,000 Tsh)—which compares to the average income per adult in the district of approximately 0.16 USD per day (Homewood, Trench, & Brockington, 2012).

2.2 | Data collection

Between April and June 2017, male participants from three villages in Enduimet WMA were recruited from randomly ordered lists of inhabitants known to be present in each village, created in consultation with village chairpersons (Supporting Information, Participant recruitment). As cultural norms prevented gender mixing (Smith, 2015), rather than split the experiment across male- and female-only samples (e.g. Keane et al., 2016), we opted to maximize statistical power and the sample size within one group—males—who were also more dominant in wildlife guarding (Homewood, Kristjanson, & Trench, 2009) and more easily recruited. However, as recruitment was achieved via mobile phones, which have high but not universal penetration in the local area (Soares, 2018), the sample was likely biased towards more literate and potentially wealthier males.

TABLE 2 List of explanatory variables included in each model (inclusion marked by 'x'), the source of data and descriptive summaries

Explanatory variables	Levels	Source	Descriptive summary (N)	Model 1	2	3	4	5
Treatment	[Moran] [WMA]	Group framed as delivering guarding intervention (factor)	Moran (N = 212), WMA (N = 212)	x	x	x	x	x
Order	[Moran first] [WMA first]	Treatment order (factor)	Moran first (N = 104), WMA first (N = 108)	x	x	x	x	x
Time	[First] [Second]	Village cohort (factor)	First (N = 104), second (N = 108)	x				
Trustworthiness: Aggregated		Weighted summation (factor scores) of ability, benevolence and integrity trustworthiness (numeric)	Moran (M = 0.725, SD = 1.69), WMA (M = −0.725, SD = 1.60), range = −1 to 1		x			
Trustworthiness: Ability		Survey, 4-point Likert scale, (numeric)	Moran (M = 2.94, SD = 1.09), WMA (M = 2.26, SD = 0.96), range = 1–4			x	x	x
Trustworthiness: Benevolence		Survey, 4-point Likert scale, (numeric)	Moran (M = 3.21, SD = 1.12), WMA (M 2.08, SD = 1.03), range = 1–4			x	x	x
Trustworthiness: Integrity		Survey, 4-point Likert scale, (numeric)	Moran (M = 2.95, SD = 1.17), WMA (M = 2.46, SD = 1.19), range = 1–4			x	x	x
Agriculturalist		Survey, self-reported proportion of livelihood that is agriculture, converted to 1–5 scale (numeric)	M: 3.07, range = 1–5, SD = 1.13				x	x
Elephant tolerance		Weighted summation (Factor Scores) from four survey questions (Kansky & Knight, 2014; numeric)	M = 0.00, range = −1 to 1, SD = 1.52				x	x
Crop loss		Survey, self-reported annual crops loss to elephants (number of bags; numeric)	M = 16.87, range: 1–90, SD = 0.87				x	x
Fear	[None] [Some] [Frequent]	Survey, self-reported (factor)	None (N = 36), some (N = 97), frequent (N = 79)				x	x
Age	[Moran] [Junior Elder] [Middle Elder] [Senior Elder]	Survey, by traditional Maasai age-set(s) (factor)	Moran (N = 45), Junior elder (N = 78), Middle elder (N = 56), Senior elder (N = 33)					x
Wealth	[Very Poor] [Poor] [Not Poor] [Rich]	As determined by village leaders with reference to livestock, houses and other assets (Keane et al., 2016; factor)	Very Poor (N = 35), Poor (N = 79), Moderate (N = 78), Rich (N = 20)					x
Education	[None] [Primary] [Secondary]	Survey, self-reported (none, primary or secondary; factor)	None (N = 72), Primary (N = 124), Secondary (N = 16)					x
Village	[1] [2] [3]	Survey (factor)	Village 1 (N = 80), Village 2 (N = 68), Village 3, (N = 64)					x

Participants were interviewed before and after each game with an orally administered pre-game survey and a structured post-game debrief interview. These were carried out by the lead author and two research assistants, who provided translations from Maa and Swahili to English. Back translations were used during the formation of survey questions to ensure that they were translated appropriately. The individual pre-game survey included a range of socio-demographic questions including age, education, wealth and occupation. Three components of trustworthiness—ability, integrity and benevolence—were each measured using 4-point Likert-type questions. We also recorded self-reported levels of wildlife damage, fear of elephants and four measures of elephant tolerance. Post-game structured debrief interviews with groups (20 groups, 80 participants) and individuals ($N = 132$) explored participant understanding and the factors influencing their cooperation decisions.

This study was approved by the University of Edinburgh School of GeoSciences Ethics Committee. We received oral informed consent from participants to participate in this research. This was obtained orally following the provision of information sheets and appropriate spoken translations, and participants were told that they did not have to continue with any interview or game if they did not feel comfortable (Tindana, Kass, & Akweongo, 2006). We did not seek written consent due to high levels of illiteracy in the study population. We anonymized both raw game, survey and debrief data to ensure that no personal information could be traced back to individuals (John et al., 2016). These data were stored digitally in the field on a password-protected laptop and was not shared with any other parties.

2.3 | Data analysis

We conducted our analyses in R (version 3.4.4; R Development Core Team, 2016) using the statistical package LME4 (Bates, Sarkar, Bates, & Matrix, 2007). As individual levels of cooperation did not show a statistically significant trend over rounds (Figure S3), we summed the cooperation score for each player over the five rounds of each treatment. To test whether cooperation differed between intervening groups, a priori predictors of cooperation and socio-demographic variables, we ran a series of generalized linear mixed effect models with binomial errors (Table 2). Unique identifiers for groups ($N = 53$) and participants ($N = 212$) were modelled with independent random intercepts reflecting the grouping structure within the data. These groups did not account for participants' village, which was instead included as a categorical predictor variable. The three items of trustworthiness (Cronbach's alpha 0.77, 0.95 CI: 0.73–0.80), and four items of tolerance (Cronbach's alpha 0.65, 0.95 CI: 0.57–0.71), were each aggregated by summation using their weighted factor scores generated from factor analysis with the R packages NFACTORS and PSYCH (Supporting Information Data analysis). To identify the frequency of prevailing reasoning themes in the post-game interviews, we used directed content analysis (Hsieh & Shannon, 2005).
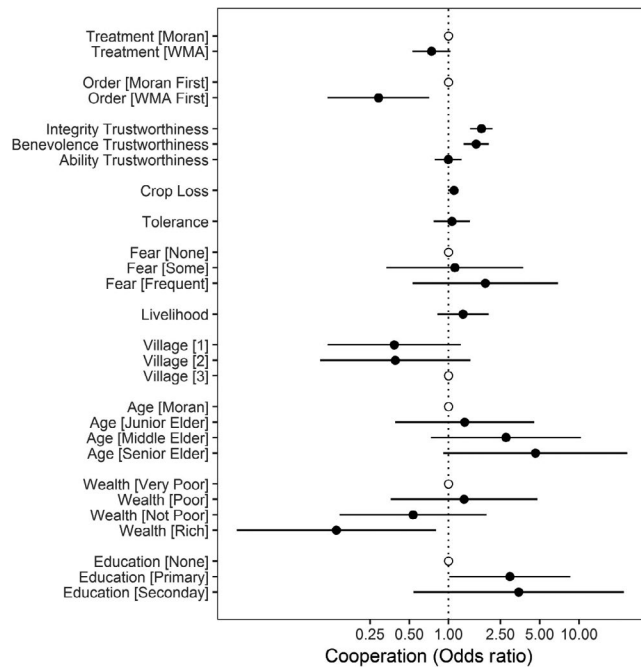
3 | RESULTS

In the framed public goods game, the proportion of participants cooperating was consistently higher in the local group treatment ('Moran') than in the WMA treatment. In the absence of other covariates, treatment was a significant predictor of cooperation, and the odds that participants cooperate with the Moran were 60% greater than for the WMA ($p < 0.01$, odds ratio 0.41, 0.95 CI: 0.32–0.54; Model 1). The time of day in which the game was played (morning or afternoon) was not significant, but cooperation was significantly lower in games in which the WMA treatment came first ($p < 0.01$, odds ratio 0.32, 0.95 CI: 0.14–0.69; Model 1).

Levels of cooperation corresponded closely to perceptions of the trustworthiness of each group. When our aggregate trustworthiness score was included alongside treatment (Model 2), the effect size of treatment was no longer distinguishable from zero—suggesting that the effect of treatment is mediated by perceived levels of trustworthiness (Figures S3 and S4). When aggregate trustworthiness was replaced as a predictor in the model by the three-component measures (Model 3), benevolence and integrity were found to be significant predictors of cooperation, but ability was not. Integrity was a stronger predictor of cooperation (odds ratio 1.88, 0.95 CI: 1.55–2.28), with an odds ratio 25% greater than for benevolence (odds ratio 1.50, 0.95 CI: 1.20–1.87).

To explore the robustness of this finding, we ran further models which included a range of a priori predictors of cooperation and socio-demographic variables (Table 2). Assessments of the intervener's benevolence and integrity continued to be the strongest positive predictors of cooperation. Elephant tolerance, experience of crop loss and elephant fear did not predict cooperation. The extent to which participants self-identified as agriculturist (livelihood) positively predicted cooperation in Model 4, but this effect was removed when other socio-demographic variables (age, village, education) were included in Model 5 (Figure 1). No interaction effects were observed between any variable and treatment. In Model 5, the variables which predicted cooperation levels included the following: benevolence (odds ratio, 1.63, 0.95 CI: 1.31–2.03), integrity (odds ratio, 1.78, 0.95 CI: 1.46–2.18), education (primary; odds ratio, 3.48, 0.95 CI: 0.54–22.10), order (WMA first; odds ratio 0.29, 0.95 CI: 0.12–0.71) and wealth (rich; odds ratio 0.14, 0.95 CI: 0.02–0.80; Figure 1). These results suggest that, accounting for every other variable, the estimated probability of cooperation increases 1.78 times per unit increase in integrity-related trustworthiness, which is 9% greater than the 1.63 increase in likelihood of cooperation per unit increase of benevolence-related trustworthiness.

In post-game individual debriefs ($N = 132$), respondents most often justified their game decision by referring to the perceived effectiveness of the intervening group (55% of respondents), compared to perceived benevolence (17%), integrity (17%), general benefits of cooperation (20%), wildlife conservation (2%) and game strategy (2%). The importance placed on effectiveness in debriefs stands in contrast to behaviour observed within the game itself. Reasoning

FIGURE 1 Results from a generalized linear mixed effects model (Model 5), showing the estimated conditional effects of each predictor variable on cooperation within games. Filled dots represent model coefficient estimates converted to odds ratios, which show the expected change in likelihood of cooperation when each continuous variable increases by a unit of one, or when each factor variable changes level from a baseline (unfilled dots). Whiskers span the 95% confidence interval and variables with whiskers that do not cross zero are considered to have a statistically meaningful effect. Larger odds ratios indicate greater predicted strength of association
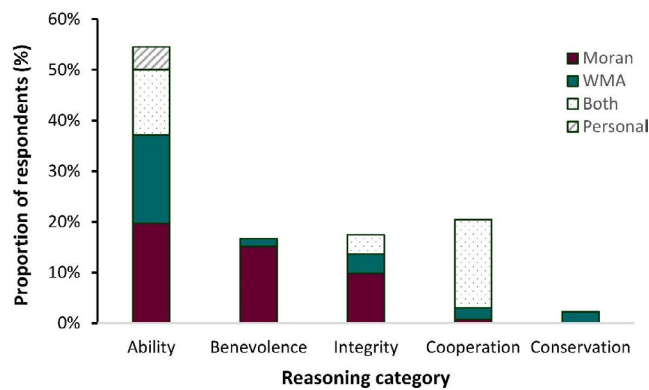
FIGURE 2 The proportion of participants in individual post-game debriefs ($N = 132$), who justified in-game cooperation with reasoning related to: the ability, benevolence or integrity of themselves or the intervening groups (bar colour), the benefits of cooperation generally or concerns related to wildlife conservation

related to the effectiveness of the WMA and the Moran as guarders was given in equal measure, but benevolence- (13% more people) and integrity-based reasoning (6% more people) was biased towards the Moran (Figure 2).

4 | DISCUSSION

This study affirms that the perceived trustworthiness of the group delivering a conservation intervention predicts the levels of stakeholder cooperation. It also finds that different components of trustworthiness—perceived ability, benevolence and integrity—differ in their influence.

Our result that trustworthiness predicts cooperation was unsurprising given previous findings and the nature of public goods games. Indeed, in both public goods games (Bouma, Bulte, & Van Soest, 2008) and natural resource management (Davenport et al., 2007), cooperation is known to vary with the levels of trust held between participants. Trust is also known to heavily shape stakeholder responses to wildlife management efforts, including where these efforts are contested (Riley et al., 2018; Schroeder et al., 2017; Young, Searle, et al., 2016). However, in some cases, higher trust actually leads to reduced engagement with interveners, as individuals have confidence that the interveners will act competently, and in their interest, without their involvement (Smith et al., 2013; Terpstra, 2011). In such situations, individuals are exercising vulnerability (and thus displaying organizational trust; Pirson & Malhotra, 2010; Riley et al., 2018) by *not* engaging. By contrast, in our game, participants exercised vulnerability (regarding expected earnings) by cooperating. Furthermore, through triangulation with debrief interviews, we are confident that greater cooperation in the games reflected more positive perceptions of the intentions of each intervening group.

What was unexpected, however, was our finding that perceptions of integrity and benevolence were stronger predictors of cooperation than ability. This finding also appears to contradict sentiments expressed in our post-game debrief interviews, in which intervener competence was most frequently emphasized. However, we cannot ascertain to what extent post-game justifications reflect post hoc rationalizations or actual drivers of game behaviour. From previous studies (Riley et al., 2018; Rudolph & Riley, 2017) it is clear that beyond rational outcome-based assessments, perceptions of intervener integrity and benevolence are also important in dictating responses to wildlife interventions, but the relative importance of each construct is less clear. For instance, perceptions of managers' trustworthiness (including perceived levels of deception) have been shown to influence stakeholder compliance (Shirley & Gore, 2019) and cooperation or support for interventions (Hamm, 2017; Ordoñez-Gauger, Richmond, Hackett, & Chen, 2018). In some quantitative (Hamm et al., 2016), and qualitative (Wald, Nelson, Gawel, & Rogers, 2018) studies of the different measures of trustworthiness, the relative importance of each construct has been found to be equally important. However, in other related studies, perceptions of procedural justice—which are in turn shaped by the perceptions of trustworthiness, notably benevolence (Rudolph & Riley, 2017)—have overshadowed the perceptions of managers' technical competence in predicting the levels of cooperation or engagement with management interventions (Rudolph & Riley, 2014; Smith et al., 2013). Hence, both our results and those from the wider literature suggest that the relative importance of different

trustworthiness constructs on responses to conflict interventions may be context-dependent.

From our interviews, and from previous studies in the region, there appear to be numerous factors which are likely to shape the (often negative) perceptions of the trustworthiness of the local conservation managers studied here. In this study location (Homewood, 2017), and across Tanzania, trust in conservation has been depleted by community displacement, resource restrictions and broken promises (Bluwstein et al., 2016; Moyo, Ijumba, & Lund, 2016; Wright, 2017). Elsewhere, interpersonal trust in natural resource managers has been found to be shaped by the perceptions of their responsiveness, honesty and dedication (Davenport et al., 2007). In our interviews, respondents commonly identified a lack of transparency, compassion and accountability within the WMA and previous conservation programs. Such experiences might explain the greater importance placed on perceptions of benevolence and integrity, which inform affinitive trust-based assessments (Stern & Coleman, 2015). Nonetheless, conceivably our analysis failed to capture the effect of ability—perhaps due to the relatively lower variation observed for this component. Indeed, in debrief interviews interveners' ability was by far the justification most commonly used by participants to explain their game behaviours. Likewise, it is likely that the relative importance of each component of trustworthiness is context-dependent. For instance, intervention preferences (Keane et al., 2016), risk perceptions (Gore & Kahler, 2012) and trust (Shirley & Gore, 2019; Xiao & McCright, 2015) have been shown to differ across different groups and geographies. Hence, rather than identifying which trustworthiness constructs generally matter more, this study highlights that they matter differentially.

Our approach further demonstrates the value of using experimental games to study conservation interventions (Andersson et al., 2018). Previous studies (Hamm et al., 2016; Smith et al., 2013; Wald et al., 2018) have gained rich insights into stakeholder cooperation or support using surveys or interviews. By contrast, games enable experimental manipulation, but unrealistic incentives can lead to poor external validity (i.e. low correspondence to real-world behaviour; Redpath et al., 2018). Here, this pitfall is minimized as our conclusions rest on relative, not absolute, differences in cooperation between groups. Likewise, although within-game behaviour and consistency can be influenced by other factors (e.g. group dynamics, or game-order, communication, or game-understanding; Andersson et al., 2018; Aswani et al., 2013; Cookson, 2000), here the lack of variation in cooperation across rounds demonstrates apparent consistency in decision-making throughout the game, and our mixed effects model accounted for between-group variation. However, we did find that having WMA in the first round significantly reduces cooperation in the subsequent round with Moran, which demonstrates that game decisions were at least somewhat influenced by participants' previous experiences within the games (in this instance, lower levels of previous group cooperation). Furthermore, one constraint on the external validity of the study stems from the lack of disclosure and discussions of in-game decisions. This is because in reality, wildlife guarding and related cooperation decisions would likely be publically known and subject to discussion and

influence between individuals (Lowassa, Tadie, & Fischer, 2012; Travers, Clements, Keane, & Milner-Gulland, 2011). For instance, on the basis of previous research (Andersson et al., 2018), we suggest that more open communication in our game would have increased cooperation, particularly where perceptions of intervener trustworthiness were lower, and that such possible communication effects warrant further study.

When using experimental games to study behaviour, it is also good practice to draw upon qualitative data to validate and contextualize the experimental results (Redpath et al., 2018). Triangulation between pre-game interviews, game behaviour and post-game debriefs also gives us confidence that players were making their decisions based upon their own experiences with each group and were interpreting the target concepts in the intended manner. Moreover, the negative association of the rich wealth category, and positive association of primary education, with game cooperation should be interpreted carefully due to the wide confidence intervals of their estimated effects (Figure 1); however, similar demographic effects have been found elsewhere to shape trust-based responses to resource managers (Shirley & Gore, 2019).

Our findings have several important implications for conservation policy and practice. Firstly, we show that perceptions of intervener's trustworthiness mediate differential levels of support for conflict interventions. This finding adds to previous work identifying how behavioural responses to conservation interventions are shaped by the relationships between interveners and recipients of interventions (Rizzolo, Gore, Ratsimbazafy, & Rajaonson, 2017; Sjölander-Lindqvist et al., 2015), including the levels of stakeholder trust (Davenport et al., 2007; Riley et al., 2018; Smith et al., 2013). Those designing conservation interventions should therefore closely consider stakeholder relations and messenger effects (Dolan et al., 2012; Veríssimo, Tully, & Douglas, 2019), and explore whether particular individuals, third-parties or local institutions might be more effective in delivering interventions than others if they are more highly trusted or trained in stakeholder engagement (Riley et al., 2018; Sommerville, Jones, Rahajaharison, & Milner-Gulland, 2010; Young, Searle, et al., 2016). Secondly, our findings that beliefs about an intervener's integrity and benevolence were stronger predictors of cooperation than beliefs about their ability suggest that technical interventions or enforcement (such as efforts to reduce crop-raiding or illegal killing) might benefit from accompanying efforts to improve the perceptions of trustworthiness and build greater affinitive-based trust between resource users and resource managers (Rudolph & Riley, 2017; Stern & Coleman, 2015). Thirdly, this study further suggests that improving the perceptions of trustworthiness and building affinitive-based trust is likely important in improving the success of community-based conservation programs (Redpath et al., 2017; Shirley & Gore, 2019). Although challenging, improving greater stakeholder trust in such community-based settings can be realized in several ways, ranging from improving communication and transparency (Rudolph & Riley, 2017), to active mediation efforts (Madden & McQuinn, 2015) and collaborative decision-making (Mishra et al., 2017; Young, Searle, et al., 2016), to avoiding making unrealistic promises (Mabele, 2017).

While these findings need to be tested across a range of contexts, elsewhere, the levels of protest, illegal harvest and active opposition to conservation have been found to be associated with perceptions of managers' honesty and fairness (linked to integrity; Shirley & Gore, 2019; Stern, 2008a), perceptions of care and community-mindedness (linked to benevolence; Hamm et al., 2016) and general levels of affinitive trust (Stern & Baird, 2015). Nonetheless, wildlife impacts (Cusack et al., 2018) and trust (Stern, 2008b) can shift over time, and that continued engagement and responsive approaches may be required for long-term conservation success (Butler et al., 2015). Future work could explore the relative importance of other types of trust, such as negative trust and systems-based trust (Stern & Baird, 2015), uncertainty (Pollard et al., 2019), how perceptions of trustworthiness are shaped by demographic background, cultural affiliations and norms (Rizzolo et al., 2017), and how insights from experimental games correspond to those derived from other methods.

CONFLICT OF INTEREST

Steve Redpath was an Associate Editor for *People and Nature* at the time this manuscript was being reviewed, but was not involved in the peer review and decision-making process. We declare no other conflict of interest.

AUTHORS' CONTRIBUTIONS

All the authors helped in designing the research approach and wrote the manuscript. Z.B.-H. carried out the data collection and analysis.

DATA AVAILABILITY STATEMENT

The data for this study have been anonymized and filtered to remove any sensitive or identifying information in accordance with ethical guidelines, and are available here https://figshare.com/s/910bd65243009ecd03be (Baynham-Herd, Bunnefeld, Molony, Redpath, & Keane, 2020).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.