PAROCHIAL ALTRUISM: PITFALLS AND PROSPECTS

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PUBLISHED IN: Frontiers in Psychology and Frontiers in Neuroscience

frontiers Research Topics

frontiers

ISSN 1664-8714
ISBN 978-2-88919-945-7
DOI 10.3389/978-2-88919-945-7

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PAROCHIAL ALTRUISM: PITFALLS AND PROSPECTS

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Cover image created by Hannes Rusch using wordclouds.com

A number of recent influential publications have promoted the idea that the high levels of altruism and violent intergroup conflicts observed in humans might be the result of a joint evolution of behavioral traits causing cooperativeness among group members ('in-group love') and spite and aggression between members of different groups ('out-group hate'). This hypothesis, dating back to Darwin himself, has been dubbed 'parochial altruism'.

While much empirical evidence has been collected which shows that humans readily condition their social behaviors on their conspecifics' group membership, a number of important questions still remain unanswered. These include: Which selective mechanisms are at work in the suggested co-evolution of in-group love and out-group hate: individual selection, kin selection, sexual selection? When and why does altruism become parochial? When and why can parochialism be altruistic? How does parochial altruism fare in comparison to other explanatory approaches to

the question of why humans are altruistic and why they are collectively aggressive? Did human prehistory really offer the conditions required for parochial altruism to evolve? Is parochial altruism universal across situational contexts and cultures? Which factors can explain individual differences in parochial altruism?

This Research Topic brings together current interdisciplinary works on the topic. Lab and field experiments using different methods critically investigate the antecedents, forms, and consequences of parochial altruism. As such, the Research Topic contributes to close some important research gaps but also provides an overview of the diverse methods for studying parochial altruism across scientific disciplines.

Citation: Rusch, H., Böhm, R., Herrmann, B., eds. (2016). Parochial Altruism: Pitfalls and Prospects. Lausanne: Frontiers Media. doi: 10.3389/978-2-88919-945-7

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frontiers in Psychology

EDITORIAL
published: 30 June 2016
doi: 10.3389/fpsyg.2016.01004

Editorial: Parochial Altruism: Pitfalls and Prospects

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Keywords: parochial altruism, intergroup conflict, in-group favoritism, intergroup relations, evolution

The Editorial on the Research Topic

Parochial Altruism: Pitfalls and Prospects

A number of recent publications have promoted the idea that the high levels of pro-sociality and violent intergroup conflict observed in humans might result from a joint evolution of behavioral traits causing cooperativeness and altruism among members of the same group ("in-group love") and spite and aggression between different groups ("out-group hate"). This hypothesis, dating back to Darwin (1871), has been dubbed "parochial altruism" (Choi and Bowles, 2007; also see: de Dreu et al., 2014; Rusch, 2014a; Yamagishi and Mifune, 2016).

Research on group conditional pro- and anti-social behaviors has a long tradition in psychology (see e.g., Tajfel, 1982; Yamagishi and Mifune, 2009). By suggesting an evolutionary link between "in-group love" and "out-group hate," though, parochial altruism theory sparked renewed interdisciplinary interest in this topic (e.g., Bernhard et al., 2006; de Dreu et al., 2010; García and van den Bergh, 2011; Abbink et al., 2012; Ockenfels and Werner, 2014).

Darwin's idea that more cooperative groups had better survival chances throughout our species' supposedly very violent (pre)history (Bowles, 2009), and that in-group directed altruism and out-group directed hostility could have evolved together seems intuitively plausible. In fact, Choi and Bowles (2007) have shown that it is logically consistent, given that a number of assumptions about the frequency, brutality, and strategic structure of ancestral intergroup conflicts hold. Evidence for the correctness of these assumptions is mixed, though (Fry and Söderberg, 2013; Rusch, 2014a; Yamagishi and Mifune, 2016). Therefore, a series of recent papers have argued that these assumptions need to be refined (Rusch, 2013, 2014b; Weisel and Böhm, 2015; Böhm et al., 2016).

The ten original studies included in this Research Topic investigate selected assumptions and predictions of parochial altruism theory in detail. We, the editors, are convinced that their highly instructive findings will help researchers interested in parochial altruism, but also in intergroup psychology more generally, to gain a much more fine-grained understanding of the interplay of altruistic and spiteful motives in human decision making in the context of intergroup relations.

The broad range of disciplines represented by the authors contributing to this Research Topic and the variety of methods used in their studies are representative for the current interdisciplinary interest in parochial altruism. The most important insight that, in our view, can be derived from the works collected here is that human decision making in intergroup contexts is more complex than suggested by current theory. Thus, we hope that future theorizing on parochial altruism will be stimulated by the evidence gathered in this Research Topic (also see Everett et al. for suggestions of future research directions). In the remainder of this editorial, we briefly highlight central findings reported here, which, to us, appear most informative for prospective enhancements of parochial altruism theory.

OPEN ACCESS

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *03 March 2016*
Accepted: *17 June 2016*
Published: *30 June 2016*

Citation:
Rusch H, Böhm R and Herrmann B (2016) Editorial: Parochial Altruism: Pitfalls and Prospects. Front. Psychol. 7:1004. doi: 10.3389/fpsyg.2016.01004

To our knowledge, Cacault et al. provide some of the first evidence of "unprovoked" parochial altruism in a laboratory setting. Using an iterated asymmetric variant of the Intergroup Prisoner's Dilemma Maximizing-Difference game (IPD-MD; Halevy et al., 2008), they find that subjects opt to benefit their in-group at a cost to a defenseless out-group even when they could achieve the same end without harming that out-group (see, e.g., Böhm et al., 2016, for complementary findings).

Also using variants of the IPD-MD, Weisel finds that subjects are largely consistent in their parochially altruistic choices when they decide (a) to harm or (b) not to help an out-group. Interestingly, though, Weisel also finds that subjects are reluctant to harm out-groups whom they have had the possibility to help before. This is, thus, first evidence for order effects in parochially altruistic choice.

De Dreu et al. investigate the interaction of deliberate reasoning and parochial altruism. Extending earlier findings on intuitive cooperativeness in dyadic settings (Rand et al., 2012; Peysakhovich et al., 2014) to the intergroup context, they find evidence of increased parochialism in the IPD-MD when subjects were cognitively taxed. Their seminal findings thus suggest that parochially altruistic choice might operate through intuitive mechanisms.

In a similar vein, Reimers and Diekhof closely investigate potential mechanisms coupling in-group cooperation and defection against out-groups. In their study employing dyadic Prisoner's Dilemma games (PDGs) played by male subjects belonging either to the same or to different natural groups, they find that testosterone levels positively correlate with revealed in-group favoritism.

Dorrough et al. employ repeated dyadic PDGs to study the dynamic development of parochially altruistic choice over time. While not showing an initial difference in cooperation levels between PDGs played with either in- or out-group members, subjects in this study gradually formed more positive expectations about their in-group members' cooperative behavior, eventually leading to pronounced in-group favoritism.

In two field experiments employing the lost-letter paradigm, Hellmann et al. find that reluctance to help members of stigmatized out-groups is conditional on the respective out-group members' social status and that an in-group member trying to contact an out-group member is more likely to be helped than an out-group member trying to contact another out-group member.

While the aforementioned studies investigate parochial altruism at the individual level, Wildschut et al. and Frischlich et al. take a closer look at how parochially altruistic norms may be formed and disseminated at the group level. Employing dyadic PDGs, Wildschut et al. find that increased normative group pressure induced by introducing accountability of individual PDG choices amplifies the inter-individual inter-group discontinuity effect (Wildschut et al., 2003). Frischlich et al. study the reaction of subjects to parochially altruistic norms conveyed in extremist propaganda videos and find that subjects submitted to a mortality salience prime report a higher level of interest in such propaganda.

In addition to these findings that shed fresh light on the antecedents of parochially altruistic choice, two contributions present negative results, highlighting the importance of refined theorizing.

In an elaborate field study conducted in Northern Ireland before, during, and after an outbreak of violent intergroup conflict, Silva and Mace find that charitable giving to neutral and out-group but, remarkably, also to in-group institutions was significantly reduced during the time of conflict, questioning simple notions of an unconditional link of conflict levels to increases in "in-group love."

Corr et al. finally, use dyadic Trust Games and PDGs to investigate the association of general pro-sociality and in-group favoritism within individuals. Strikingly, they find that pro-sociality does not predict in-group favoritism in these games. Furthermore, they even find that these two traits are predicted by separate Big-5 personality dimensions.

In summary, we are positive that the instructive evidence gathered here will inspire refined work on parochial altruism. This Research Topic, we hold, marks a fruitful starting point for exciting progression.

AUTHOR CONTRIBUTIONS

All authors listed, have made substantial, direct and intellectual contribution to the work, and approved it for publication.

ACKNOWLEDGMENTS

We are grateful to all contributing authors for choosing this Research Topic as the outlet for their work. Furthermore, we very much appreciate the careful work of all reviewers involved in this project.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 02 June 2015
doi: 10.3389/fpsyg.2015.00729

Do we harm others even if we don't need to?

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Evolutionary explanations of the co-existence of large-scale cooperation and warfare in human societies rest on the hypothesis of parochial altruism, the view that in-group pro-sociality and out-group anti-sociality have co-evolved. We designed an experiment that allows subjects to freely choose between actions that are purely pro-social, purely anti-social, or a combination of the two. We present behavioral evidence on the existence of *strong aggression*—a pattern of non-strategic behaviors that are welfare-reducing for all individuals (i.e., victims and perpetrators). We also show how strong aggression serves to dynamically stabilize in-group pro-sociality.

Keywords: parochial altruism, experimental tests, public-good, in-group favoritism, out-group aggression, strong aggression

OPEN ACCESS

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *18 December 2014*
Accepted: *15 May 2015*
Published: *02 June 2015*

Citation:
Cacault MP, Goette L, Lalive R and Thoenig M (2015) Do we harm others even if we don't need to? Front. Psychol. 6:729. doi: 10.3389/fpsyg.2015.00729

1. Introduction

> "...Ich bin ein Teil von jener Kraft, die stets das Böse will, und stets das Gute schafft" (*Faust*, 1335–1336).
> [I am part of that power which eternally wills evil and eternally works good].

Human societies are unique in the animal world. They are characterized by extensive cooperation in large groups of genetically unrelated individuals (Fehr and Fischbacher, 2003; Boyd and Richerson, 2006). But they are also ravaged by intergroup cleavages and conflicts with huge death toll arising due to genocides, ethnic cleansing, terrorism, and wars in modern societies (Doyle and Sambanis, 2006; Blattman and Miguel, 2010). Ethnographic research suggests that warfare was a leading cause of death and presumably an important driver of the evolution of Homo Sapiens in foraging societies (Chagnon, 1988; Keeley, 1996; Bowles, 2006; Gat, 2006). This dual aspect of human social behavior has been an enduring puzzle in evolutionary biology (Darwin, 1871; Hamilton, 1975), in social sciences (Baron, 2001; Posner, 2004; Sambanis et al., 2012) and in humanities as illustrated by our quote from Mephistopheles' famous statement to Faust (von Goethe, 1808). A prominent evolutionary explanation of this joint phenomenon rests on the hypothesis of parochial altruism (Wilson, 1975; Avilés, 2002; Boyd et al., 2003; Franck, 2003; Bowles, 2009). Though a catch-all term, we define parochial altruism as the set of behaviors and heuristics combining strong forms of in-group pro-sociality and out-group anti-sociality that translate into actions where individuals, at *personal cost*, help members of their in-group while also hurting others in the out-group. Thus, violence and atrocities are often perpetrated in the name of group interests and history abounds with tales of self-sacrifice in war. For instance, Arnold von Winkelried, a Swiss soldier, is reputed to have helped the Swiss to victory over the army of the Habsburg regime in the battle of Sempach in 1386. He saved the battle by throwing himself into the Austrian attack formation, grabbing as many spears as he could and having them impale him. He fell dead but his action opened a hole in the attack formation and helped his compatriots to rush to victory. Winkelried personifies an extreme combination of in-group cooperation and inter-group hostility.

In this paper, we design incentivized experiments to test the key set of phenotypic predictions at the core of the theory of parochial altruism. We first test for the existence of *strong aggression*: a pattern of antisocial behaviors which are designed to reduce the welfare of the out-group, do not improve welfare for the in-group compared to other peaceful behaviors, and are not motivated by cross-group strategic concerns (e.g., retaliation or preventive strike). Secondly, we ask whether the presence of aggression increases cooperation with the in-group. Theories of parochial altruism (Choi and Bowles, 2007; Lehmann and Feldman, 2008; Lehmann, 2011) suggest that we should observe the aggressive trait not in isolation but rather systematically associated to its in-group pro-social counterpart. We are able to identify this relationship because our experimental design allows participants to either be cooperative with their in-group, hurt the out-group, or cooperate with their in-group and hurt the out-group at the same time. Thirdly, the parochial theory claims that, in human evolutionary history, the stabilization of in-group pro-sociality has been ensured by the simultaneous emergence of out-group aggression. We study the dynamics of in-group cooperation in a repeated interaction setup and assess whether the mere existence of anti-social actions dynamically stabilizes in-group cooperation, even when repeated-game incentives vanish.

Research on parochial altruism has focused on the theoretical channels through which selective pressures have calibrated human brain and cognition—i.e., genetic evolution in small groups of hunter-gatherers or cultural evolution in large groups with norm enforcement and social punishment (Henrich et al., 2006, 2010; Choi and Bowles, 2007; Lehmann and Feldman, 2008; Bell et al., 2009; Lehmann, 2011; Mathew and Boyd, 2011). However, phenotypic evidence on parochial altruism is scant. Some studies show that anti-social motivations are quite common in many societies and organizations (Abbink et al., 2010; Goette et al., 2012). Several behavioral investigations document the in-group bias of pro-sociality and its moderation by group salience (Goette et al., 2006; Efferson et al., 2008; Yamagishi and Mifune, 2009; Abbink et al., 2010; Alexander and Fotini, 2011). These papers look at how cooperation is affected by in-group vs out-group membership and test for the presence of "in-group love" and "out-group hate" using manipulations of group membership (e.g., minimal groups or private/public knowledge about group membership). Our study complements the literature by providing evidence for strong aggression. Strong aggression differs from out-group hate that is defined as a "reduced level of cooperation with out-group members" (Yamagishi and Mifune, 2009, p. 230). In our design group-salience is not manipulated and out-group hate is muted as subjects are not allowed to cooperate with their out-group in any way.

Existing evidence in the literature is consistent with parochial altruism but it discusses only partial and indirect manifestations of parochialism. The crucial aspect of parochial altruism is the complementarity between in-group pro-sociality and out-group anti-sociality. With this respect, our study differs in important ways from earlier work on aggression in the laboratory. In our design participants can reach any given level of in-group cooperation without exerting out-group aggressive behaviors[1]. The strategic proximate motives to display out-group aggression are thereby muted and aggression is not a necessary precondition for achieving in-group cooperation as in earlier work (Bornstein and Ben-Yossef, 1994; Tan and Bolle, 2007). Moreover, in our design, strong aggression is elicited in an asymmetric way such that there is no overlap between perpetrating groups and victimized groups. This feature is the key difference with the intergroup prisoner's dilemma-maximizing differences game (IPD-MD, Halevy et al. 2008; De Dreu et al. 2010). In particular, an important result by Halevy et al. (2008) is that participants to the IPD-MD do not exhibit strong aggression and exert peaceful cooperation when they are allowed to. We hypothesize that this pattern is due to the symmetric design of the IPD-MD that presumably promotes peaceful behaviors: Expectations of retaliation by the other group could potentially inhibit aggressive behaviors. By contrast, those expectations play no role in our asymmetric version of the IPD-MD and our results clearly show that participants exhibit patterns of strong aggression in this asymmetric setup. Zizzo (2004) discusses an experiment where, by paying a price, subjects could then eliminate (burn) and redistribute money (including their own) and, in about half of the sessions, steal money from others. He finds that about 20% of the subjects "burn" money and stealing also occurs quite frequently. There is a key difference between this experiment and ours: while burning money reduces inequality in Zizzo (2004)'s setting, the corresponding options in our design increased inequality.

2. Materials and Methods

We implement the test for parochial altruism in the context of a linear Public Good laboratory experiment. Participants were recruited from a subject pool composed mainly of undergraduate students at the University of Lausanne (UNIL) and at the Federal Polytechnic School of Lausanne. Invitations were sent to a random subset of the subject pool; we excluded psychology students because they may have been participating in experiments that involve deception. None of the conditions implemented in this experiment involved deception and the experimental procedure was approved by the Ethics' Committee of the Faculty of Business and Economics (HEC) of the UNIL. All experiments were anonymous, computer-mediated (Fischbacher, 2007), with a strict enforcement of non-communication between participants, and the instructions were phrased in a neutral way (with no reference to aggression, competition, victimization, etc. C.f. Section 2 of the Supplementary Material for a translation of the instructions). Upon arrival at the meeting point, participants signed a consent form in line with the aforementioned ethics' committee guidelines.

We organized 8 sessions gathering 18 participants each, who were randomly assigned to a three-person group (their *in-group*). Each group was exposed to one, and only one,

[1] This is important because (Brewer, 2001) argues that "the relationship between in-group identification and out-group hostility is progressive and contingent rather than necessary or inevitable." Indeed, Duckitt and Mphuthing (1998) show that out-group hostility is contingent on historical experience in the South African context.

of the three following conditions (see **Table 1**): The control condition is a standard linear public good game; aggression is a treatment condition and corresponds to a variant of the public good game where members of this group can perpetrate aggression against a victimized group; victimization is a treatment condition where group members are engaged into a standard linear public good game and simultaneously are victimized by another group. Groups were randomly assigned to the control, aggression or victimization condition and there was no strategic interaction between these groups whatsoever. Group membership was reinforced by a minimal-group manipulation with shirts of different colors, depending on the condition (Control: orange, Aggression: green, Victimization: blue). We neither manipulate the emotional state of individuals, nor do we induce inter-group hostility, nor do we manipulate information on group membership. Our key manipulation concerns the actions individuals can take and the effects of their actions for others.

In the control condition, members of each group received an individual endowment of 30 monetary units (MUs) that they were entitled to keep or to allocate partially/totally to an in-group pool called "Project A." Every MU contributed to this in-group pool is doubled (by the experimenter) and shared equally among the three in-group members. The game was played for six periods with the same group composition. After each period, participants stated their beliefs about the contribution to non-selfish option A of the other individuals in their in-group. Since the group composition was stable, there was the scope for cooperation early in the game due to incentives stemming from finite repetition. In this condition, we expect the standard pattern of initial cooperation to steadily decline over periods as players approach the final period of the public good game (end-game effect).

In the aggression condition, participants could also keep or partially/totally allocate their endowment to Project A, but two additional options were made available to them. The first option is an in-group pool called "Project B" where every MU is doubled and shared equally among the in-group members. In contrast to project A, the extra MU in project B comes from the victimized group reducing its payoff by one MU. The second option is "Project C," where every MU contributed to that option is lost to members of the in-group and it reduces the payoff of the victimized group by one MU. The game was played for six periods. After each period, participants saw the total number of MUs invested in projects A, B, and C and by how much the payoff of the victimized group was reduced as a result of contributions to B and C. Subjects then stated their beliefs about the average contribution to non-selfish options A, B, and C of the other individuals in their in-group. Notice that contributions to projects A and B generate identical payoffs for the in-group. The key difference is that project B entails aggression toward the out-group whereas project A is neutral to the out-group. Contributions to project B and C are consistent with *strong aggression*, as they reduce out-group welfare, do not improve in-group welfare compared to project A, and can not be motivated by retaliation.

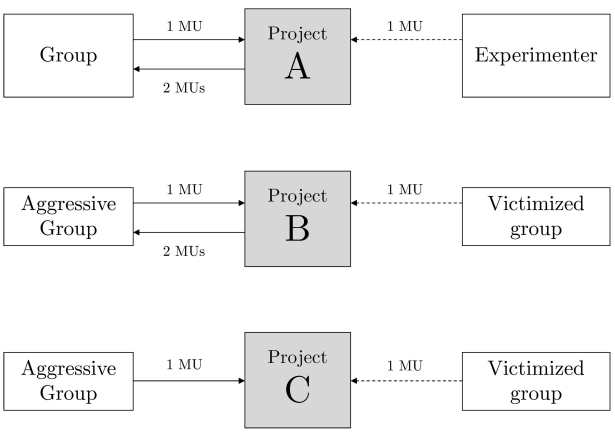
In the victimization condition, members of the group play the standard public good game. In contrast to the control condition, payoffs received by the victimization participants are reduced in a way defined by decisions of the assigned perpetrating group. Importantly these reductions are independent of decisions of members of the victimized group. Consequently, in-group cooperation does not allow victimized group members to shield against external aggression.

Notice that in all three conditions contributions are affected by the standard social dilemma: not contributing yields the highest individual payoff regardless of what others do.

At the end of each session, participants completed an open-answer survey with questions on why they chose to contribute to the projects available to them. We make use of this information on motivational aspects in order to complement the behavioral evidence on strong aggression.

TABLE 1 | Summary of the options available to participants in the different conditions.

Condition	Control	Victimization	Aggression
Available options	Keep	Keep	Keep
	Project A	Project A	Project A
			Project B
			Project C
DESCRIPTION OF THE OPTIONS			
Keep:	1 MU invested in this option yields 1 MU to the individual, i.e., players keep the MUs in their individual account.		
Project A:	1 MU invested yields 2 MU that are distributed equally among the three group members. The extra MU comes from the Experimenter.		
Project B:	1 MU invested yields 2 MU that are distributed equally among the three group members. The extra MU comes from the Victimized group.		
Project C:	1 MU invested yields 0 MU. 1 MU is deducted from the Victimized group.		



3. Results

Our first result is that antisocial projects B and C are used throughout the game in the aggression condition (see **Figure 1**). Participants contribute around 9 out of 30 MUs to the purely cooperative project A, around 5 MUs to the anti-social project B,

and about 1 MU to the anti-social project C. Anti-social projects (B and C) make up 30–40% of total non-selfish contributions (projects A, B, and C) and this amount is statistically significant (one-sample mean-comparison test $t = 12.87$, $p < 0.01$). Contributions to the purely anti-social project C are positive (one-sample mean-comparison test $t = 6.16$, $p < 0.01$), but significantly lower than contributions to project B, which is both anti-social to the out-group and pro-social to the in-group (two-sample mean-comparison test $t = 9.11$, $p < 0.01$, c.f. **Figure 1**). This evidence suggests that purely aggressive behavior is rare, but it becomes much more prevalent if it can be combined with in-group pro-sociality.

Participants who invest into projects B and C display behaviors consistent with *strong aggression*. However, there are two alternative motivational drivers that we would like to discuss: Firstly, participants could contribute to B rather than A because they are indifferent to the consequences on the victimized group; secondly, participants who contribute to C could have been merely confused and chosen this option by mistake. We investigate this issue by analyzing answers to the survey on why participants in the aggression condition contributed to projects A, B, and C. **Table 2** displays the list of motives for each project, by order of frequency (see Section 3 of the Supplementary Material for details about this classification and examples of participants' statements). Results show that participants who contributed to A did so to increase earnings of the group (15 out of 44) or increase earnings of the group without harming the other group (13 out of 44 subjects). This evidence suggests that most subjects in the lab were not indifferent to the payoffs of their own group and that a sizable proportion was also sensitive to the earnings of the victimized group. Similarly, the modal motive for contributing to B was to "harm the other group while benefiting my own group" (12 out of 33) while others wanted "to harm the other group" (5 out of 33). Hence, more than half of all subjects who contributed to project B claimed to do so in order to reduce the payoffs of others. Were participants who chose option C merely confused about this option? Results show that most participants who contributed to C did so "to harm the other group" (11 out of 18). When we study detailed information on who chose C, we find that of the participants who choose C, most chose it two times or more. Most participants who chose option C apparently did not do so by mistake or out of confusion. Clearly, the motivational evidence indicates that a sizable proportion of participants who contribute to projects B and C were fully aware of the negative consequences for the out-group, and claimed to do so specifically because of those negative consequences. Both their motives and behavior are consistent with "strong aggression."

Notice that contributions to project B might also be higher than contributions to C because B is a more effective aggression technology than C: Reducing the out-group's payoff by one MU costs 1 MU with C but only 1/3 of a MU with B. While we cannot rule out that some subjects chose B simply because it is a better punishment technology, we exploit again the survey

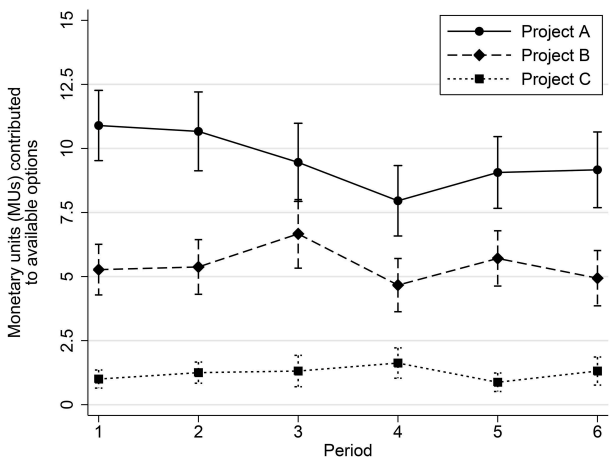


FIGURE 1 | This figure shows the average number of monetary units (MUs) contributed to project A, project B, and project C (mean ± 1 standard error) among the individuals in the aggression condition (see Table 1 for description of the projects). Contributions to project A are significantly higher than contributions to project B (two-sample mean-comparison test (paired) $t = 4.78$, $p < 0.01$) but individuals also contribute to anti-social projects B and C—options that reduce the payoffs to individuals in the victimized group.

TABLE 2 | Motives to invest in available projects of participants in the agression condition.

Motive	Participants
PROJECT A	
To increase earnings of my group	15
To increase earnings of my group w/o harming other group	13
It is the safest or most profitable project	11
Not invested	4
Unclear motive	3
Others in my group had invested	2
All	*48*
PROJECT B	
Not invested	15
To harm the other group while benefiting my group	12
It is the safest or most profitable project	6
To harm the other group	5
Unclear motive	5
Indifference with project A	3
Was testing	1
Others in my group had invested	1
All	*48*
PROJECT C	
Not invested	30
To harm the other group	11
Was testing	3
Unclear motive	2
To harm the other group w/o benefiting my group	1
Others in my group had invested	1
All	*48*

on motivational aspects to show that this feature of our design is unlikely to drive the main results. As displayed in **Table 2** only a small share of participants (5 out of 33) use B because it can "harm the other group." By contrast a sizable proportion of subjects (12 out of 33) who contributed to B claimed to do so because it entailed a benefit for their "in group" and a cost to the "out-group," consistent with an interpretation of parochial behavior.

The second result is that non-selfish contributions increase if out-group aggression can be exerted. **Figure 2** shows that contributions to non-selfish options (i.e., projects A, B, and C) are larger in the aggression condition than in the control condition ($t = 1.91$, $p = 0.065$, see **Table 3**, col. 2). The aggressive options partially crowd out project A. But in net, there is a 21% increase in non-selfish contributions. Importantly, the difference is even more pronounced at later periods of the experiment, as column (4) of **Table 3** shows. The period-trend of contributions to non-selfish options is significantly bigger in the aggression condition than in the control condition ($t = 2.73$, $p = 0.01$). Repeated interactions create a strategic motive to contribute to the public good in early rounds of the game but this motive is less important in the last periods of the game. Indeed, there is a strong decrease in contributions to the public good in the control condition (see Section 1 and Table S1 in the Supplementary Material for additional support). This breakdown of in-group cooperation in the control condition is a well-known dynamic pattern in repeated public good games (Isaac and Walker, 1988; Ledyard, 1995; Fehr and Fischbacher, 2003). We interpret this dynamic pattern as a support to the evolutionary theories of

TABLE 3 | Aggression and non-selfish behavior.

Dependent variable: contributions to projects A, B, and C OLS estimates			
	(1)	**(2)**	**(3)**
Aggressor	2.906	2.906	−2.004
	(1.878)	(1.520)*	(2.339)
Aggressor × Period			1.403
			(0.514)**
Period			−1.885
			(0.420)***
Constant	13.295	13.580	18.103
	(1.378)***	(2.801)***	(3.146)***
Observations	576	576	576
R^2	0.017	0.136	0.143
Session dummies	No	Yes	Yes
Period dummies	No	Yes	No

*Standard errors clustered by group in parentheses. ***p<0.01, **p<0.05, *p<0.1. Aggressor=1 if participant in Aggression condition, =0 if Control condition.*

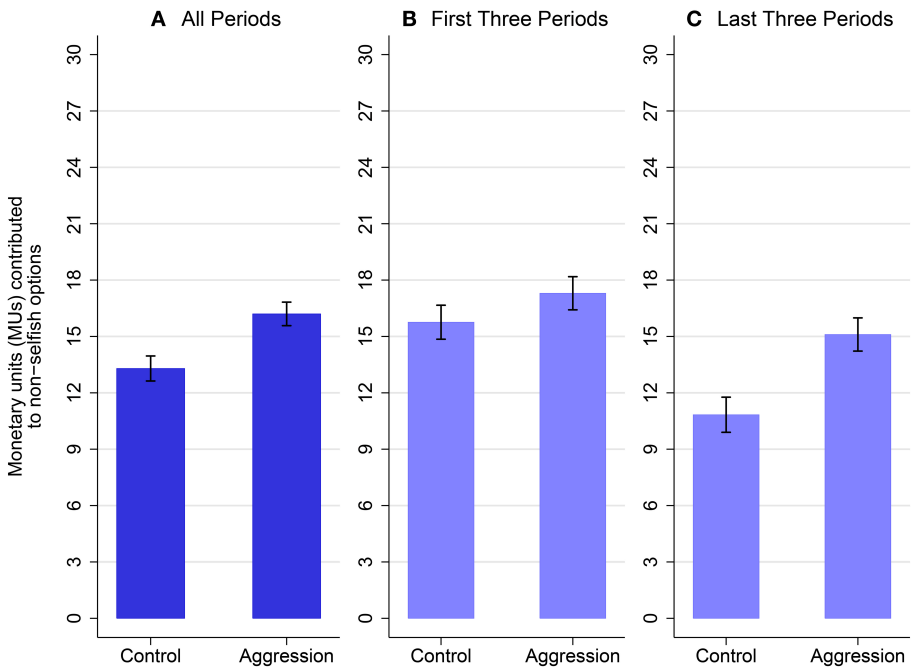


FIGURE 2 | This figure shows the number of monetary units (MUs) contributed to non-selfish projects (mean ± 1 standard error). Contributions to non-selfish projects are contributions to project A for individuals in the control condition, and contributions to projects A, B, and C for individuals in the aggression condition. The figure shows contributions over all six periods in **(A)**, over the first three out of six periods in **(B)**, and contributions over the last three out of six periods in **(C)**. Over all periods, the possibility to perpetrate aggression increases non-selfish behavior ($t = 1.91$, $0.05 < p < 0.1$, c.f., **Table 3** col. 2). The possibility to perpetrate aggression does not increase non-selfish behavior in the early periods ($t = 0.86$, $p > 0.10$, c.f., Table S1 col. 3), but it does so in the last three periods ($t = 2.60$, $0.01 < p < 0.05$, c.f., Table S1 col. 4).

parochial altruism (i.e., co-evolution of in-group cooperation and out-group aggression).

Can unpacking effects due to the larger number of options in the aggression condition explain our results? Participants who play a public goods game with two identical public goods options tend to contribute much more in early rounds, but they learn over time that unpacked options are identical and their contributions converge to the level observed in the standard game in later rounds (Bernasconi et al., 2009). Our results are different. Contributions to projects A, B, and C in the aggression condition are similar to contributions to project A in the control condition in initial rounds. The difference in contributions becomes only salient toward later periods of the game. Thus, the pattern of our empirical findings is not consistent with unpacking effects. What is more, we carefully explained to participants that option A had no implications for other participants whereas option B did, and participants answered a series of control questions that specifically addressed this issue before making decisions (c.f. instructions in Section 2 of the Supplementary Material).

Results are similar when we focus more specifically on in-group cooperation (i.e., projects A and B only). **Figure 3** shows a positive impact of the possibility to perpetrate aggression on in-group cooperation, though the effect is not statistically significant over all periods (see **Table 4**, col. 2). The difference in cooperation between aggression and control is, however, magnified in the later periods of the game as the period-trend is significantly higher in the aggression condition than in the control ($t = 2.56$, $p = 0.015$, see **Table 4**, col. 3. C.f. Table S2 in the Supplementary Material). This result reflects the fact that in-group cooperation

TABLE 4 | Aggression and cooperative behavior.

Dependent variable: contributions to projects A and B OLS estimates			
	(1)	**(2)**	**(3)**
Aggressor	1.677	1.677	−3.158
	(1.780)	(1.509)	(2.375)
Aggressor × Period			1.382
			(0.539)**
Period			−1.885
			(0.420)***
Constant	13.295	13.476	17.884
	(1.378)***	(2.806)***	(3.167)***
Observations	576	576	576
R^2	0.006	0.110	0.116
Session dummies	No	Yes	Yes
Period dummies	No	Yes	No

*Standard errors clustered by group in parentheses. ***p<0.01, **p<0.05, *p<0.1. Aggressor=1 if participant in Aggression condition, =0 if Control condition.*

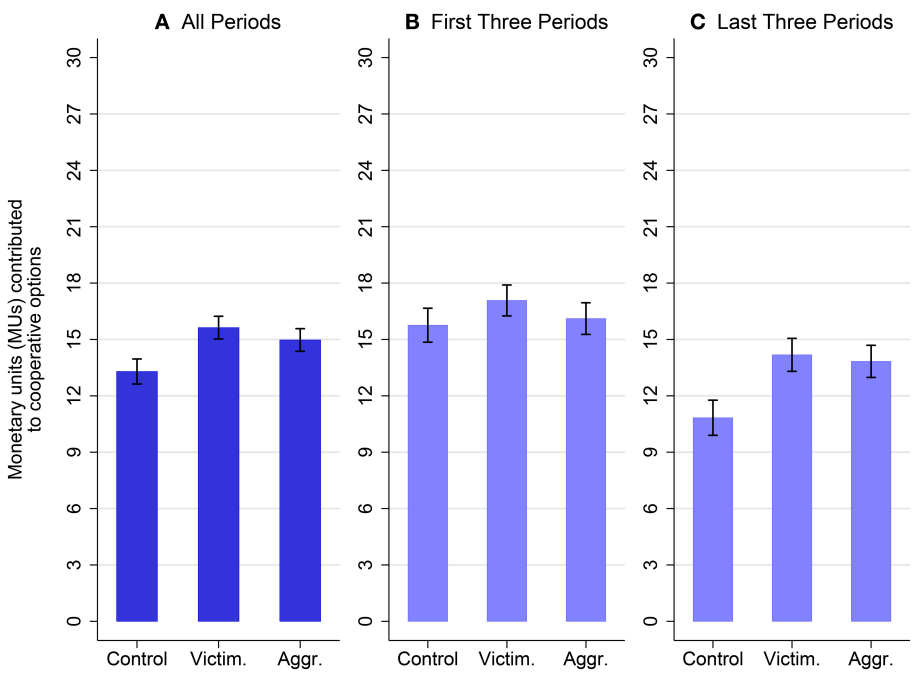


FIGURE 3 | This figure shows the number of monetary units (MUs) contributed to cooperative projects, i.e., projects that help the in-group (mean ± 1 standard error). Cooperative contributions are contributions to project A for individuals in the control and victimization conditions, and contributions to projects A and B for individuals in the aggression condition. The figure shows contributions over all six periods in **(A)**, over the first three out of six periods in **(B)**, and contributions over the last three out of six periods in **(C)**. Over all periods, the possibility to perpetrate aggression does not increase cooperative behavior. However, the possibility to perpetrate aggression does increase cooperative behavior in the last three periods ($t = 1.70$, $0.05 < p < 0.1$, c.f., Table S2 col. 4). Moreover, in-group cooperation of victimized participants is also larger than cooperation of control participants in the last three periods ($t = 2.01$, $0.05 < p < 0.1$, c.f., Table S3 col. 5).

TABLE 5 | Victimization and cooperative behavior.

Dependent variable: contributions to project A OLS estimates				
	(1)	(2)	(3)	(4)
Victim	2.333	2.817	5.178	−1.562
	(1.781)	(1.712)	(2.142)**	(2.703)
Victim × Period				1.113
				(0.539)**
Period				−1.885
				(0.420)***
Aggression $_{t-1}$			−0.096	
			(0.063)	
E_t(aggression $_t$)			−0.033	
			(0.105)	
Constant	13.295	12.910	12.937	17.459
	(1.378)***	(3.772)***	(3.556)***	(3.643)***
Observations	576	480	480	576
R^2	0.012	0.106	0.119	0.096
Session dummies	No	Yes	Yes	Yes
Period dummies	No	Yes	Yes	No
Sample restriction	No	period> 1	period> 1	No

*Standard errors clustered by group in parentheses. ***p<0.01, **p<0.05, *p<0.1. Victim=1 participant in Victimization condition, =0 if Control condition; Aggression = total contribution of aggressors to projects B and C if participant in Victimization condition, =0 if participant in Control condition.*

breaks down in the control condition whereas it remains high in the aggression condition.

Our third result concerns in-group cooperation among victimized groups. **Figure 3** also discusses how exposure to aggression affects in-group cooperation among victimized groups. We observe an increase in cooperation among victimized individuals, i.e., members of groups experiencing aggression from others, compared to the control condition. The increase takes place already in the early periods and the period-trend is significantly higher among victims than among control participants ($t = 2.06$, $p = 0.045$, see **Table 5** col. 4. C.f. Table S3 in the Supplementary Material), suggesting that in-group cooperation does not decrease over time among victims as it does among individuals in the control condition. Interestingly, cooperation is neither sensitive to the extent of aggression experienced in the previous round nor to the amount of aggression victims expect for the current round (see **Table 5** col. 3). This result suggests that the mere threat of aggression triggers a higher level of in-group cooperation among victims.

4. Discussion

This study provides behavioral evidence consistent with the phenotypic predictions of evolutionary theories of parochial altruism.

Firstly, a proportion of participants in our experiment exhibit *strong aggression* in the absence of any strategic motive. Despite the fact that any level of desired in-group cooperation is attainable without perpetrating aggression toward an out-group, and that aggression does not entail any gains to the individual nor to her in-group over and above what can be attained without aggression, some participants do invest part of their endowment in reducing the payoffs of victimized groups. That is, participants in the aggression condition contribute a statistically significant amount of their endowment to anti-social options (projects B and, to a lesser extent, C) and are aware of the consequences for the other group. Aggression is not observed in isolation but *combined with in-group cooperation*. Participants readily perpetrate aggression toward a victimized group when this behavior favors the in-group, even if the strategic incentives for cooperation are also weak. Second, evolutionary theories of parochial altruism state that the presence of a type of behavior that combines in-group cooperation with out-group aggression is a sufficient condition for evolutionary stability of in-group altruism (Choi and Bowles, 2007). Consistent with this hypothesis, we find *more cooperative behavior that remains stable across periods* when participants have the possibility to perpetrate aggression against a victimized group, whereas there is a distinct drop in public-good contributions in the control condition, possibly as repeated-game/reputation mechanisms fade in that condition (Fischbacher and Gachter, 2010). This suggests that the possibility to exert aggression against an out-group is a more powerful mechanism to generate cooperation than the strategic concern to appear pro-social in the standard public goods setting. Third, we also document that the mere threat of aggression triggers a higher level of in-group cooperation among victims.

The asymmetric design of our experiment, in which groups that experience aggression cannot retaliate is key to identify the effects across victims and perpetrators. In particular, our results show that both for victims and perpetrators, exposure to aggression at the *group-level* increases in-group cooperation and indicate that the mere presence of aggression, much more than its extent, triggers higher cooperation. These results contrast with previous evidence on the deleterious pro-social impact of exposure to aggression when it occurs *at the individual level* (Alesina and La Ferrara, 2002). This moderating effect of group salience makes clear that the social context in which aggression takes place is a key factor for understanding the differential evolutions of large-scale cooperation observed in various post-conflict and war episodes (Bellows and Miguel, 2009; Blattman and Miguel, 2010). For example, micro-level studies interested in the reintegration of child soldiers find contrasted effects of exposure to civil war on political participation and local collective action (Humphreys and Weinstein, 2007; Blattman, 2009; Annan and Blattman, 2010).

Various organizations and institutions try to exploit the behavioral pattern of parochial altruism by creating a strong sense of community (as do various human-resource policies or even military training) and, at the same time, by making salient the looming threat of competition from other organizations. Our results suggest that such policies are doubly effective and that the creation of an outside threat is an effective stabilizer of in-group cooperation. We believe that this dual phenomenon is at the root of many genocides and large-scale atrocities that are perpetrated in the sake of in-group interests—e.g., the infamous "Radio-Television libre des Mille Collines" that exacerbated the

Hutu-Tutsi ethnic divide and allowed Hutus to feel justified in committing murders during the Rwandan genocide.

In our experimental protocol, we neither manipulate the salience of group identity nor the emotional state of the participants. We believe that both would be promising avenues for future research. Indeed we expect that both an increase in group salience or getting subjects into an aggressive emotional state could amplify the complementarity between in-group pro-sociality and out-group anti-sociality; we present a lower bound to this complementarity.

Funding

MT acknowledges financial support from the ERC Starting Grant GRIEVANCES-313327.

Supplementary Material

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.00729/abstract

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 28 April 2015
doi: 10.3389/fpsyg.2015.00476

The development of ingroup favoritism in repeated social dilemmas

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In two comprehensive and fully incentivized studies, we investigate the development of ingroup favoritism as one of two aspects of parochial altruism in repeated social dilemmas. Specifically, we test whether ingroup favoritism is a fixed phenomenon that can be observed from the very beginning and remains stable over time, or whether it develops (increases vs. decreases) during repeated contact. Ingroup favoritism is assessed through cooperation behavior in a repeated continuous prisoner's dilemma where participants sequentially interact with 10 members of the ingroup (own city and university) and subsequently with 10 members of the outgroup (other city and university), or vice versa. In none of the experiments do we observe initial differences in cooperation behavior for interaction partners from the ingroup, as compared to outgroup, and we only observe small differences in expectations regarding the interaction partners' cooperation behavior. After repeated interaction, however, including a change of groups, clear ingroup favoritism can be observed. Instead of being due to gradual and potentially biased updating of expectations, we found that these emerging differences were mainly driven by the change of interaction partners' group membership that occurred after round 10. This indicates that in social dilemma settings ingroup favoritism is to some degree dynamic in that it is enhanced and sometimes only observable if group membership is activated by thinking about both the interaction with the ingroup and the outgroup.

Keywords: ingroup favoritism, intergroup contact, prisoner's dilemma, social identity, social dilemmas

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *09 January 2015*
Accepted: *02 April 2015*
Published: *28 April 2015*

Citation:
Dorrough AR, Glöckner A, Hellmann DM and Ebert I (2015) The development of ingroup favoritism in repeated social dilemmas. Front. Psychol. 6:476. doi: 10.3389/fpsyg.2015.00476

Introduction

Cooperation is an essential prerequisite for human social life, but it often involves social dilemma situations that require individuals to decide whether to maximize selfish or collective interests. A typical social dilemma situation is the following: a team of two people works together on a collectively profitable project where benefits are shared evenly and independently of individual contributions. Although the collective benefit would be highest if both team members contributed as much as possible, the benefit of each individual is even higher if one chooses the non-cooperative option given that the other member cooperates.

Numerous factors have been shown to influence the tendency of individuals to behave cooperatively in social dilemmas or not (for overviews, see Dawes, 1980; Komorita and Parks, 1995; Zelmer, 2003; Van Lange et al., 2013). One important determinant is group affiliation, that is, whether the partner is perceived as a member of the ingroup or the outgroup.

Studies have repeatedly demonstrated ingroup favoritism, that is, the tendency to favor members of one's ingroup over outgroup members both in social dilemma tasks (e.g., Goette et al., 2006; Simpson, 2006; Balliet et al., 2014; De Dreu et al., 2014) and beyond (e.g., for helping behavior in violent situations: Levine et al., 2006; or after natural disasters: Levine and Thompson, 2004; see Hewstone et al., 2002, for an overview).

In the context of social dilemmas, ingroup favoritism is usually found in the form of higher cooperation rates toward ingroup members compared to outgroup members (e.g., Wit and Wilke, 1992; De Cremer and van Vugt, 1999; Goette et al., 2006, 2012) and higher expectations regarding cooperation behavior for the ingroup as compared to the outgroup (e.g., Yamagishi et al., 2008). As applied to the introductory example above, each individual's tendency to contribute to the joint project should be higher if the interaction partner belongs to the same group as compared to a different group (e.g., the same vs. a different university).

Overall, a comprehensive meta-analysis summarizing the results of 212 studies from 77 publications (Balliet et al., 2014) finds a small to medium effect size, indicating that people are more cooperative with ingroup compared to outgroup members ($d = 0.32$), and a slightly stronger effect on expectations concerning cooperation ($d = 0.41$). The meta-analysis identified several moderators for ingroup favoritism, such as bilateral knowledge of group membership (i.e., both people know whether they are from the same or different groups) or the frequency of interactions (one shot vs. repeated). Although, most of the studies assessing repeated interactions acknowledge that cooperation in general changes over time (typical declining pattern of cooperation), none of the studies considers changes in ingroup favoritism over repeated contact.

In the current work, we therefore aim to investigate possible dynamics of ingroup favoritism at a cognitive and a behavioral level over repeated interactions.

Dynamic Aspects of Ingroup Favoritism

The theory of parochial altruism explains ingroup favoritism from an evolutionary perspective. It states that increased cooperativeness toward the ingroup (ingroup love) is due to parochial altruistic norms, which have an evolutionary origin. According to the theory, ingroup favoritism represents, together with aggressiveness against the outgroup (outgroup hate), a genetic or cultural trait that has co-evolved in humans (Bernhard et al., 2006; Rusch, 2014). Following this rationale, it could be assumed that ingroup favoritism might prevail from the first of repeated interactions. Several models for behavior in social dilemmas (Van Lange et al., 2013) would predict the same. According to the goal expectation theory proposed by Pruitt and Kimmel (1977), individuals cooperate if they adopt the goal of cooperation and expect their partner to reciprocate. Similarly, Bogaert et al. (2008) proposed in their model that cooperation is driven by an integration of context-specific cooperative goals and context-specific expectations. Joint group membership can function as an important context cue that influences both the likelihood for adopting cooperation goals and the expectations that the interaction partner will reciprocate cooperation. The latter class of models, however, also highlights the fact that repeated experiences can at least change expectations and potentially also the tendency of individuals to take over cooperation goals. Experiences should be updated in a roughly rational manner, in that expectations after some time reflect the average behavior of ingroup and outgroup members in the real world.

As stated in the contact hypothesis (Allport, 1954), repeated interactions with other persons (e.g., members from the outgroup) can reduce prejudice and might therefore also reduce differences between ingroup and outgroup. Indeed, previous research has shown that discrimination against members from the outgroup is reduced after repeated contact (Birtel and Crisp, 2012; see Pettigrew and Tropp, 2006, for a meta-analysis). Not surprisingly, and also in line with a rational updating of expectations, the opposite effect (i.e., increased discrimination) was found in cases where the interaction with the outgroup included negative experiences (Barlow et al., 2012). Following this line of reasoning and in line with the models explained above, both a reduction and an enhancement of ingroup favoritism are conceivable, depending on the actual experiences made with different group members. Expectations and cooperation behavior should be adjusted, in line with actual experienced cooperation and independently of group affiliation. If one experiences higher cooperation from ingroup members than from outgroup members, own expectations and cooperation should be adjusted accordingly and ingroup favoritism should increase (or emerge if it does not exist from the beginning). However, if both the ingroup and the outgroup cooperate to the same degree, ingroup favoritism should disappear, given an unbiased adjustment of expectations and cooperation.

In contrast, one can assume that the adjustment of expectations and cooperation behavior in repeated interactions is not completely rational, depending not only on the degree of experienced cooperativeness. Rather, it is possible that the group affiliation of the interaction partner is a key factor for the assessment of her or his behavior and the adjustment of own expectations and cooperation behavior in subsequent interactions. Categorical thinking about ingroup and outgroup can shape the perception of the behavior of others (Macrae and Bodenhausen, 2000; Mussweiler and Ockenfels, 2013), which results in different attribution patterns in explaining the behavior of the ingroup and the outgroup member. The ultimate attribution error states that negative behavior is attributed dispositionally when it is shown by the outgroup, whereas positive behavior is attributed externally, and vice versa, for the ingroup (Pettigrew, 1979). According to social identity theory, this reflects the need to develop and maintain a positive self-concept by maximizing the positive distinctiveness of the ingroup in contrast to an outgroup (Tajfel and Turner, 1979; Hewstone et al., 2002). As a consequence, a cognitive mechanism that facilitates the processing of incoming social information in an ingroup favoring light might be activated, causing different generalization patterns for behavior from ingroup as compared to outgroup members (Henderson-King and Nisbett, 1996). If patterns of observations are consistently attributed in a rather "friendly" manner for interactions with the ingroup and in an

"unfriendly" manner for the outgroup, the (objectively) same experiences of behavior should be generalized quite differently. Based on the important work on the ultimate attribution error and differential generalization patterns, people could be expected to show an ingroup-favoring generalization bias in repeated social dilemma interactions, as follows: while positive behavior (cooperation) is more strongly generalized from one to subsequent members of the ingroup, negative behavior is more strongly generalized to outgroup members. In contrast to the prediction of rational updating of expectations, this ingroup-favoring generalization bias would lead to increasing ingroup favoritism.

In two experiments we investigate (i) whether ingroup favoritism is mainly driven by fixed initial differences or dynamics that develop over repeated interactions, and (ii) whether these dynamics reflect rational updating or an ingroup-favoring generalization bias.

Investigating initial differences and potential dynamics of ingroup favoritism is methodologically demanding. To assure high internal and external validity we decided to use a repeated version of a social dilemma game, in which participants interact with different members of both groups (i.e., stranger matching with change of groups after half of the trials). Additionally to avoid effects due to artificial responses, participants interact with real interaction partners and we use real incentives. Also we use relatively salient and to some degree natural groups. Furthermore, to learn more about drivers for possible dynamics, expectations regarding cooperation are repeatedly measured.

Interestingly, although there are many studies published on ingroup favoritism in social dilemmas (Balliet et al., 2014, for an overview), none of them can be directly used to derive clear predictions concerning our research questions. First, none of them fulfills all the above mentioned characteristics to properly investigate dynamics at the same time. Specifically, from the seven studies reporting results from repeated interactions in prisoner's dilemmas, four do involve fake interaction partners, which makes potential conclusions concerning dynamics questionable (Wrightsman et al., 1972; Baxter, 1973; Dion, 1973; Parks et al., 2001). Of the remaining studies two do not involve interactions with members from both groups (Wilson and Kayatani, 1968; Wallace and Rothaus, 1969) and another one does not use real groups but minimal groups instead (Wilson et al., 1965). Second, due to being interested in different topics, most studies do not report analyses concerning the dynamics of ingroup and outgroup cooperation over repeated interactions. An exception is the study by Wallace and Rothaus (1969), which shows relatively stable cooperation over time in the ingroup condition, but a decrease in cooperation in the outgroup condition. However, the study does not report changes in ingroup favoritism (comparison between ingroup and outgroup cooperation) and, as stated before, it does not include alternating interaction partners nor interactions with both groups. Considering these limitations and taking into account that most relevant studies have been published more than 40 years ago our research questions cannot be answered based on published results and neither by re-analyzing existing data. Therefore, we conducted two new studies to directly address them.

Overview of the Experiments

In our experiments, we investigate ingroup favoritism at a cognitive and a behavioral level by measuring (a) whether there are higher expectations regarding cooperation behavior for the ingroup as compared to the outgroup and (b) whether there is higher cooperation toward the ingroup compared to the outgroup. We used repeated interactions in a prisoner's dilemma with a stranger-rematching protocol, in which individuals knew that they would never interact with the same partner twice. Participants sequentially interacted (got into contact) with 10 different members from the ingroup and subsequently with 10 different members from the outgroup, or vice versa, which constituted a group change manipulation (contact with both groups) between the two parts of the experiment. Group salience was induced by a Skype conference of about 2 min at the beginning of the experiment, during which participants could confirm that the outgroup actually existed. Participants sitting together with their ingroup in one experimental laboratory (in separate cubicles) could see the outgroup's laboratory, but could not identify the individual participants. Besides the Skype conference, participants in Experiment 1 knew that they would play the prisoner's dilemma game with different people from their own university and city (ingroup) or another university and city (outgroup). To enforce the salience of the ingroup-outgroup differentiation, and to make sure that our manipulation did not prime the common identity of being a student, we conducted Experiment 2 (which also served as a partial replication of Experiment 1), in which participants were additionally told which university and city their interaction partners came from.

On theoretical ground, we investigate the development of ingroup favoritism and the underlying process driving this development. In order to do so, we test for differential hypotheses concerning generalization patterns that follow from different classes of models and examine whether the dynamic development of ingroup favoritism reflects rational updating or an ingroup-favoring generalization bias.

Experiment 1

Experiment 1 assesses whether ingroup favoritism is a fixed phenomenon that can be observed from the first interaction onwards and that remains stable over time, or whether it is a dynamic construct that develops over time. Besides, Experiment 1 aims to identify drivers for potential dynamics in ingroup favoritism.

Methods

Participants and Design

Seventy-two people (mainly students at the University of Bonn and the University of Erfurt, 44 of whom were female) were recruited via the online recruitment tool *Orsee* (Greiner, 2004) and took part in the experiment. Subjects participated in continuous prisoner's dilemma games (for a detailed description, see below) in groups of two. We manipulated as within-subjects factor whether individuals played with different individuals from their own city and university (ingroup) or with different individuals from another city and university (outgroup). Sessions consisted of 24 individuals, 12 in the experimental laboratory in

Bonn and 12 in the experimental laboratory of the University of Erfurt. Assignment to dyads and conditions was anonymous and random. Participants played 10 rounds with different people from one group. After round 10, a group change took place, followed by another 10 rounds with different members of the other group. For both parts, we used a stranger-rematching protocol, so that participants never interacted with the same person twice. The sequence of ingroup and outgroup conditions was counterbalanced (session-wise).[1] The experiment was computerized and run using *Bonn Experimental System* (BoXS, Seithe, 2012). Completing the experiment took participants about 60 min overall. Participants' payments depended on their decisions, and earnings ranged from 8.30 to 23.90 Euros (approx. USD 11.20 to USD 32.30).[2]

Materials and Procedure

All participants were informed about the structure of the game by detailed instructions which they read before beginning with the experiment. Communication was forbidden throughout the experiment. After reading the instructions, participants answered six control questions to assure they had understood the rules. Answers were checked by the experimenters and questions were answered individually. After participants had read the instructions and answered the control questions, we arranged a live Skype conference with the other lab to assure our participants that they would interact with people from another lab in real time and to make group affiliation salient. As a manipulation check for the effectiveness of our ingroup–outgroup manipulation, before starting with the prisoner's dilemma game, we assessed perceived interpersonal closeness with both groups using a pictorial scale containing seven graphical items for the overlap of self and ingroup as well as self and outgroup (Aron et al., 1992; Schubert and Otten, 2002). The repeated prisoner's dilemma worked as follows: In each round, participants were given a round endowment of 10 Taler (1 Taler = 0.05 Euro). Both players decided simultaneously which amount between 0 and 10 of their round endowment to transfer to their current interaction partner, whereas they kept the rest (10 – transferred amount) in their private account. The money transferred to the interaction partner was multiplied by a factor of 2. If both participants in a dyad transferred their whole endowment of 10 Taler, each player earned 20 Taler in this round. Hence, there was a potential collective gain of 100% that could be realized by transferring Taler to the interaction partner (cooperating). The individual payoff was maximized, however, if a player did free-ride on the cooperation of his or her interaction partner, that is, if the player kept the round endowment and enjoyed the money the other player transferred to her/him. Before participants made their cooperation decisions, they were asked about their expectations regarding their current interaction partner's cooperation by typing any amount between 0 and 10 which they expected to receive from their current partner.[3] At the end of each round participants were informed about the amount of money their interaction partner transferred to them and their earning in the current round.

Results

The interpersonal closeness scale reveals that people felt a higher overlap between self and ingroup ($M = 4.88$, $SD = 1.61$), as compared to self and outgroup ($M = 3.05$, $SD = 1.49$), prior to playing the prisoner's dilemma game [$t_{(58)} = 8.79$, $p < 0.001$, $d = 1.19$], indicating that our ingroup–outgroup manipulation was successful and induced a large effect.[4]

First, we examined whether ingroup favoritism prevails overall. We ran two ordinary least square (OLS) regressions over all rounds, which predicted cooperation behavior and expectations by group affiliation of the interaction partner (dummy coded; outgroup = 0 vs. ingroup = 1). For the regressions, we clustered at the individual level (Rogers, 1994) and controlled for counterbalancing condition (ingroup first = 0 vs. outgroup first = 1) and experimental lab (Bonn = 0 vs. Erfurt = 1).[5] We found significantly increased average cooperation for members of the ingroup as compared to members of the outgroup, $b = 0.70$, $t_{(71)} = 3.07$, $p = 0.003$, $d = 0.21$ (**Table 1**, Model 1). Hence, overall cooperation toward the ingroup is 0.70 (out of 10) Talers higher for interactions with members from the ingroup as compared to interactions with members from the outgroup. A similar effect is observed for average expectations concerning cooperation, which is increased by about the same magnitude for the ingroup as compared to the outgroup, $b = 0.74$, $t_{(71)} = 3.00$, $p = 0.004$, $d = 0.24$ (**Table 1**, Model 2).

In order to examine whether ingroup favoritism is a fixed phenomenon that remains stable or whether it develops dynamically over repeated contact, we calculated a mean bias score (difference between ingroup and outgroup cooperation) for

[1]Due to technical problems, we lost one session, which led to an unbalanced number of order conditions (ingroup first vs. outgroup first). In two sessions ($N = 48$), participants interacted with the ingroup first; in one session ($N = 24$), participants interacted with the outgroup first.

[2]For Experiment 1, we also employed personality measures. Results for personality measures of Experiment 1 are not reported here (and were not collected for Experiment 2), but are available upon request. Instructions for both experiments were provided in German. An English translation is provided in the online supplementary materials.

[3]We assessed expectations prior to cooperation decisions and not the other way around since we were interested in the factors driving ingroup favoritism and therefore wanted to assess our predictor before our criterion. Due to the repeated interaction design, the order of expectation and action assessment is crucial only for the first round since afterwards in any case both kinds of assessments alternate and this was common knowledge already prior to the start of the game. Also, when analyzing the data without the very first round, the conclusion that ingroup favoritism is dynamic did not change.

[4]Participants completed the whole interpersonal closeness measure (perceived overlap between self and ingroup, self and outgroup, and ingroup and outgroup) on three different occasions: Before the experiment started, after the first 10 rounds (before participants received instructions for part 2 where they learned with whom they would interact in the second part of the experiment), and in the end. At all stages and for both studies, participants stated a higher overlap between self and ingroup, as compared to self and outgroup. In both studies, the perceived overlap between ingroup and outgroup diminished from time 1 to time 3. For 13 participants, we have missing values for the overlap between self and outgroup, since some participants forgot to complete the reverse side of the questionnaire.

[5]Due to collinearity, we did not additionally include session dummies (we only had one session where participants interacted with the outgroup first). To test the robustness of our findings we additionally confirmed our analyses by applying fixed-effects panel regressions with ingroup (vs. outgroup) as the within-subjects (fixed-effects) variable when appropriate. This analysis led to the same conclusions.

TABLE 1 | Regression analysis for cooperation and expectations.

	(1) Experiment 1 cooperation	(2) Experiment 1 expectation	(3) Experiment 2 cooperation	(4) Experiment 2 expectation	(5) Overall cooperation	(6) Overall expectation
Interaction partner's group affiliation (0 = outgroup; 1 = ingroup)	0.701** (3.07)	0.740** (3.00)	1.005*** (4.93)	1.146*** (5.58)	0.875*** (5.75)	0.972*** (6.14)
Experimental lab (0 = Bonn, 1 = Erfurt)	0.490 (0.93)	0.671 (1.59)	0.278 (0.57)	0.110 (0.30)	0.369 (1.03)	0.351 (1.27)
Counterbalancing condition (ingroup first = 0 vs. outgroup first = 1)	1.534* (2.51)	1.259** (2.71)	0.749 (1.54)	0.731* (2.02)	1.044** (2.80)	0.899** (3.27)
Constant	2.966*** (7.65)	3.323*** (10.52)	3.119*** (8.25)	3.351*** (10.31)	3.039*** (11.23)	3.342*** (14.72)
Observations	1440	1440	1920	1920	3360	3360
Subjects/Cluster	72	72	96	96	168	168
Adjusted R^2	0.059	0.061	0.030	0.043	0.039	0.045

*t-statistics in parentheses, OLS regression analysis used, standard errors are clustered at the individual level, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.*

each round and collapsed over all participants, resulting in 20 data points (one for each round). Running a regression predicting this bias score by the variable round, we found that ingroup favoritism significantly increased over time (rounds), $b = 0.21$, $t_{(18)} = 5.10$, $p < 0.001$, which is in line with the dynamic perspective. Hence, in each of the 20 rounds, favoring the ingroup over the outgroup increased by 0.21 Talers, which is represented by the red regression line in **Figure 1** (left).

Interestingly, when comparing average contribution rates for the ingroup and the outgroup, participants did not show any ingroup favoritism (and even a tendency in the opposite direction) in the first round, $b = -0.85$, $t_{(69)} = -1.05$, $p = 0.298$ (**Table 2**, Model 1), but a tendency to do so for the last round, $b = 1.38$, $t_{(69)} = 1.94$, $p = 0.056$ (**Table 2**, Model 2).[6] This results is also illustrated in **Figure 1** (left), in that the bias score for the first round (as well as subsequent rounds up to round 10) is negative, whereas it is positive for the last round.[7]

Furthermore, we aimed to investigate what drives the change in ingroup favoritism over time and led to the development of ingroup favoritism after the first round. Since ingroup favoritism concerning cooperation was not observable in the first round, rational updating cannot account for the observed dynamics. We therefore focus the investigation on the ingroup-favoring generalization bias. According to an ingroup-favoring generalization bias, positive experiences should be more strongly generalized over the ingroup, as compared to the outgroup, and vice versa for negative experiences. Stated differently, receiving more than one expects should lead to a stronger increase in expectations about members from the ingroup as compared to the outgroup in the following round. Conversely, receiving less than one expects should lead to a stronger decrease in expectations for the outgroup, as compared to the ingroup. **Figure 2** (left) presents the observed changes in expectations concerning cooperation as a function of positive or negative experiences in the previous round.

As indicated by the similar slope of the regression lines for ingroup and outgroup, and as further confirmed by a statistical analysis, no differential effects were observed (interaction between experience and ingroup) for positive, $b = 0.03$, $t_{(70)} = 0.51$, $p = 0.610$ and negative experiences, $b = -0.01$, $t_{(68)} = -0.09$, $p = 0.93$.[8] Hence, there was no support for an ingroup-favoring generalization bias (**Table 3**, Models 1 and 2).

For exploratory reasons, we further investigate whether changing groups had any effect, which might activate social identity by making group membership more salient. Comparing cooperation rates between round 10 (last round with one group) and 11 (first round with the other group), there is indeed a sharp increase in ingroup favoritism, as indicated by a significant

[6] In the two regression analyses we predict cooperation by group (ingroup vs. outgroup) in round 1 and round 20, respectively, additionally controlling for experimental lab. We do not control for counterbalancing condition since this information is included in the variable group due to considering the first and the last trial only.

[7] Interestingly and although we do observe ingroup favoritism in both experiments, when analyzing the first 10 rounds of Experiment 1 separately, we find a tendency toward outgroup favoritism, $b = -1.20$, $t(71) = -1.91$, $p = 0.060$. In previous studies occasionally also outgroup favoritism has been found in situations in which the status of the ingroup was low as compared to the outgroup (e.g., Jost and Burgess, 2000). In our study particularly effects of perceived status differences between own and other universities cannot be fully precluded. Furthermore, since in Erfurt mainly first-year students (95%) took part in the experiment, one could assume additional effects of status or it might be the case that they did not yet identify with their fellow students and preferred the outgroup instead. Both explanations remain highly speculative and future research would be necessary to explore this issue further.

[8] We conducted a regression analysis in which the change in expectations (current expectation – expectation in the previous round) was predicted by the previous experience with a member from the current group (received cooperation – expected cooperation), a variable coding our ingroup–outgroup manipulation (both variables centered) and their interaction. We furthermore again included the control variables "lab" and "condition" and clustered at the individual level. Analyses were run separately for positive experiences (i.e., receiving more than expected) and negative experiences (i.e., receiving less than expected). A further full factorial analysis including the three-way interaction of positive and negative experiences led to the same conclusions.

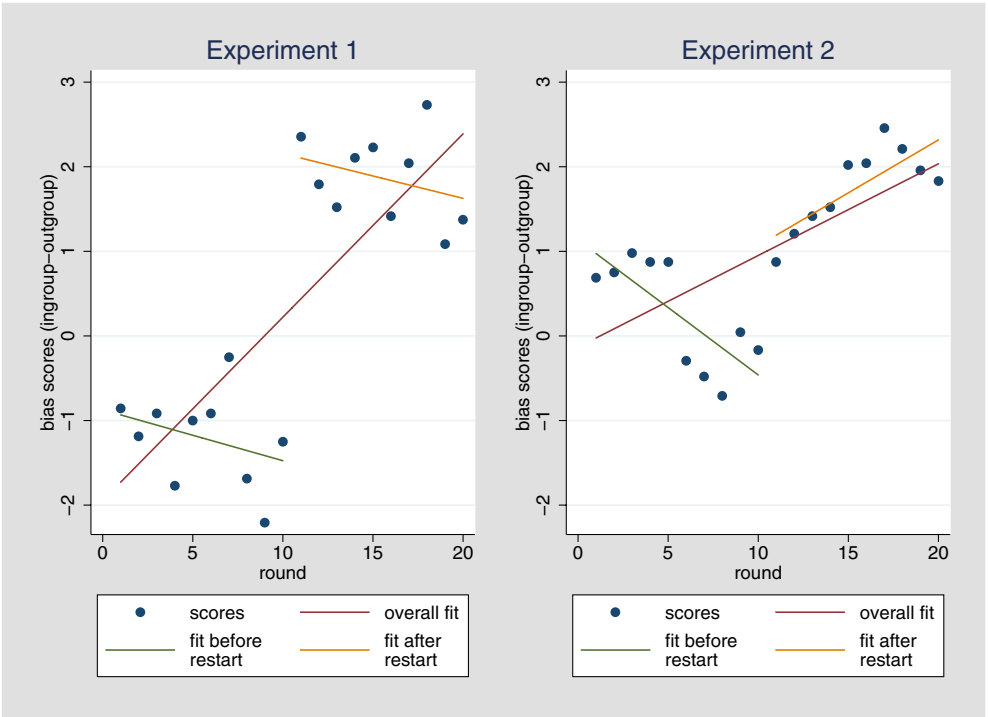

FIGURE 1 | Development of bias score (ingroup – outgroup cooperation) from round 1 to round 20 with group change and restart after round 10.

TABLE 2 | Regression analyses for cooperation in the first and the last round.

Cooperation (in Taler)	(1) Experiment 1 first round	(2) Experiment 1 last round	(3) Experiment 2 first round	(4) Experiment 2 last round	(5) Overall first round	(6) Overall last round
Interaction partner's group affiliation (0 = outgroup; 1 = ingroup)	−0.854 (−1.05)	1.375^{+} (1.94)	0.687 (0.94)	1.833** (2.84)	0.0486 (0.09)	1.653*** (3.53)
Experimental lab (0 = Bonn, 1 = Erfurt)	−0.0278 (−0.04)	1.361* (2.04)	0.229 (0.31)	0.417 (0.65)	0.119 (0.23)	0.821^{+} (1.77)
Constant	6.597*** (8.60)	0.819 (1.55)	5.677*** (9.01)	1.125* (2.02)	5.996*** (12.42)	1.006** (2.62)
Observations	72	72	96	96	168	168
Adjusted R^2	−0.013	0.077	−0.011	0.064	−0.012	0.075

t-statistics in parentheses, OLS regression analysis used $^{+}p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

interaction between round (round 10 vs. 11) and ingroup[9], (**Table 4**, Model 1).

When analyzing cooperation in round 10 and 11 separately there was even a slightly lower cooperation rate toward the ingroup as compared to the outgroup in round 10, $b = -1.25$, $t_{(69)} = -1.41$, $p = 0.16$ and strong ingroup favoritism was observed in the first interaction with the new group $b = 2.35$, $t_{(69)} = 3.21$, $p = 0.002$. This is also illustrated in **Figure 1** by the jump from a negative bias score in round 10 to a positive bias score in round 11. Hence, the significantly increasing bias score over several rounds is not a result of a gradual slope, but rather of an abrupt rise of ingroup favoritism from round 10 to round 11, where the group change and restart took place. Within the two phases of the experiment, the regression lines are rather flat or even decreasing (**Figure 1**, left). Running the same regression as before with the bias score as a criterion and adding a dummy for the experimental phase (before or after group change), the effect of round on ingroup favoritism is no longer significant.

Interestingly, when controlling for expectations, the group change effect is no longer significant either, indicating that changes in expectations mediate the effects of activated social

[9]Both variables centered.

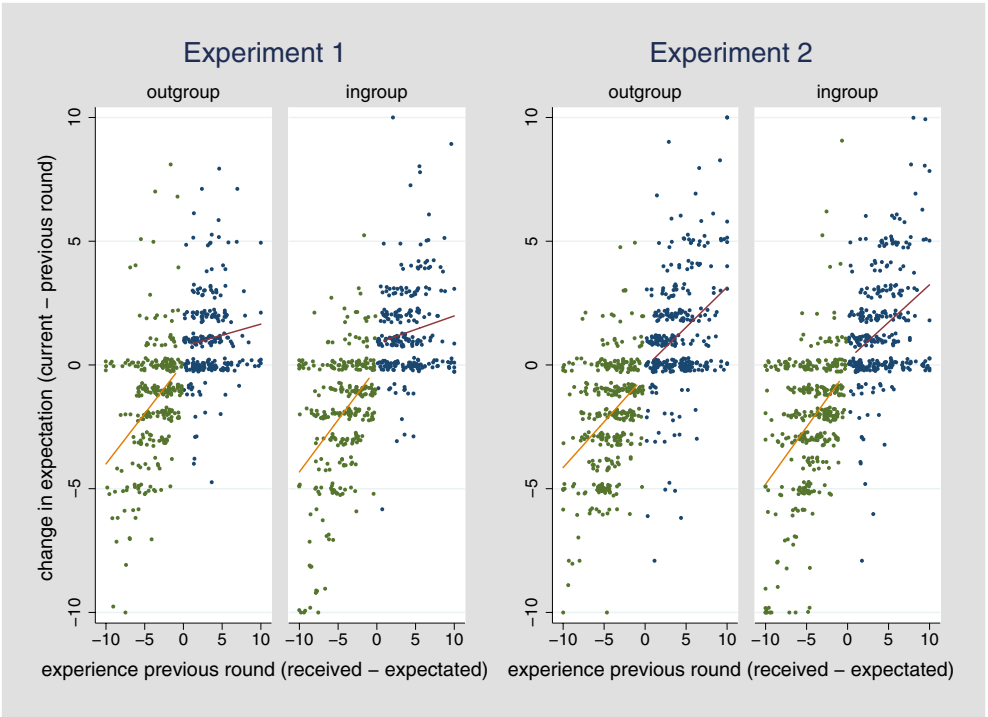

FIGURE 2 | Experience in previous round (received Taler – expected Taler) dependent on the change in expectation (current – previous round) for the ingroup and the outgroup in Experiment 1 and 2.

TABLE 3 | Regression analysis for changes in expectations due to positive or negative experience in the previous round.

Change in expectation (current round – previous round)	(1) Experiment 1 positive experiences	(2) Experiment 1 negative experiences	(3) Experiment 2 positive experiences	(4) Experiment 2 negative experiences	(5) Overall positive experiences	(6) Overall negative experiences
Experience (amount received – expectation)	0.122*	0.411***	0.312***	0.417***	0.237***	0.419***
	(2.54)	(6.25)	(7.21)	(6.68)	(6.86)	(9.24)
Interaction partner's group affiliation (0 = outgroup; 1 = ingroup)	0.0661	−0.263	0.324	0.210	0.243	−0.0136
	(0.30)	(−0.73)	(1.11)	(0.63)	(1.20)	(−0.05)
Experience*group affiliation	0.0281	−0.0109	−0.0239	0.0899	−0.0148	0.0433
	(0.51)	(−0.09)	(−0.32)	(0.93)	(−0.28)	(0.56)
Experimental lab (0 = Bonn, 1 = Erfurt)	0.307	0.367	0.00204	−0.232	0.163	0.0508
	(1.51)	(1.48)	(0.01)	(−0.89)	(1.05)	(0.28)
Counterbalancing condition (ingroup first = 0 vs. outgroup first =1)	−0.191	0.0396	−0.0886	0.182	−0.172	0.0619
	(−0.88)	(0.14)	(−0.42)	(0.72)	(−1.12)	(0.34)
Constant	0.621**	−0.364	0.0176	−0.415+	0.273+	−0.341*
	(3.19)	(−1.64)	(0.08)	(−1.78)	(1.67)	(−2.11)
Observations	524	606	691	751	1215	1357
Subjects/Cluster	71	69	95	95	166	164
Adjusted R^2	0.022	0.170	0.118	0.169	0.076	0.169

t-statistics in parentheses, OLS regression analysis used, standard errors are clustered at the individual level; variables group affiliation and experience centered; positive (negative) experience take into account only cases in which people received more (less) than they expected; $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 4 | Regression analysis for changes in cooperation due to group change from round 10 to round 11.

Cooperation (in Taler)	(1) Experiment 1	(2) Experiment 1	(3) Experiment 2	(4) Experiment 2	(5) Overall	(6) Overall
Interaction partner's group affiliation (0 = outgroup; 1 = ingroup)	0.552 (1.18)	0.255 (0.96)	0.354 (0.94)	−0.160 (−0.54)	0.493^{+} (1.73)	−0.0193 (−0.09)
Round (round 10 = 0, round 11= 1)	1.573** (3.37)	0.461^{+} (1.69)	2.250*** (6.00)	0.898* (2.57)	1.951*** (6.84)	0.614** (2.68)
Group affiliation*round	3.604* (2.46)	0.342 (0.43)	1.042 (0.88)	0.140 (0.14)	1.924* (2.16)	0.359 (0.52)
Experimental lab (0 = Bonn,1 = Erfurt)	0.139 (0.22)	−0.0341 (−0.10)	−0.167 (−0.28)	0.144 (0.30)	−0.0357 (−0.08)	0.114 (0.36)
Expectations		0.890*** (20.47)		0.609*** (7.40)		0.720*** (13.42)
Constant	4.675*** (9.07)	0.424 (1.56)	4.271*** (9.70)	1.541** (3.20)	4.384*** (13.23)	1.107*** (3.48)
Observations	144	144	192	192	336	336
Cluster/Subjects	72	72	96	96	168	168
Adjusted R^2	0.085	0.702	0.088	0.391	0.084	0.506

t-statistics in parentheses, OLS regression analysis used, standard errors are clustered at the individual level, variables group affiliation and round centered, $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

identity due to group change (**Table 4**, Model 2). To further test whether the group change effect could partially be explained by expectations, we conduct a mediation analysis clustering across individuals and using bootstrapping to estimate standard errors (Preacher and Hayes, 2008). This analysis reveals a significant mediation [total indirect effect: $b = 3.26$, CI_{95}:(0.97; 5.49)].[10]

Discussion

In Experiment 1, we find ingroup favoritism to be a dynamic phenomenon that develops over contacts with the ingroup and the outgroup. This dynamic ingroup-favoring effect is not driven by differences in generalizing experiences or gradual changes over rounds. In contrast, we find that differences are mainly driven by one specific event, namely the change of groups that occurred after round 10. This finding can be due to the fact that a group change activates social identity by making the distinction between outgroup and ingroup more salient.

However, before rejecting the ingroup-favoring generalization bias as a potential influence factor, one has to point to several potential limitations of our experiment. First, it has to be acknowledged that the power of the experiment was limited due to the relatively low number of participants. Second, in one of the two labs involved (the lab in the city of Erfurt), mainly 1st year students (95%) took part in the experiment, who might still have had low identification with their university, perceived lower status or other characteristics that were not observable.

With our second experiment, we aimed to overcome these limitations and to test the stability of the findings more generally. To increase the chances of observing rational updating or generalization biases from the beginning, we made social identity more salient from the beginning by revealing to participants that they would interact with different people from the University of Bonn or the University of Erfurt. The resulting increase in group distinctiveness can be expected to affect group perceptions (Spears et al., 1985; Acorn et al., 1988; McConnell et al., 1994) and ingroup favoritism should generally increase with salience of the ingroup (see the meta-analysis by Mullen et al., 1992).

[10] 91% of the total effect could be explained by the indirect effect.

Experiment 2

Methods

Ninety-six people (mainly students from the University of Bonn and the University of Erfurt, 65 of whom were female) were recruited in the same way as in Experiment 1. Participants' payments depended on their decisions, and earnings ranged from 6.70 to 21.70 Euros (approx. USD 9.00 to USD 29.30). We applied the same procedure as in Experiment 1, with the exception that this time we explicitly named the city of the interaction partner in the instructions so that all participants were aware of whether they were interacting with students from the University of Bonn or Erfurt. Everything else remained the same.

Results and Discussion

Again, the group manipulation proved to be successful in that people indicated a higher interpersonal closeness between self and ingroup ($M = 5.25$, $SD = 1.63$), as compared to self and outgroup ($M = 3.46$, $SD = 1.73$), prior to playing the prisoner's dilemma game, $t_{(95)} = 9.75$, $p < 0.001$, $d = 1.06$.

Using the same analyses as in Experiment 1, we again find that cooperation is higher for the ingroup as compared to the outgroup, $b = 1.01$, $t_{(95)} = 4.93$, $p < 0.001$, $d = 0.28$ and the same holds for expectations, $b = 1.15$, $t_{(95)} = 5.58$, $p < 0.001$,

$d = 0.36$ (**Table 1**, Models 3 and 4). Similar to Experiment 1, the bias score indicating average ingroup favoritism in the respective round increases over the course of time, $b = 0.11$, $t_{(18)} = 3.90$, $p = 0.001$, again speaking for the ingroup favoritism to be dynamic. Hence, in each of the 20 rounds, favoring the ingroup over the outgroup increases by 0.11 Taler. Furthermore, we replicate the effect that there is no significant difference in cooperation in the first round, $b = 0.69$, $t_{(93)} = 0.94$, $p = 0.347$ (**Table 2**, Model 3), but it appears in the last round, $b = 1.83$, $t_{(93)} = 2.84$, $p = 0.005$ (**Table 2**, Model 4).

We again do not find support for the ingroup-favoring generalization bias (**Table 3**, Models 3 and 4). Generalization of positive and negative experiences does not differ between ingroup and outgroup (**Figure 2**, right), with both respective interactions being reversed in direction and not significant. The strong effect of the change in groups after round 10, observed in Experiment 1, is not fully replicated, but a tendency in the same direction is observed, $b = 1.04$, $t_{(95)} = 0.88$, $p = 0.383$ (**Table 4**, Model 3; see also **Figure 1**, right). We have no conclusive explanation for why the magnitude of the effect is reduced but perhaps the stronger and more salient group manipulation that was applied already in the beginning of Experiment 2 might have contributed to it in that it reduced potential later contrast effects between ingroup and outgroup. As before, none of the comparisons between round 1 and 10 as well as between round 11 and 20 reveals significant changes. When running a regression predicting the bias score by round and adding a dummy for the experimental phase (before or after group change), the dynamic in ingroup favoritism is no longer significant, which is in line with the results of Experiment 1.

Experiment 2 was designed to readdress the development of ingroup favoritism with a more salient initial group manipulation at the beginning. We were thus able to replicate the result of a developing ingroup-favoring effect over repeated interactions in a prisoner's dilemma game. Again there was no support for the second hypothesis concerning systematic biases in generalization of experiences.

Overall Analysis

Given the similarity between Experiments 1 and 2, we conduct an overall analysis to generate best estimates concerning the dynamic effects.[11] The detailed development of cooperation and expectations is shown in **Figure 3**.

Generally, there is clear evidence for a dynamic development of ingroup favoritism in cooperation since we find that ingroup favoritism (as indicated by the round-specific bias score) significantly increases over time, $b = 0.15$, $t_{(18)} = 5.46$, $p < 0.001$. There is no indication for a generalization bias in updating of expectations neither for positive, nor for negative experiences, although there is a strong effect of experience on updating in general (**Table 3**, Models 5 and 6). In the overall analysis, the effect of the change in groups between round 10 and 11 seems to be the main force driving differences between ingroup and outgroup (**Table 4**, Model 5). When controlling for expectations, the group change effect is no longer significant, again indicating that the effects of group change on ingroup favoring are mediated by expectations (**Table 4**, Model 6), which is further confirmed by a mediation analysis using bootstrapping to estimate cluster corrected standard errors (clustering at the level of individuals), $b = 1.56$, CI_{95}:(0.46; 2.64). In contrast, ingroup favoritism does not change over repeated interactions with several members from the ingroup or the outgroup, as indicated by the fact that there are no systematic differences between rounds 1 and 10, $b = -0.52$, $t_{(167)} = -0.82$, $p = 0.415$, as well as rounds 11 and 20, $b = 0.20$, $t_{(167)} = 0.34$, $p = 0.736$. Overall, this result indicates that the dynamics we have observed are mainly due to changing groups, which makes the comparison between groups more salient. Gradual effects of biased generalization in repeated interactions are not observed and findings after the first interaction with a member from the respective group are more in line with rational models of belief updating that do not assume differential effects between ingroups and outgroups. A detailed development of cooperation by experimental session is shown in **Figure 4**. Interestingly, the comparison between sessions also reveals that effect of group change is larger when switching from outgroup to ingroup than vice versa.

Expectations (**Figure 3**, right) show a similar general pattern, although there is a tendency toward expecting more cooperation from the ingroup already in the first round, $b = 0.81$, $t_{(167)} = 1.71$, $p = 0.089$, which diminishes and even reverses in subsequent interactions with members from the same group up to round 10, $b = -1.18$, $t_{(167)} = -1.82$, $p = 0.071$. No systematic differences can be observed between rounds 11 and 20, $b = -0.74$, $t_{(167)} = -1.12$, $p = 0.226$.

General Discussion

A recent meta-analysis (Balliet et al., 2014) showed that, aggregated over the large set of available studies, individuals tend to cooperate more with members of their ingroup as compared to members of an outgroup. Overall, this effect of ingroup favoritism is small to medium in size and a similar difference prevails concerning expectations. The meta-analysis identified several moderators for ingroup favoritism. Of particular interest for our study was the finding that cooperation between the ingroup and the outgroup is stronger in repeated interactions with changing interaction partners from the same group (i.e., the ingroup or the outgroup), as compared to one-shot interactions. We expected that differences are due to dynamic developments over repeated interactions. To test this assumption, we assessed ingroup favoritism through cooperation behavior in a repeated continuous prisoner's dilemma where participants sequentially interacted with 10 members of the ingroup (own city and university) and subsequently with 10 different members of the outgroup (other city and university) or vice versa. Aggregated over all trials, we replicated ingroup favoritism in cooperation

[11] Due to the imbalance of order conditions (ingroup vs. outgroup first) between Experiments 1 and 2, random assignment to experimental conditions is no longer given when pooling data over both experiments. Therefore we cannot rule out potential confounds concerning our results. However, when including a dummy for experiment (1 vs. 2) in the regression models (predicting generalization bias, group change, and expectations) to control for potential differences between studies, we observe the same pattern of results.

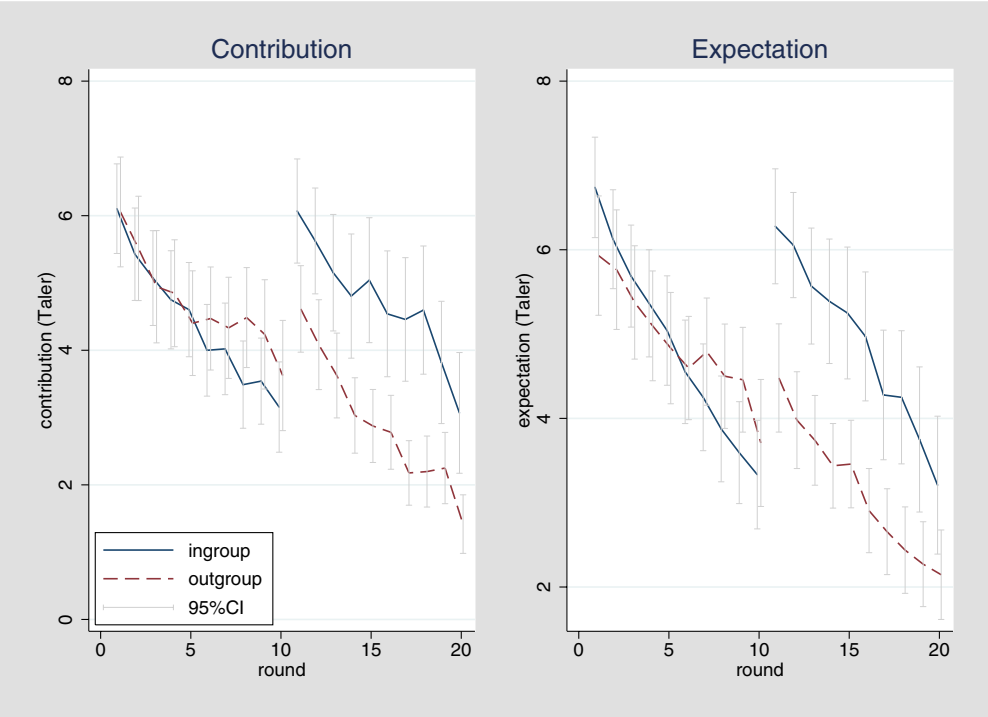

FIGURE 3 | Overall development of contributions and expectations in rounds 1–20.

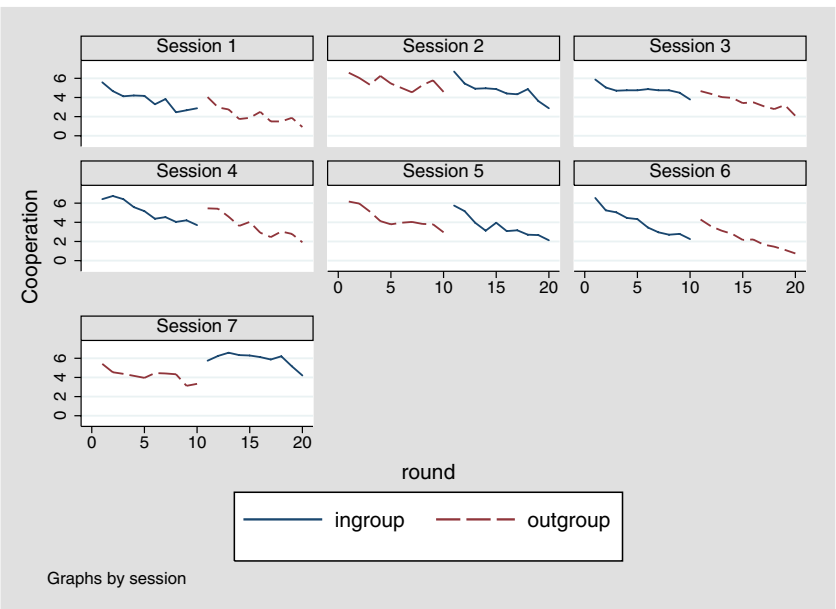

FIGURE 4 | Development of contributions per experimental session in rounds 1–20.

and expectation and found effects that are comparable in size to the results from the meta-analysis. More importantly, we observed a development of ingroup favoritism over time, in that the intergroup bias—the systematic tendency to evaluate the own group more positively or behave more positively toward the ingroup—in cooperation changed in favor of the ingroup over repeated contact with both groups. However, rational updating of expectations based on real differences in experienced cooperation

with the ingroup as compared to the outgroup did not seem to be the crucial driver for the observed dynamics. We also did not find support for an ingroup-favoring generalization bias suggesting that people generalize differently (and in an ingroup-favoring way) over past experiences with ingroup or outgroup members. Although individuals updated their expectations concerning the behavior of members from the ingroup and the outgroup with repeated interactions, this updating process did not differ between groups and is hence unbiased with regard to the difference between ingroup and outgroup. Rather, we see that ingroup favoritism only occurred from the moment people effectively got into contact with the second of both groups, that is, after the group change in round 11. As illustrated in **Figure 3**, a systematic difference in restart effects can be observed. While restart effects in general are typical for behavior in repeated social dilemmas after a restart of the game (Cookson, 2000; Fischbacher et al., 2001), in our experiments the effect was particularly pronounced when playing with the outgroup first before interacting with the ingroup. The cooperation pattern during the first 10 rounds shows the typical declining pattern for social dilemma games. One could assume that, when contrasting both groups, people start more optimistically when first playing with an outgroup member followed by interactions with ingroup members ("my group will be much nicer than the other group") as compared to the other way around ("the other group cannot be much better than my group"). When comparing our findings to the results from previous studies, it is worth noting that the meta-analysis (Balliet et al., 2014) indicates consistent ingroup favoring for one-shot interactions, while over two studies we consistently do not find ingroup favoring in the first round of a repeated interaction. Hence, the anticipation of subsequent interactions even with other persons seems to influence behavior.

Interestingly, expectations mediate the occurrence of ingroup favoritism after group change. The development of ingroup favoritism between round 10 and 11 (group change) is conveyed by increasing expectations when the interaction partner is from the ingroup compared to the outgroup. When controlling for expectations, the effect of group change on ingroup favoritism disappears.

Given that our result concerning the factors driving dynamics in ingroup favoritism leads to different results than a priori expected, and since Experiment 2 replicated the jump after group change only as a tendency, more studies are needed to validate our findings and conclusions further. We think that the research paradigm developed for this study is useful for this purpose, since it allows us to conduct investigations in a highly controlled setting. Although we did not find evidence supporting the ingroup-favoring generalization bias in our experiments, we would not exclude the possibility that such patterns might occur in other settings with more homogeneous groups or less anonymous intergroup contact. Additionally, strictly speaking we only have 3 (Experiment 1) and 4 (Experiment 2) independent observations, since all participants in one session were connected. Further studies with more observations would be recommended. However, there are natural limitations for running more subjects since the organization of such experiments in two labs that require full participation is rather cumbersome.

The present studies assess the development of ingroup favoritism, which is one aspect of parochial altruism. Parochial altruism explains intergroup conflict through two phenomena that have been closely linked in human evolution: the readiness to benefit the ingroup (ingroup love) and to harm the outgroup (outgroup hate). The prisoner's dilemma used in the current investigation allows one to study ingroup love elaborately. At the same time, the prisoner's dilemma does not allow one to assess people's motivation to harm the outgroup. Future studies should rely on extended paradigms that allow one to measure both components of parochial altruism separately (De Dreu, 2010) and to identify potential dynamics in both aspects.

Acknowledgments

We thank Jeronim Morina for the programming and our research students in Bonn and Erfurt for their assistance in conducting the experiments.

Supplementary Material

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.00476/abstract

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 31 October 2015
doi: 10.3389/fpsyg.2015.01594

Negative and positive externalities in intergroup conflict: exposure to the opportunity to help the outgroup reduces the inclination to harm it

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Outgroup hate, in the context of intergroup conflict, can be expressed by harming the outgroup, but also by denying it help. Previous work established that this distinction—whether the externality on the outgroup is negative or positive—has an important effect on the likelihood of outgroup hate emerging as a motivation for individual participation in intergroup conflict. The current work uses a within-subject design to examine the behavior of the same individuals in intergroup conflict with negative and positive externalities on the outgroup. Each participant made two choices, one for each type of externality, and the order was counter balanced. The main results are that (1) behavior is fairly consistent across negative and positive externalities, i.e., the tendency to display outgroup hate by harming the outgroup is correlated with the tendency to display outgroup hate by avoiding to help the outgroup; (2) People are reluctant to harm the outgroup after being exposed to the opportunity to help it; (3) *Groupness*—the degree to which people care about their group and its well-being—is related to outgroup hate only when participants encounter the opportunity to harm the outgroup first (before they encounter the opportunity to help it). In this setting the relationship between groupness and outgroup hate spilled over to the subsequent interaction, where it was possible to help the outgroup. When the opportunity to help the outgroup was encountered first, groupness was not related to outgroup hate.

Keywords: parochialism, intergroup conflict, ingroup love, outgroup hate, team games

OPEN ACCESS

Edited by:
Hannes Rusch,
University of Cologne, Germany

Reviewed by:
Daniel Balliet,
VU University, Netherlands
Özgür Gürerk,
RWTH Aachen University, Germany

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *30 June 2015*
Accepted: *02 October 2015*
Published: *31 October 2015*

Citation:
Weisel O (2015) Negative and positive externalities in intergroup conflict: exposure to the opportunity to help the outgroup reduces the inclination to harm it. Front. Psychol. 6:1594. doi: 10.3389/fpsyg.2015.01594

1. INTRODUCTION

In the context of intergroup conflict, parochial altruism—the willingness to incur a personal cost in order to favor one's ingroup over the outgroup—can be motivated by "ingroup love" (a cooperative preference for helping the ingroup) and/or by "outgroup hate" (an aggressive/competitive preference for harming the outgroup, or increasing the gap between the groups; Rusch, 2014). In many intergroup conflicts the two are not distinguishable, as individual participation in the conflict simultaneously increases the ingroup's welfare and decreases the outgroup's welfare, such that participation can be motivated by ingroup love, by outgroup hate, or by a combination of both (Allport, 1954; Bornstein and Ben-Yossef, 1994; Brewer, 1999).

Outgroup hate is often thought of as a desire to actively harm the outgroup, e.g., by taking part in hate crimes or property destruction targeted against the outgroup. In such cases, outgroup hate is expressed by imposing negative externalities on members of the outgroup. Outgroup hate can

also manifest itself, however, as discriminatory helping behavior. In the latter case, outgroup hate is expressed by avoiding to help, or, in other words, avoiding to impose positive externalities, on members of the outgroup. In a recent paper, Weisel and Böhm (2015) show that the relative roles of ingroup love and outgroup hate as motivations for individual participation in intergroup conflict crucially depend on whether outgroup hate can be expressed by imposing negative externalities, or by avoiding to impose positive externalities, on the outgroup.

Outgroup hate emerges as an important motivation for individual participation in intergroup conflict when it can be displayed by help-avoidance (avoiding to impose a positive externality), especially when the degree of enmity between the groups is high (Weisel and Böhm, 2015). When outgroup hate necessarily entails harming the outgroup (i.e., imposing a negative externality), it plays a lesser role, and ingroup love seems to be the main motivation at play (Halevy et al., 2008, 2012; De Dreu, 2010; De Dreu et al., 2010). The above result—that outgroup hate plays a major role when it can be expressed by help-avoidance—is in line with previous work that finds that many instances of discrimination are driven by *ingroup favoritism* (the selective preferential treatment of ingroup members; sometimes used synonymously to *ingroup love*), and not necessarily by *outgroup hostility* (outright outgroup derogation; sometimes used synonymously to (*outgroup hate*; Mummendey et al., 1992, 2000; Banaji and Greenwald, 2013; Greenwald and Pettigrew, 2014).

Weisel and Böhm (2015) had participants make decisions in the context of three experimentally induced intergroup conflicts, namely the Intergroup Prisoner's Dilemma (IPD; Bornstein and Ben-Yossef, 1994), the Intergroup Prisoner's Dilemma—Maximizing Difference game (IPD-MD; Halevy et al., 2008), and a positive variant of the IPD-MD (introduced by Weisel and Böhm), in a between-subjects design. The present study employs a within-subjects design and focuses on the IPD-MD and the positive variant of the IPD-MD. In the IPD-MD game participants face a choice between selfish behavior, helping their ingroup (at a personal cost), or helping their ingroup *and* harming the outgroup (at the same personal cost; see **Table 1**). In the positive variant of the IPD-MD the choice is between selfish behavior, helping the ingroup (at a personal cost), or helping the ingroup and *helping* the outgroup as well (at the same cost; see **Table 1**).

The logic underlying the analysis in Weisel and Böhm (2015) is that the IPD-MD and the positive variant of the IPD-MD are useful tools for investigating ingroup love and outgroup hate because the decisions made in the context of these games make the two key motivations—ingroup love and outgroup hate—distinguishable from each other. As stated above, helping the ingroup in the IPD-MD can be achieved either with or without harming the outgroup. As a result, choosing to help the ingroup while harming the outgroup was interpreted by Weisel and Böhm (2015) as a display of outgroup hate, and choosing to help the ingroup without harming the outgroup was interpreted

TABLE 1 | Games, accounts, and payoffs.

Group size = 3		**Effect on**					
		Ingroup			**Outgroup**		
Game	**Account**	**Self**	**2**	**3**	**1**	**2**	**3**
IPD-MD	Private	+2	0	0	0	0	0
	Within-group	+1	+1	+1	0	0	0
	Between-group	+1	+1	+1	−1	−1	−1
Positive variant of the IPD-MD	Private	+2	0	0	0	0	0
	Within-group	+1	+1	+1	0	0	0
	Between-group	+1	+1	+1	+1	+1	+1

Group size = 6		**Effect on**											
		Ingroup						**Outgroup**					
Game	**Account**	**Self**	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**	**4**	**5**	**6**
IPD-MD	Private	+2	0	0	0	0	0	0	0	0	0	0	0
	Within-group	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	0	0	0	0	0	0
	Between-group	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	−0.5	−0.5	−0.5	−0.5	−0.5	−0.5
Positive variant of the IPD-MD	Private	+2	0	0	0	0	0	0	0	0	0	0	0
	Within-group	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	0	0	0	0	0	0
	Between-group	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5	+0.5

The table illustrates the effect of each token allocated to the private, within-group, or between-group accounts on the payoff of the individual making the allocation (referred to as ingroup member "self"), the payoff of each of the two other ingroup members, and the payoff of the three outgroup members. Each individual had 10 tokens to allocate. The final payoff of each person was determined by the combined effect of the allocations of all ingroup and outgroup members.

as a display of ingroup love (an interpretation shared by, e.g., Halevy et al., 2008, 2012; De Dreu et al., 2010). In a similar vein, helping the ingroup in the positive variant of the IPD-MD can be achieved either with or without helping the outgroup. Crucially to the analysis in Weisel and Böhm, choosing to help the ingroup without helping the outgroup was interpreted as a display of outgroup hate, and choosing to help the ingroup and helping the outgroup as well was interpreted as a display of ingroup love[1].

An initial goal of the present study is to examine whether choices in the IPD-MD and in the positive variant of the IPD-MD indeed have comparable motivational underpinnings. Weisel and Böhm interpret (1) harming the outgroup in the IPD-MD, and avoiding to help the outgroup in the positive variant of the IPD-MD, as manifestations of outgroup hate; and (2) avoiding to harm the outgroup in the IPD-MD, and helping the ingroup and the outgroup in the positive variant of the IPD-MD, as manifestations of ingroup love. To the degree that these interpretations are reasonable, people who choose to help the ingroup and harm the outgroup in the IPD-MD should also show a preference for helping the ingroup and avoiding to help the outgroup in the positive variant, as both of these actions are, supposedly, displays of outgroup hate; and people who choose to help the ingroup without harming the outgroup in the IPD-MD should also show a preference for helping the ingroup and the outgroup in the positive variant, as both actions are, supposedly, related to ingroup love.

An additional question that the current study addresses is that of order effects. Does the order in which people encounter situations in which they can display outgroup hate by imposing negative externalities on the outgroup, and situations in which they can display outgroup hate by avoiding to impose positive externalities on the outgroup, affect behavior? Past work suggests, albeit indirectly, that exposure to the possibility of harming the outgroup might lead to more negative attitudes toward it (i.e., more outgroup hate) in future interactions, and that the possibility to help the outgroup might lead to more positive attitudes toward it in the future. This prediction is derived from work showing that perceptions of the outgroup (in particular dehumanization and rehumanization) are affected by awareness of harm or help that members of the ingroup imposed on the outgroup in the past (Castano and Giner-Sorolla, 2006; Čehajić et al., 2009; Saguy et al., 2015). The present design allows to examine whether exposure to the opportunity to harm or to help the outgroup, and the understanding that other ingroup member have the same opportunity, has a similar effect on future behavior. The results can have implications on the way repeated interactions between groups are structured, as well as methodological implications for research using the IPD-MD and related paradigms.

Finally, the study addresses the relation between peoples' sense of groupness—defined as the degree to which they care about their group and its well-being—and their willingness to display outgroup hate by imposing negative externalities, and/or by avoiding to impose positive externalities, on the outgroup. As groupness is measured by items that concern the ingroup only (see Section 2.3.1), a straight forward prediction is that it is related to the overall willingness to contribute to the ingroup, regardless of the effect on the outgroup. The respective relations between groupness and ingroup love and outgroup hate are less obvious to predict. Would groupness be related to ingroup love, to outgroup hate, or to both? Results from studies investigating the hormone oxytocin, known for increasing peoples' affinity to their group (i.e., their groupness), suggest that it is associated mainly with ingroup love, as opposed to outgroup hate (De Dreu et al., 2010; De Dreu, 2012).

The groupness measure that is introduced here can be seen as a type of social value orientation (SVO) measure that is targeted at one's ingroup. Typically, SVO is conceptualized as concerning an unidentified other, not necessarily a member of the in-group (see Section 2.3.3). The groupness measure used here (Section 2.3.1) explicitly focuses on the well-being of the ingroup. Despite this difference, it would hardly be surprising if the two measures turn out to be very related to each other; indeed, recent work suggests that pro-social tendencies are often ingroup-bounded (De Dreu et al., 2014, 2015). Although both groupness and SVO are measured in the current experiment, the main interest here is the possible relation of groupness—a concern for the well-being of one's ingroup—to displays of outgroup hate vis-à-vis an outgroup.

2. MATERIALS AND METHODS

2.1. Participants

One hundred forty-four undergraduate students (74 females, $M_{age} = 25$) at the Hebrew University of Jerusalem participated in the experiment, which was approved by the psychology department's ethics committee. Participants were recruited by campus advertisements promising monetary rewards for participation in a decision-making task.

2.2. Experimental Procedure

Sessions were held with cohorts of twelve participants. Upon arrival each participant was seated in a separate cubicle, and given printed instructions and decision forms (see Supplementary Material).

2.3. Design

The independent variables were the game (IPD-MD vs. positive variant of the IPD-MD; within-subjects) and the size of the interacting groups (three vs. six; between-subjects). The order of the two games was counter-balanced across sessions. The two orders of the game and the two group sizes were perfectly balanced, resulting in 36 participants in each cell. The group size did not affect the results in any meaningful way, so this variable was dropped from the analysis, and the observations were pooled, resulting in 72 participants in each order of the games.

The twelve participants in each session were randomly divided into groups of size three or six. Each group was matched with another group. Groups were named, and graphically represented

[1]Helping the ingroup and the outgroup might be considered as a display of *outgroup love*. Recall, however, that the two main motivations under consideration are ingroup love and outgroup hate.

on the instructions, as the *circles* group, the *triangles* group, the *diamonds* group, and the *squares* groups (when the group size equalled six, there were only two groups: circles and triangles). Participants were informed that they will be required to make decisions in two *world states*, color coded as the yellow and green world states; that at the end of the experiment one of the two world states will be chosen by a public coin toss; and that decisions made in the chosen state will determine the payoffs of all participants. No feedback was given between decisions in the two world states. To increase the saliency of the distinction between the two world states, the instructions that explained the yellow world state were printed on yellow paper, as were the corresponding decision forms. Likewise, the instructions that explained the green world state, and the corresponding decision forms, were printed on green paper.

In both the green and the yellow world states each participant was endowed with ten tokens, and had to allocate them between a private account, a within-group account, and a between-group account. Participants decided on one allocation of tokens in each world state. In the green state they played the IPD-MD game, and in the yellow state the positive variant of the IPD-MD game. The payoffs associated with each account in each of these games, and for each of the two group sizes, are displayed in **Table 1** (see Supplementary Material for the instructions participants received, and for formal payoff functions).

It is apparent from **Table 1** (see also the payoff functions in the Supplementary Material) that in both the IPD-MD and the positive variant, regardless of group size, payoff maximizing players should invest all of their tokens in the private account, which generates a profit of 2 New Israeli Shekels (NIS) for the decision maker. Investing in the other accounts generates only 1 (group size = 3) or 0.5 (group size = 6) NIS. This is the case regardless of the actions of the other ingroup and/or outgroup members. Since no feedback was provided between the two games, they can be thought of as two separate one-shot games, and the Nash equilibrium is to invest all of the tokens in the private account in both the IPD-MD and the positive variant.

In the IPD-MD negative payoffs are possible. The worst-case scenario for a given individual is to allocate all of her tokens to the within- or between-group account, which generates a profit of either 10 NIS (group size = 3) or 5 NIS (group size = 6) for herself, while her group members keep all of their tokens in their private account, which does not affect the individual's payoff, and all outgroup members allocate all of their tokens to the between-group account, which leads to a loss of 30 NIS for the individual. In this case the individual's payoff is −20 or −25 NIS (depending on the group size). To avoid negative payoffs, an initial amount of 40 NIS was added to each participant's total payoff in the IPD-MD, ensuring a minimum payoff of 20 or 15 NIS. In the positive variant of the IPD-MD an initial amount of 10 NIS was added to each participant, such that the minimum payoff is 20 or 15 NIS as well.

A post experimental questionnaire tapped participants' sense of "groupness," i.e., the degree to which they cared for and identified with their group; their social value orientation; as well as beliefs about the allocations of ingroup and outgroup members (the latter are not reported in the current work).

2.3.1. Groupness

The following four items, rated on a 1 ("do not agree at all") to 7 ("totally agree") scale, captured participants' sense of groupness:

1. It is important to me to contribute to the group.
2. I am committed to contribute to the group.
3. It is important to me to act in favor of the group.
4. I want the group to do well.

2.3.2. Beliefs

Participants were asked to best estimate the average number of tokens that the other members in their group and in the other group chose to keep and to invest in each account in both the green (IPD-MD) and yellow (positive variant) world states.

2.3.3. Social Value Orientation

Participants' social value orientation (SVO)—the way they balance between their own and others' welfare—was assessed with the social value orientation decomposed game measure (Van Lange, 1999). The measure is based on nine items. In each item participants choose one of three allocations of resources between themselves and an anonymous other person. One of the three allocations indicates a pro-social preference to maximize the joint outcome of self and other, another indicates an individualistic preference to maximize the outcome of self, and the third indicates a competitive preference to maximize the gap between self and other. An example is the choice between 500 points to self and 100 to other (the competitive option), 500 points to self and 500 points to other (the pro-social option), or 550 points to self and 350 to other (the individualistic option). Participants who make at least six choices that are consistent with one of the three types are classified as that type (e.g., a participant who makes six (or more) pro-social choices is classified as pro-social).

3. RESULTS

3.1. Consistency between IPD-MD and the Positive Variant of the IPD-MD

Are the motivations associated with contribution to the within-group and between-group accounts in the IPD-MD—ingroup love and outgroup hate, respectively—indeed a mirror image of the motivations in the positive variant of the IPD-MD? In other words, are people who contribute to the within-group (between-group) account in the IPD-MD more likely to contribute to the between-group (within-group) account in the positive variant? According to Weisel and Böhm (2015), this should indeed be the case.

Table 2 presents correlations between the number of tokens each participant allocated to the within- and between-group accounts in the IPD-MD and the positive variant of the IPD-MD. Regardless of which game was played first, the correlation between allocations to the within-group account in the IPD-MD and the between-group account in the positive variant ($r = 0.64$, $r = 0.45$) was medium-high and significantly different from zero. The same holds true for the correlation between

TABLE 2 | Correlations between contribution decisions in the first and second games.

			2nd game			
			IPD-MD		Positive variant of the IPD-MD	
			Within-group	Between-group	Within-group	Between-group
1st game	IPD-MD	Within-group	–	–	−0.15	0.64***
		Between-group	–	–	0.48***	−0.11
	Positive variant of the IPD-MD	Within-group	−0.10	0.72***	–	–
		Between-group	0.45***	−0.01	–	–

***$p < 0.001$.

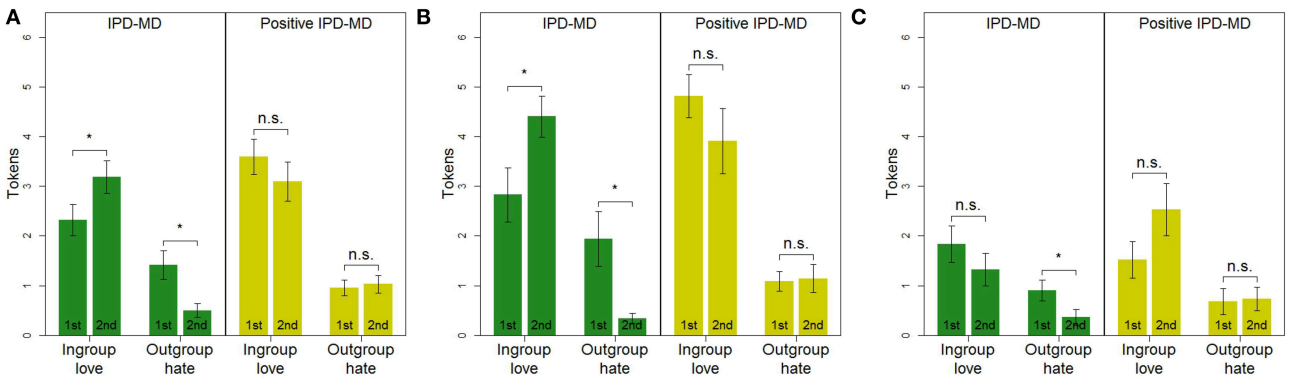

FIGURE 1 | Allocations to ingroup love and outgroup hate in the IPD-MD and Positive IPD-MD. (B,C) Are restricted to either pro-social or individualistic participants, respectively. Each pair of bars refers to conditions where the respective game was played first (left) or second (right). Ingroup love stands for the within-group account in the IPD-MD and for the between-group account in the positive variant of the IPD-MD; outgroup hate stands for the between-group account in the IPD-MD, and for the within-group account in the positive variant. *$p < 0.05$; Wilcoxon Rank Sum test. **(A)** All participants ($n = 144$). **(B)** Pro-Social ($n = 79$). **(C)** Individualistic ($n = 55$).

the between-group account in the IPD-MD and the within-group account in the positive variant ($r = 0.48, r = 0.72$). In contrast, correlations between the within-group accounts ($r = -0.15, r = -0.10$), and between the between-group accounts ($r = -0.11, r = -0.01$), are low and not significantly different from zero. This pattern of results confirms that the motivations underlying contribution to the within-group and between-group accounts in the IPD-MD (ingroup love and outgroup hate, respectively) are indeed a mirror image of the motivations in the positive variant of the IPD-MD, as argued in Weisel and Böhm (2015).

3.2. Order Effects

Does behavior in a given game depend on whether it is played first or second? **Figure 1A** shows the average contributions toward ingroup love and outgroup hate, for each game and for each position the game was played (first or second). As can be seen in the figure, the order makes a difference only for the IPD-MD, but not for the positive variant of the IPD-MD. In the IPD-MD there was more outgroup hate, and less ingroup love, when it was played first, as compared to when it was played second (i.e., after the positive variant; Wilcoxon Rank Sum test: ingroup love, $p = 0.029$; outgroup hate, $p = 0.002$). In the positive variant of the IPD-MD allocations to both ingroup love and outgroup hate remained similar, regardless of whether it was played first or after the IPD-MD (ingroup love, $p = 0.135$; outgroup hate, $p = 0.996$).

A plausible way to interpret this finding is that the positive variant of the IPD-MD has a spillover effect on behavior in the IPD-MD, but not vice-versa. After having the option to help the outgroup in the positive variant of the IPD-MD, very few group members find it appropriate to harm the outgroup in a subsequent IPD-MD. The opposite is not true: having the option to harm the outgroup in the IPD-MD does not affect behavior in the positive variant that follows.

3.3. Social Value Orientation

Of the 144 participants that took part in the study, 79 (55%) were classified as pro-social, 55 (38%) as individualistic, 1 (1%) as competitive, and 9 (6%) were unclassified (see **Table 3**). **Figures 1B,C** show the average contributions toward ingroup love and outgroup hate for pro-social and individualistic participants, respectively. The figures show that the order effects reported in the previous section are driven by pro-social participants, while behavior of individualistic participants did not follow the same pattern.

Previous work links pro-sociality to increased discriminatory behavior (in favor of the ingroup) in intergroup setting (Aaldering et al., 2013). In the present study, discriminatory behavior is manifested in the clearest way by contributions to the

TABLE 3 | Distribution of participants accross SVO and groupness levels.

	Groupness level			
SVO	**High**	**Low**	**=Median**	**Total**
Pro social	49	29	1	79
Individualistic	16	35	4	55
Competitive	0	1	0	1
Unclassified	3	5	1	9
Total	68	70	6	144

SVO was determined according to the SVO decomposed game measure. The High and Low groupness levels were determined according to a median split of the groupness scores.

within-group account in the positive variant of the IPD-MD (i.e., outgroup hate). These choices are clearly discriminatory, since the same outcome for the ingroup can be achieved by investing in the non-discriminatory between-group account, which benefits the outgroup as well[2]. Pro-socials indeed invested more than individualistic participants in the discriminatory within-group account in the positive variant (Pro-social: $n = 79$, $M = 1.11$, $SD = 1.47$; Individualistic: $n = 55$, $M = 0.71$, $SD = 1.30$; Wilcoxon Rank Sum test: $p = 0.054$).

Social value orientation was highly related to the groupness measure. Pro-socials were clearly higher on groupness ($M = 4.78$, $SD = 1.38$) than individualistic participants [$M = 3.49$, $SD = 1.61$; $t_{(132)} = 4.96, p < 0.001$]. Despite this strong relation between SVO and groupness, the groupness score of a considerable number of participants is not in line with their SVO type. The groupness score of thirty-seven percent of the pro-social participants was below the median, and the groupness score of 29% of the individualistic participants was above the median (see **Table 3**), suggesting that while SVO and groupness are strongly related, they do not fully overlap.

3.4. Effect of Groupness

The effect of groupness on contribution decisions was tested by means of generalized linear mixed effect models, using the lme4 package (Bates et al., 2012) in the R environment (R Core Team, 2012). Since each participant made two decisions, the specific participant was modeled as a random effect (Pinheiro and Bates, 2000). The explanatory variables were groupness, the game [dummy variable; IPD-MD (baseline) or positive variant of the IPD-MD], the position of the game [dummy variable; first (baseline) or second], and the two- and three-way interactions between these variables. The dependant variables were (in separate models) the number of tokens invested in the private account, the number of tokens invested toward ingroup love (within-group account in IPD-MD, between-group account in positive variant), and the number of tokens invested toward outgroup hate (between-group account in IPD-MD, within-group account in positive variant).

Table 4 presents the results of three regression models, predicting the number of tokens invested in the private account, invested toward ingroup love, and invested toward outgroup hate, as a function of the participants reported level of groupness, the game, and the position of the game (first or second). To facilitate interpretation, the table reports the intercept and slope for the groupness variable for each combination of game and position, rather than the effect of each variable relative to a baseline. Accordingly, the significance indicators in **Table 4** refer to comparisons of the intercepts and slopes to zero, rather than to an (arbitrary) baseline (see Supplementary Material for another presentation of these results).

In both the IPD-MD and the positive variant of the IPD-MD, regardless of the order in which the games were played, groupness was negatively related to the number of tokens invested in the private account (i.e., groupness had a positive effect on overall contributions). When the IPD-MD was played first, groupness was positively related to both ingroup love and outgroup hate. In contrast, when the positive variant of the IPD-MD was played first, groupness was related—in both the initial positive variant and the subsequent IPD-MD—*only* to ingroup love, and not to outgroup hate.

4. DISCUSSION

Previous research already established that when outgroup hate can be expressed by avoiding to help the outgroup and its members, discrimination is more likely to occur (Mummendey et al., 1992, 2000; Banaji and Greenwald, 2013; Greenwald and Pettigrew, 2014), and outgroup hate plays a more central role in the unfolding of intergroup conflict (Weisel and Böhm, 2015). The current works sheds further light on the interplay between ingroup love and outgroup hate by examining behavior of the same participants when outgroup hate can be displayed by harming the outgroup (IPD-MD) and by avoiding to help it (positive variant of the IPD-MD).

The analysis and interpretation in Weisel and Böhm (2015) assumed that the motivations in the IPD-MD and the positive variant of the IPD-MD are comparable, in the sense that contribution to the within-group account in each is motivationally similar to contribution to the between-group account in the other (and vice-versa). The results from the current study confirm this assumption (see Section 3.1).

More interesting, perhaps, are the different behavioral patterns between the IPD-MD and the positive variant of the IPD-MD. Behavior in the positive variant was rather stable; it did not depend on whether decisions were made before or after taking part in the IPD-MD. Behavior in the IPD-MD, however, was sensitive to the order. Interestingly, when the IPD-MD was played after a preceding positive variant, there was a very low level of outgroup hate (see Section 3.2). A possible explanation for this result is that the first situation (game) that people encounter establishes a set of available actions. In the positive variant of the IPD-MD this set of actions includes helping the ingroup only, or helping both the ingroup and outgroup, with outgroup hate being associated with the former. This association between outgroup hate and helping just the ingroup carries on to the subsequent IPD-MD, where

[2]In the IPD-MD both the within-group account and the between-group account are discriminatory (albeit not to the same degree).

TABLE 4 | Generalized linear mixed effects model.

Game	Position	Private account		Ingroup love		Outgroup hate	
		Intercept	Slope	Intercept	Slope	Intercept	Slope
IPD-MD	Fisrt	11.21***	−1.19***	−0.83	0.76***	−0.38	0.43**
Positive variant of the IPD-MD	Second	10.51***	−1.11***	−0.53	0.87***	0.02	0.24†
Positive variant of the IPD-MD	First	11.04***	−1.30***	−1.29	1.13***	0.25	0.17
IPD-MD	Second	11.35***	−1.17***	−1.50†	1.09***	0.14	0.08

The number of tokens invested the private account, ingroup love, and outgroup hate (in separate models), as a function of groupness, the game (dummy variable with two levels: IPD-MD or the positive variant), whether the game was played first or second (dummy variable with two levels), and the interactions between these three variables. The intercept and slope of groupness for each level of the dummy variables are compared to zero.
*†p < 0.1, **p < 0.01, ***p < 0.001.*

helping just the ingroup is also an available action, such that even people with an initial inclination for outgroup hate opt for it.

This line of reasoning also accounts for the lack of a similar spillover effect when the IPD-MD was played first. In this case outgroup hate is initially associated with helping the ingroup and at the same time harming the outgroup. This combination, however, is not available in the subsequent positive variant, forcing participants to make a "fresh" choice. The result is that the level of outgroup hate is not affected by the preceding IPD-MD.

The order effect discussed above is not limited to displays of outgroup hate, but extends to the way peoples' sense of groupness relates to outgroup hate. When the IPD-MD was played first, i.e., when the first set of available actions participants were exposed to involved the possibility to harm the outgroup, groupness was related to ingroup love as well as to outgroup hate in both the initial IPD-MD and the subsequent positive variant of the IPD-MD (see Section 3.4). Strikingly, when the positive variant was played first, groupness was still related to ingroup love, but—in both the initial positive variant *and* the subsequent IPD-MD—*not* to outgroup hate. The negative effects of groupness can be avoided, it seems, if "positive" encounters take place first.

A straight forward implication of these results is that it is important that initial encounters between members of potentially conflicting groups take place in a positive context (e.g., student exchanges), where group members can have the option to help members of the other group, even if the future holds inevitable encounters in a negative context. In a similar vein, before deciding whether or not to join the army, perhaps it is better that young adults make a conscious decision about whether or not to volunteer for the red-cross, or for a similar organization that provides indiscriminate help. This can reduce conflict in subsequent encounters, even those where it is possible to harm the outgroup, and help harness group members' sense of groupness to constructive causes.

The reasoning above resonates well with research showing that awareness of harm imposed on an outgroup by members of the ingroup can increase the dehumanization of outgroup members (Castano and Giner-Sorolla, 2006; Ćehajić et al., 2009), and that awareness of intergroup help can help rehumanize the outgroup (Saguy et al., 2015). The current results suggest that rather than awareness of actual intergroup harm or help that occurred in the past, negative and positive impressions of the outgroup, accompanied by the relevant motivational forces (outgroup hate/ingroup love), can arise by being in a situation where there is an opportunity to harm or to help the outgroup, even in the absence of information about the actual harming/helping behavior of other ingroup members.

Given the relatively low levels of outgroup hate they observed in the IPD-MD game, Halevy et al. (2008) assert that "intergroup conflicts can be resolved by channelling group members' altruism toward internal group causes" (p. 410). The current results suggest that if initial encounters between groups involve the opportunity to help the outgroup, or, possibly, if the encounters are framed such that the choice is between helping the outgroup or not, intergroup conflict can be reduced even further. Intergroup conflicts that involve the opportunity to harm or to help the outgroup not only evoke different motivations (e.g., Weisel and Böhm, 2015), but affect each other in different ways when they take place in succession.

FUNDING

This work was supported by the Israel Science Foundation (grant 1392/08) and by the European Research Council (grant ERC-AdG 295707 COOPERATION).

ACKNOWLEDGMENTS

I thank Matan Zilkha, Hen Pundak, Atar Shiloh, and Reut Zeiri for help in administering the experimental sessions, and Marcus Giamattei for helpful comments.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.01594

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Conflict of Interest Statement: The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 06 May 2015
doi: 10.3389/fpsyg.2015.00572

In intergroup conflict, self-sacrifice is stronger among pro-social individuals, and parochial altruism emerges especially among cognitively taxed individuals

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OPEN ACCESS

Edited by:
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Reviewed by:
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Stefan Pfattheicher,
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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *27 January 2015*
Accepted: *20 April 2015*
Published: *06 May 2015*

Citation:
De Dreu CKW, Dussel DB and Ten Velden FS (2015) In intergroup conflict, self-sacrifice is stronger among pro-social individuals, and parochial altruism emerges especially among cognitively taxed individuals. Front. Psychol. 6:572. doi: 10.3389/fpsyg.2015.00572

Parochial altruism is decomposed in a tendency to benefit the in-group along with a tendency to ignore, derogate, and harm rivaling out-groups. Building off recent work suggesting that decisions to cooperate can be relatively fast and intuitive, we examine parochial altruism in intergroup conflict when cognitive deliberation is rendered difficult or not. Predictions were tested in an experiment using an incentivized Intergroup Prisoner's Dilemma–Maximizing Differences Game with 95 subjects classified as either pro-social or pro-self being randomly allocated to high vs. low impulse-control conditions. Results showed, first of all, that self-sacrificial decisions to contribute were made faster than decisions not to contribute, and that faster decision time associated with more positive expectations of in-group members. Second, we observed that lowering impulse control with a difficult rather than easy Stroop Task increased the amount contributed to a pool that benefited in-group members while harming out-group members; thus reducing deliberation increased parochial altruism. Finally, results replicated earlier work showing that especially pro-social (vs. pro-self) individuals contributed more to the in-group and did not lower their contributions to the between-group pool that benefitted their in-group and, simultaneously, hurt the out-group. This pattern emerged independent of their impulse control. Thus, (in-group bounded) cooperation is more prominent among individuals with strong rather than weak other-regarding preferences. Moreover, the intuitive tendency to cooperate may have evolved in the context of intergroup conflict and therefore is sharp-edged—in-group bounded and including willingness to aggress out-groups.

Keywords: intergroup conflict, competition, parochial altruism, dual systems, ego depletion

Introduction

Humans owe much of their evolutionary success to their strong capacity to create and maintain cohesive groups within which they engage in complex forms of cooperative exchange, negotiate, and trade, innovate, and disseminate knowledge, insights, values, and preferences (Darwin, 1871; Bowles and Gintis, 2004, 2011; Henrich and Henrich, 2007; Wilson, 2012; De Dreu et al., 2014a).

In fact, being included in strong, well-functioning, and innovative groups provides fitness functionality to its individual members because they are more likely to survive, prosper, and reproduce than individuals living in groups where most members lack such cooperative inclinations: "...groups with a greater number of courageous, sympathetic, and faithful members, who were always ready to warn each other of danger, to aid and defend each other ...would spread and be victorious over other tribes" (Darwin, 1871, p. 156).

Because of the group's functionality to individual fitness, humans may have evolved a "group psychology" that includes a propensity to (i) identify with groups and its members, (ii) empathize with the needs and interests of fellow group members, (iii) self-sacrifice, trust, and cooperate with other group members, and (iv) loyally commit and contribute to the functioning of one's group (De Dreu et al., 2014a; De Dreu and Kret, 2015). Furthermore, because groups exist next to other groups with whom they cooperate, compare, and compete, group efficiency often is relative – groups that generate greater surplus than other groups become relatively strong and prosperous, achieve a relatively favorable social status position, and may be better able to exert power and influence over other groups and their members (De Dreu et al., 2014a). Accordingly, the evolved group psychology must be, at least to some extent, relative and comparative vis-à-vis other groups. Throughout evolution humans may have become prepared to self-sacrifice in order to cooperate with others, but especially with those they rely upon, are interdependent with, and expect interactions with in the future, that is, with those others that are perceived to be part of one's group (Balliet et al., 2014). Some even proposed that such in-group bounded cooperation may have co-evolved with tendencies to aggress against rivaling out-groups (LeVine and Campbell, 1972; Campbell, 1975; Bernhard et al., 2006; Bowles, 2009; De Dreu et al., 2014a). After all, when group efficiency is relative, promoting in-group efficiency, or undermining out-group efficiency are two means toward the same end (De Dreu et al., 2014a).

The possibility that self-sacrificial in-group cooperation and out-group aggression co-evolved (henceforth parochial altruism; Bowles, 2009) fits extant work showing that intergroup competition motivates individuals to make costly contributions to their in-group (e.g., Manson and Wrangham, 1991; Erev et al., 1993; Bornstein and Ben-Yossef, 1994; Bornstein et al., 2002; Bornstein, 2003; Bornstein and Gilula, 2003; Wildschut et al., 2003; Reeve and Holldobler, 2007; Abbink et al., 2012; Bohm and Rockenbach, 2013). It also is key in evolutionary models such as group selection and gene-culture co-evolution theory that argue that parochial altruism evolved because of impactful hostile intergroup encounters throughout human evolutionary history (Boyd and Richerson, 1982; Alexander, 1990; Choi and Bowles, 2007; Efferson et al., 2008; Bowles, 2009).

If such evolutionary perspectives on parochial altruism hold, individual propensity for parochial altruism may be sustained by evolutionary ancient neural circuitries involved in affective responding and intuitive decision making. Indeed, there is some work showing that cooperation and trust rests, in part, on sub-cortical neural circuitries recruited for affective and intuitive rather than deliberative, controlled decision making (Rilling and Sanfey, 2011). For example, parochial altruism is modulated by hypothalamic oxytocin that acts on the amygdala-hippocampal circuitries more than on prefrontal brain areas involved in impulse-control and deliberation (De Dreu et al., 2010, 2012, 2014b; Baumgartner et al., 2014; Carter, 2014; De Dreu and Kret, 2015; Ma et al., 2015). Neuro-imaging studies of individual tendencies to discriminate between in-group and out-group confirm that both categorization of self and others into in- and out-groups as well discriminatory preferences for the in-group over the out-group are fast and modulated by sub-cortical brain structures disconnected from executive control and cognitive monitoring (Hein et al., 2010; Baumgartner et al., 2014; Cikarna and Van Bavel, 2014; Kret et al., 2015). In addition to this, there is some evidence to suggest that cooperation in general, and parochial altruism in particular, may be fast and intuitive, rather than deliberated. From studies on public goods provision we know that cooperative individuals decided more quickly than those who withheld cooperation, and that individuals in which an intuitive mindset was primed cooperated more than those in which a deliberation mindset was activated (Rand et al., 2012). Moreover, demotivating and/or disabling deliberation by having participants perform a cognitively taxing Stroop task prior to decision making, amplified both spiteful rejection of other's unfairness and benign reciprocation of trust (Halali et al., 2013).

Our first goal here was to examine the possibility that, consistent with the above works, self-sacrifice is fast and intuitive, rather than deliberated and calculative. Prior to decision making, participants performed a difficult and cognitively taxing (vs. easy) Stroop Task (Stroop, 1935). There is good evidence that performing a cognitively taxing task prior to decision making reduces the ability and/or motivation to exert cognitive control (Muraven et al., 2006; Baumeister and Vohs, 2007; Inzlicht and Schmeichel, 2012). Both possibilities suggest that following a cognitively taxing task, decision making becomes more impulsive, and intuitive (Hagger et al., 2010). Accordingly, we expected (i) more parochial altruism when decision making is intuitive, and (ii) faster decisions to be associated with more self-sacrifice.

We pursued two additional goals. First, the work on parochial altruism allows for the possibility that individuals self-sacrifice to serve the in-group (Brewer, 1999; Halevy et al., 2008), or to hurt the out-group (Brewer, 1999), or to simultaneously serve the in-group and hurt the out-group. Specifically, earlier work using experimental games, such as the intergroup prisoner's dilemma (Bornstein, 2003), showed that intergroup competition motivates individuals to extend cooperation toward their in-group, yet such cooperation not only benefitted their in-group but also, at the same time, hurt the out-group (Halevy et al., 2008). Halevy et al. (2008) designed a Intergroup Prisoner's Dilemma-Maximizing Differences (IPD–MD) game to examine whether such simultaneously benefitting the in-group and hurting the out-group, in fact, primarily reflects a desire to serve the in-group, and their results indeed supported such a proposition—in intergroup settings, individuals contributed

more to a within-group pool that benefitted their in-group, than to a between-group pool that benefitted their in-group and simultaneously hurt their out-group. This result fits the outcomes of a recent meta-analysis (Balliet et al., 2014), along with a growing body of primary studies (Halevy et al., 2008, 2010, 2012; De Dreu, 2010; De Dreu et al., 2010; Buttelmann and Böhm, 2014) that in intergroup settings individuals are motivated more by a desire to benefit the in-group than by a desire to hurt the out-group.

Using the experimental set-up designed by Halevy et al. (2008), we explored whether cognitive taxation increases contributions to the within-group pool, or whether it increases parochial altruism (the between-group pool). Second, we examined whether parochial altruism is stronger among individuals who value fairness and cooperation (henceforth "pro-socials," Van Lange, 1999), compared to those who value personal outcomes, and relative gain (henceforth "pro-selfs"). While evolutionary perspectives on parochial altruism are silent about the possibility that individual differences in value orientation impacts parochial altruism, several studies indicate that in intergroup competition, pro-social individuals display stronger parochial altruism, and a desire to benefit the in-group in particular, than pro-selfs (De Dreu, 2010; De Dreu et al., 2010; Abbink et al., 2012; Aaldering et al., 2013). We expected to replicate this finding, and explored whether cognitive taxation interacts with social value orientation in driving parochial altruism.

Materials and Methods

Participants, Ethics, and Experimental Design

Participants were recruited through the web-portal of the Psychology Research Institute of the University of Amsterdam. Based on our earlier work (De Dreu, 2010; De Dreu et al., 2010) we set a required sample size of 100, and recruited a total $N = 111$ (35 males and 76 females; $M_{age} = 21.44$, SD = 2.66) to participate in a study on human decision making. Participants received a €7 show-up fee, and the possibility to earn extra money through decision making (actual extra earnings were $M =$ €5.75, range €0–€15). The study was approved by the Psychology Ethics Committee (file number 2012-WOP-2501), and participants provided written informed consent prior to the study. They were paid and debriefed upon completion of the study.

The design involved a 2 (Cognitive Taxation: Yes/No) × 2 (Social Value Orientation: Pro-social/Pro-self) between-subjects design. Participants were randomly assigned to the first factor; social value orientation was a *post hoc* blocking factor. Dependent variables were the time taken to decide (log-transformed), self-sacrifice (money contributed) as well as its decomposition in within-group and between-group contribution (the latter counting as parochial altruism). A post-experimental questionnaire assessed expectations that in-group members contributed to the within-group pool and the adequacy of the cognitive taxation manipulation.

Procedure and Measures

Experimental sessions involved groups of six individual participants. Upon arrival in the laboratory, participants were seated in individual cubicles that prevented them from seeing or hearing others. The experimenter unlocked the computer, and left. From that point onward, the experiment was computer-guided. **Figure 1** gives a schematic representation of the experimental tasks and time-lines. As can be seen, participants first completed a measure to assess their social value orientation, then performed a series of filler tests that contained no experimental manipulations, received instructions for the IPD–MD and performed a more or less cognitively taxing Stroop task to manipulate cognitive taxation. Then they made decisions in the IPD–MD, responded to a short questionnaire, and were debriefed and dismissed.

To assess social value orientation, we used a standard decomposed triple dominance measure that is widely used and well-validated (Van Lange and Kuhlman, 1994; De Dreu and Van Lange, 1995; Van Lange, 1999; Aaldering et al., 2013; also see Murphy and Ackermann, 2014). In each of nine decomposed games, subjects could choose from three different distributions of points to themselves and another person that they did not know and would not meet. An example is the decision between Option 1 [560 to You; 300 to Other], Option 2 [500 to You; 100 to Other], and Option 3 [500 to You; 500 to Other]). Option 1 reflects individualism because one's own outcomes (560) exceed those in Option 2 (500) or Option 3 (500). Option 2 reflects competition, because it provides a greater advantage over the other's outcomes (500 − 100 = 400) than Option 1 (560 − 300 = 260) or Option 3 (500 − 500 = 0), and Option 3 reflects a pro-social orientation because it provides a larger joint outcome (500 + 500 = 1000) than either Option 1 (560 + 300 = 860) or Option 2 (500 + 100 = 600). To be classified as pro-social (pro-self) participants had to choose consistently in at least six of the nine games. Ninety-five subjects were classified as pro-social ($N = 45$) or pro-self ($N = 50$; 45 were individualistic, and five were consistently competitive). The remaining subjects were unclassifiable and dropped from the analyses.

Following the decomposed game measure, subjects continued with a series of unrelated filler-tasks (surveys about attitudes regarding various health issues) to create a gap between the measurement of social values and the IPD–MD (Halevy et al., 2008) we used to study parochial altruism. After 25 min, the computer ended the filler-tasks and introduced the IPD–MD (Halevy et al., 2008, 2010, 2012; De Dreu, 2010). Subjects were told that they would make decisions involving the participant's own group (denoted as "Team C2"), and another three-person group (denoted as "Team H5"; labeling was counterbalanced but never had effects and is further ignored). Participants were informed that groups were composed on the basis of the order in which they had signed up for the experiment, and that most, but not necessarily all, group members were currently present in the laboratory. They were also told that they would not know who was in their group or who was in the other group (Halevy et al., 2008; De Dreu, 2010).

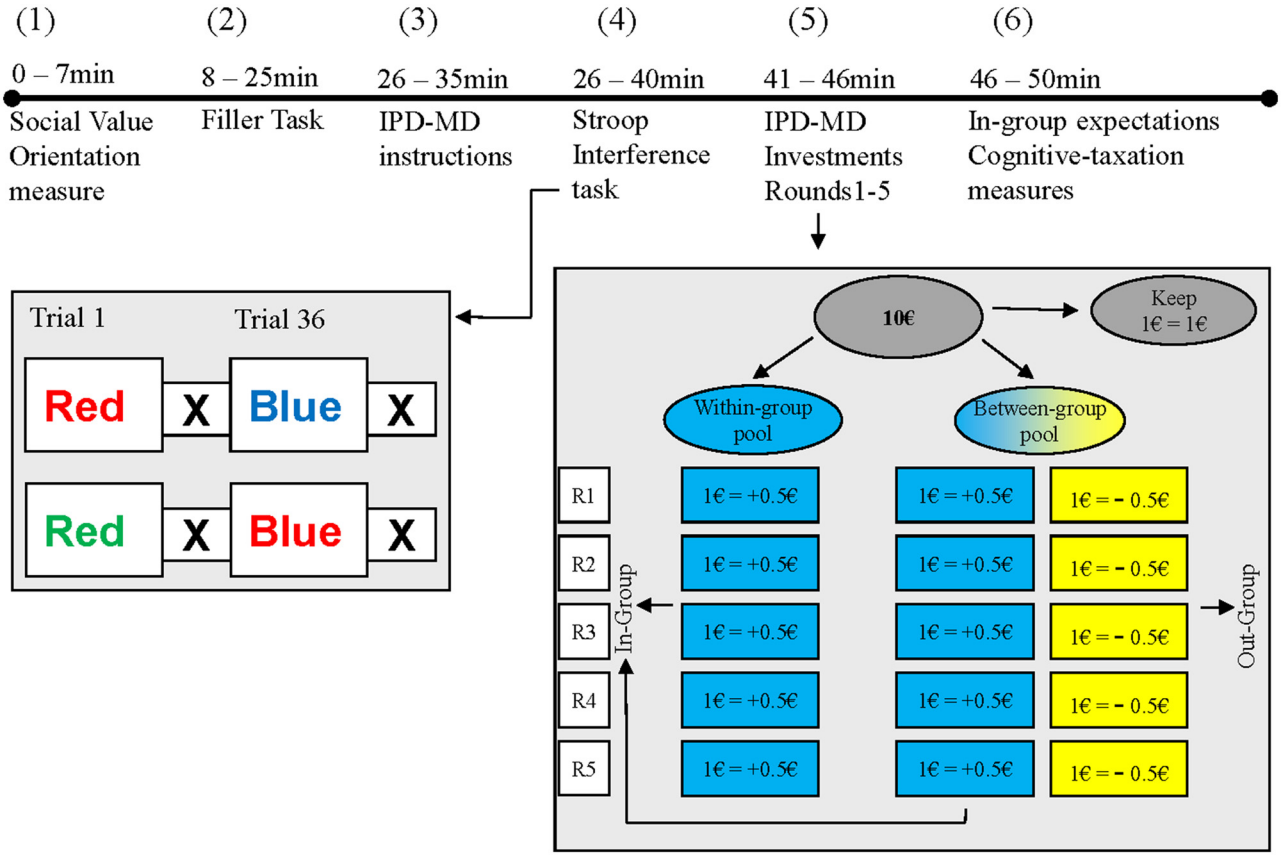

FIGURE 1 | Overview of experimental procedures and timeline. Following assessment of (1) social value orientation using nine decomposed games, subjects (2) completed irrelevant filler-tasks, were (3) organized in two three-person groups and explained the IPD–MD, before they (4) performed either a high or low taxing Stroop Interference Task to tax cognitive resources or not, and then (5) made five IPD–MD decisions, (6) indicated their in-group expectations, and finished with cognitive-taxation measures. Coloring is for illustrative purposes only.

Hereafter, computer instructions stated that for group decision making, each individual group member would receive an endowment of €10, which was in addition to individuals' participation fee. Next, we explained that each Euro kept was worth €1 for the individual; each Euro that was contributed to the within-group pool added €0.50 to each in-group member including the contributor; each Euro that was contributed to the between-group pool added €0.50 to each in-group member including the contributor and, in addition, also subtracted €0.50 from each out-group member. The amount contributed to the within-group pool reflects "in-group cooperation," the amount contributed to the between-group pool reflects parochial altruism (or "out-group hate" per Halevy et al., 2008). The instructions were in neutral language and there was no mention of the words cooperation or competition. Participants were assured that their decisions would remain completely confidential, and solved a quiz that tested their understanding of the rules of the game [i.e., we provided a series of possible group-level investments (e.g., you keep three, invest five in the within-group pool, and invest two in the between-group pool; all other members of your Team, and those of the other Team keep their endowments and make no investment: how much do you receive? How much does another member of your Team receive?)]. Analyses of their responses showed that all subjects understood the game.

Following the IPD–MD instructions, participants were given a short task intended to lower cognitive control and increase intuitive decision making. The task was modeled after the Stroop Interference Task (SIT; Stroop, 1935; Hagger et al., 2010; Halali et al., 2013, 2014). Subjects were shown a color word on their screen (e.g., "blue") that was written in a particular color (e.g., blue) and had to indicate as fast and accurately as possible what the color of the word was. In the high taxing condition, we provided thirty-six inconsistent stimuli (i.e., color words written in a different color, e.g., "blue" written in red). Studies have shown that responding to inconsistent stimuli is cognitive taxing and reduces the ability and motivation to engage executive and impulse-control (Stroop, 1935; Hagger et al., 2010). Two subjects in this condition indicated they were color-blind and dropped from the analyses (as they were also unclassifiable regarding their social value orientation, this did not further reduce our final sample size). In the low-taxing condition, we provided 36 consistent stimuli (i.e., color words written in the same color, e.g., "blue" written in blue).

Immediately following the low or high taxing SIT, participants were asked to indicate how much of their €10 they contributed to the within-group pool, how much they contributed to the between-group pool, and how much they kept for themselves. Participants were asked to make their allocation decision five times and told that one of these decisions would be randomly drawn for payout. Participants knew that no feedback about others' choices would be given. Investment decisions were averaged across the five rounds ($\alpha = 0.93$ for within-group investments; $\alpha = 0.94$ for between-group investments; $r_{\text{within-between}} = -0.396$, $p = 0.001$). In addition to recording investments, we measured time in seconds taken to decide how much participants kept to themselves (i.e., the reverse of self-sacrifice; $\alpha = 0.88$). Decision time was log-transformed to meet the requirements for parametric testing (analyses using the observed data permitted the same conclusions).

Following IPD–MD investments we measured in-group expectations by asking subjects to indicate the extent to which they expected fellow in-group members to contribute to the within-group pool (1 = not at all; 7 = very much). To verify the effectiveness of the cognitive-taxation manipulation, participants were given an (unknowingly) unsolvable anagram which they were asked to solve. Time was unlimited and at subjects' discretion, and we assessed how much time they persisted on this task. Then participants indicated how alert and concentrated they felt (both 1 = not at all, to 5 = very much; $r = 0.421$, $p < 0.01$). This completed the experiment.

Results

Manipulation Checks

Participants given the high taxing SIT gave up earlier on trying to solve an (unknowingly) unsolvable anagram [$M_{\text{SIThightaxing}} = 46.94$ s vs. $M_{\text{SITlowtaxing}} = 72.60$ s, $F(1,91) = 11.19$, $p = 0.001$]. They also felt less alert and concentrated [combined $M_{\text{SIThightaxing}} = 2.47$ vs. $M_{\text{SITlowtaxing}} = 2.95$, $F(1,91) = 5.483$, $p = 0.021$]. From these results, we conclude that those given the high taxing SIT had lowered cognitive control than those given the low taxing SIT.

Decision Making

Consistent with the possibility that self-sacrifice is intuitive, self-reported alertness and concentration was positively correlated with the amount participants kept for themselves, $r(95) = 0.231$, $p = 0.024$. Furthermore, **Figure 2A** shows that the time it took subjects to decide how much to keep to themselves positively predicted how much they kept to themselves, $r(95) = 0.272$, $p = 0.008$. Decision time was negatively related to within-group contributions, $r(95) = -0.220$, $p = 0.033$, and unrelated to parochial altruism, $r(95) = -0.067$, $p = 0.51$. Finally, **Figure 2B** shows that time to ponder how much to keep was negatively related to in-group expectations, $r(95) = -0.185$, $p = 0.078$ (marginal). These results are consistent with the idea that selfish behavior is deliberated whereas self-sacrifice and assessments of in-group members' cooperation are relatively fast and intuitive.

Intergroup Prisoner's Dilemma–Maximizing Differences Game investments were averaged and analyzed in a 2 (Yes/No cognitive taxing SIT) × 2 (pro-social/pro-self) × 3 (pool: self/within-group/between-group) mixed-model ANOVA with pool within-subjects. A strong main effect for Pool showed, first of all, that self-sacrifice manifested in within-group contributions more than in between-group contributions, $M = 4.304$ vs. $M = 2.11$, $F(1,91) = 25.77$, $p = 0.0001$. This effect was qualified by an interaction between cognitive taxation and pool, $F(2,90) = 4.59$, $p = 0.013$. **Figure 3A** shows that parochial altruism was stronger among high taxed (vs. low taxed) individuals, $F(1,91) = 7.08$, $p = 0.009$. Interestingly, compared to low taxed individuals, those in the high taxing condition allocated about equally to the within-group pool, $F(1,91) = 1.01$, $p = 0.32$, and more to the between-group pool, $F(1,91) = 4.81$, $p = 0.031$. Together these results suggest that lowered cognitive control following taxation increases contributions to the between-group pool, and this fits the idea that parochial altruism is more intuitive than deliberated.

Cognitive taxation did not interact with social value orientation in influencing contributions, Fs < 1.9. However, consistent with earlier work, we observed a pool × social value orientation interaction, $F(2,90) = 3.573$, $p = 0.032$: pro-socials kept less to themselves, $F(1,91) = 4.20$, $p = 0.043$, contributed more to the within-group pool, $F(1,91) = 7.29$, $p = 0.008$, and equally to the between-group pool as pro-selves, $F(1,91) = 1.19$, $p = 0.278$ (**Figure 3B**). Both pro-selves and pro-socials contributed more than nothing to the between-group pool, $t(44) = 6.315$, $p = 0.001$, and $t(49) = 6.833$, $p = 0.001$. Together these results show that whereas pro-selves are non-cooperative toward their in-group, pro-socials benefit their in-group. Both pro-socials and pro-selves maintain a certain level of parochial altruism regardless of whether or not they are cognitively taxed.

The above analyses leave open the possibility that some participants invested exclusively in the within-group pool (and could thus be described as in-group bounded cooperators as well as universal cooperators), whereas others invested exclusively in the between-group pool (and thus are strict parochial altruists). To investigate this possibility, we classified subjects into distinct types: those who kept their entire endowment (selfish types), those who contributed exclusively to the within-group pool (in-group cooperators), those who contributed to both the within- and between-group pool (ambivalent parochial altruists), and those who contributed exclusively to the between-group pool (strict parochial altruists). **Table 1** shows the breakdown of types by cognitive taxation, with the 4 × 2 interaction being, $\chi^2(3, N = 95) = 7.115$, $p = 0.068$. As can be seen, very few participants never (across five investment decisions) contributed anything (selfish types) and very few contributed exclusively to the between-group pool (strict parochial altruists). Across the five investment decisions, most participants did invest (>0) in either the within-group pool (in-group cooperators) or in both the within-group and the between-group pool (ambivalent parochial altruists). As can be seen also, especially ambivalent parochial altruists emerge under cognitive taxation. This resonates with the above analysis showing that cognitive taxation boosts parochial altruism. It suggests that such a boost is not a reflection of a

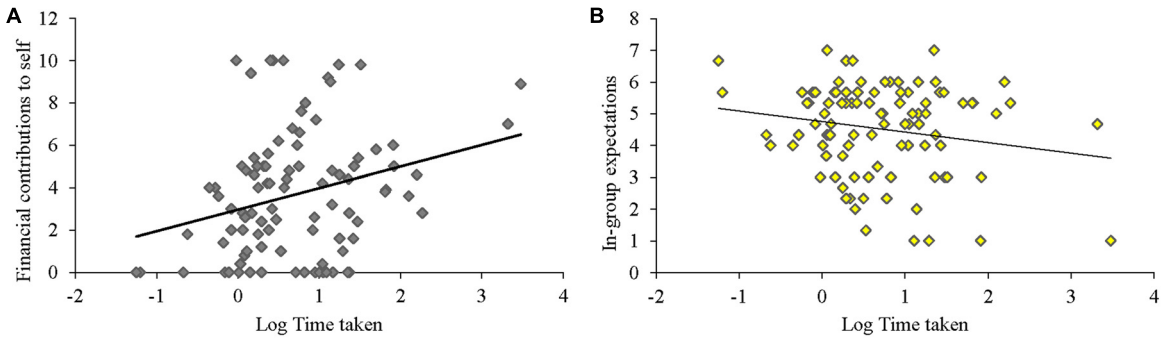

FIGURE 2 | Longer time used when deciding how much to keep to oneself (in seconds, log-transformed) associates with more selfish decision-making and less positive expectations of in-group members. **(A)** Time (log-transformed seconds) taken to decide how much to keep positively relates to contribution to self. **(B)** Time (log-transformed seconds) taken to decide how much to keep negatively relates to in-group expectations.

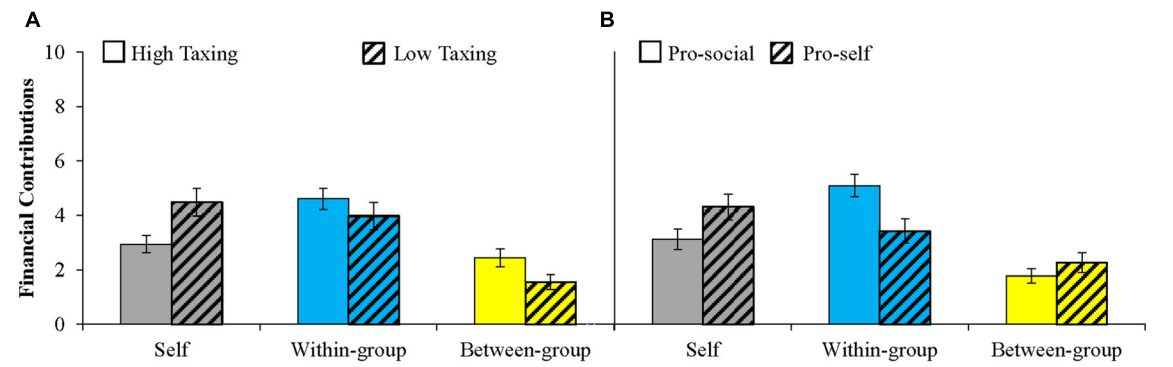

FIGURE 3 | Averaged Intergroup Prisoner's Dilemma–Maximizing Differences Game (IPD–MD) contributions to self, within-group pool, and between-group pool (parochial altruism; range 0–10; means displayed ±1 SE). (A) Compared to individuals in the low taxing condition ($N = 46$), individuals in the high taxing condition ($N = 49$) self-sacrifice, and display parochial altruism. **(B)** Compared to pro-selves ($N = 50$), pro-social individuals ($N = 45$) self-sacrifice, contribute more to the within-group pool, and display similar levels of parochial altruism.

TABLE 1 | Contributor types broken down by cognitive taxation.

		Contributor type		
Cognitive taxation	**Selfish**	**In-group cooperator**	**Ambivalent parochial altruists**	**Strict parochial altruists**
Yes ($N = 49$)	1 (2%)	12 (24%)	35 (71%)	1 (2%)
No ($N = 46$)	3 (7%)	16 (35%)	22 (48%)	5 (10%)

Entries are observed number of subjects (row-based percentages in brackets). Selfish types keep their endowment; In-group cooperators contributed (>0) exclusively to the within-group pool; ambivalent aarochial altruists contributed (>0) to both the within- and between-group pool; strict parochial altruists exclusively contributed (>0) to the between-group pool.

shift toward strict parochial altruism, but instead a muddying of cooperation with the in-group and aggression toward the rival out-group.

We also examined the break-down of types by social value orientation, which was not significant, $\chi^2(3, N = 95) = 4.848$, $p = 0.183$. Among pro-social (pro-self) individuals, 27% (32%) were in-group cooperators, and 56% (64%) were ambivalent parochial altruists. This suggests that the above findings for social value orientation reflect the strength of motivation—the extent to which people decide to contribute—rather than its strict directionality.

In-Group Expectations

Expectations of in-group members contributions to the within-group pool was positively related to self-sacrifice, $r(95) = 0.445$, $p = 0.001$, especially to contributions to the within-group pool, $r(95) = 0.469$, $p = 0.001$, and not to contributions to the between-group pool, $r(95) = -0.043$, $p = 0.677$). A 2(Yes/No cognitively taxing SIT) × 2(pro-social/pro-self) between-subjects ANOVA on in-group expectations showed less positive expectations among individuals in the high cognitive taxing condition ($M = 4.809$) compared to those in the low cognitive taxing condition ($M = 4.267$), $F(1,91) = 4.32$, $p = 0.040$. Pro-social individuals also displayed (somewhat) more positive expectations ($M = 4.753$) than pro-selves ($M = 4.211$), $F(1,91) = 2.86$, $p = 0.094$. The cognitive taxation × social value interaction was not significant, $F(1,91) = 0.73$, $p = 0.395$. In short, cognitively taxed individuals, and to a lesser extent those with a pro-social value orientation, had more positive expectations of their in-group members.

Discussion and Conclusion

Human cooperation and self-sacrifice may emerge partly because it provides survival benefits in intergroup competition and, therefore, often is in-group bounded and parochial (Bornstein, 2003; De Dreu et al., 2014a). Heretofore unanswered was whether such self-sacrifice in intergroup competition was a deliberated, calculated response to pressing conflicts between personal and group interests or, instead, a relatively automatic and intuitive decision. Present findings align with the latter possibility—whereas selfishness appeared to be the slower and thus more deliberated response, self-sacrifice appeared to be fast and thus more intuitive. Indeed, self-sacrificial contributions were released when individual's cognitive control was taxed. This resonates with recent work in neurobiology and cognitive psychology (Kosfeld et al., 2005; De Dreu et al., 2010, 2012; Rand et al., 2012; Van Honk et al., 2012) and supports the conjecture that cooperation is oftentimes intuitive, in-group-bounded, and potentially sharp-edged.

Current findings inform neo-classical rational choice theories that view humans to be motivated to maximize personal, short-term gain. Our results, and those of others (Rand et al., 2012; Halali et al., 2013, 2014), support the idea that human cooperation is intuitive rather than calculated. Furthermore, the conjecture that cooperation is primarily geared at benefiting one's in-group while simultaneously hurting the out-group fits evidence that brain circuitries involved in empathy and other-concern operate much stronger when targets are classified as in-group rather than out-group (Harris and Fiske, 2006; Hein et al., 2010; Cikara et al., 2011; Baumgartner et al., 2012).

We studied intuitive cooperation in the presence of an out-group that was enabled to hurt the in-group. Collective action oftentimes takes place in absence of rivaling out-groups, in which case in-group boundedness and universalism as foci of self-sacrifice cannot be separated (Wit and Kerr, 2002; De Dreu and Balliet, 2015). Perhaps, the default, intuitive response in social dilemmas is to cooperate, with such cooperation becoming parochial when out-group competition is present. Perhaps, however, the default, intuitive response is to serve one's in-group, which translates into universalism when no other option to serve one's in-group is available (Burton-Chellew and West, 2012; also see De Dreu and Balliet, 2015). We call for new research mapping situations ranging from inter-group competition being fully absent to being strongly present, to further understand when and why human cooperation evolved into an automated, intuitive response that is released rather than blocked by impeded impulse-control.

The impulse to benefit one's in-group was triggered here by a simple task known to undermine executive functioning (Stroop, 1935). We note that because of time constraints, multiple tasks awaiting attention, ambient noise, and social pressures, the human capacity to deliberate and to think deeply before acting is constantly challenged (Kruglanski et al., 2006; De Dreu et al., 2008). However, it is important to note that questions have been raised about depletion as a manipulation of intuitive vs. deliberativeness. For example, looking at altruism in the Dictator Game, depletion typically reduces altruism (Balliet and Joireman, 2010; Xu et al., 2012; Halali et al., 2013), whereas cognitive load (which is a direct manipulation of cognitive resources) typically increases altruism (Roch et al., 2000; Cornelissen et al., 2011; Schulz et al., 2014). A recent study by Rand et al. (2014) relates to the current findings, in that they also examined how decision making constraints—time pressure during decision making in their case, compared to cognitive taxation prior decision making in the current study—influenced cooperation in intergroup settings. Experiment 1 involved a two-person prisoner's dilemmas between a participant and an antagonist said to either prefer the same presidential candidate (e.g., Obama), or the opposing candidate (e.g., Romney). Results showed that time pressure facilitated cooperation, and that people cooperated more with someone that preferred the same presidential candidate, rather than the opposing candidate; no interaction among time pressure and antagonist's political preference was observed. Our finding that cognitive taxation increases contributions not only fits this, but also clarifies that increased cooperation with someone sharing the same political preference is motivated by a desire to benefit the in-group more than a desire to hurt the out-group (also see Balliet et al., 2014). This convergence notwithstanding, new research using a different manipulation is required to conclusively settle whether time constraints and cognitive taxation impact cooperation because of their shared impact on intuitive versus more deliberated decision making. Such new research should include sophisticated measures also of depletion and impulse-control, akin to the measures used here that showed that the cognitive taxing manipulation not only affected self-sacrifice and parochial altruism, but also decision time, post-decision making task-persistence, and self-reported fatigue and alertness.

Current findings suggest that cognitively challenging contexts lower self-control and facilitate rather than impede cooperation and collective action. Such cognitively challenging settings can also trigger negative behaviors toward rival out-groups. Displays of parochial altruism not only increase in-group status relative to the out-group but also negative emotions and aggressive responses among maltreated out-group members (Dovidio and Gaertner, 2010; De Dreu et al., 2014b). Ironically, then, whereas humans may have the evolved intuition to cooperate, it is unlikely such intuition brings world peace closer.

Author Contributions

BD, FTV, and CKWDD conceived of the study; BD and FTV conducted the study; BD and CKWDD analyzed the data; and CKWDD wrote the paper.

Acknowledgment

Financial support was provided by NWO-432-08-002 to CKWDD.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Neuroscience

ORIGINAL RESEARCH
published: 12 June 2015
doi: 10.3389/fnins.2015.00183

Testosterone is associated with cooperation during intergroup competition by enhancing parochial altruism

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The steroid hormone testosterone is widely associated with negative behavioral effects, such as aggression or dominance. However, recent studies applying economic exchange tasks revealed conflicting results. While some point to a prosocial effect of testosterone by increasing altruistic behavior, others report that testosterone promotes antisocial tendencies. Taking into account additional factors such as parochial altruism (i.e., ingroup favoritism and outgroup hostility) might help to explain this contradiction. First evidence for a link between testosterone and parochial altruism comes from recently reported data of male soccer fans playing the ultimatum game. In this study high levels of endogenous testosterone predicted increased altruistic punishment during outgroup interactions and at the same time heightened ingroup generosity. Here, we report findings of another experimental task, the prisoner's dilemma, applied in the same context to examine the role of testosterone on parochial tendencies in terms of cooperation. In this task, 50 male soccer fans were asked to decide whether or not they wanted to cooperate with partners marked as either fans of the subject's own favorite team (ingroup) or fans of other teams (outgroups). Our results show that high testosterone levels were associated with increased ingroup cooperation during intergroup competition. In addition, subjects displaying a high degree of parochialism during intergroup competition had significantly higher levels of testosterone than subjects who did not differentiate much between the different groups. In sum, the present data demonstrate that the behavioral effects of testosterone are not limited to aggressive and selfish tendencies but may imply prosocial aspects depending on the context. By this means, our results support the previously reported findings on testosterone-dependent intergroup bias and indicate that this social hormone might be an important factor driving parochial altruism.

Keywords: testosterone, intergroup conflict, prisoner's dilemma, altruistic behavior, competition

OPEN ACCESS

Edited by:
Hannes Rusch, University of Cologne, Germany

Reviewed by:
Salomon Israel, Duke University, USA
Matthias Greiff, Justus Liebig University Giessen, Germany

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Neuroscience

Received: *11 March 2015*
Accepted: *08 May 2015*
Published: *12 June 2015*

Citation:
Reimers L and Diekhof EK (2015) Testosterone is associated with cooperation during intergroup competition by enhancing parochial altruism. Front. Neurosci. 9:183. doi: 10.3389/fnins.2015.00183

Introduction

The steroid hormone testosterone is known to play an important role in modulating human behavior, especially during social interaction. During the past, testosterone has been widely associated with aggressive and dominant behavior, a view that is mainly based on animal studies or correlational evidence in humans linking endogenous testosterone levels to self-reports or

personality scales on aggressive and antisocial behavior (Mazur and Booth, 1998; Archer, 2006). More recently, researchers have begun to further investigate the effects of testosterone on human behavior in social contexts by applying economic decisions paradigms adapted from game theory such as the ultimatum game or the prisoner's dilemma. These paradigms allow for a direct measure of aggressive or selfish behavior under laboratory conditions, which can then be linked to habitual testosterone levels. To date, studies from this context revealed inconsistent results with some suggesting that testosterone promotes prosocial behavior such as increased altruistic punishment (i.e., bearing personal costs for sanctioning selfish behavior and violations of social norms) or fairness (Burnham, 2007; Eisenegger et al., 2010; Mehta and Beer, 2010), whilst others report a positive association between testosterone and antisocial tendencies, for instance in the form of decreased generosity (Zak et al., 2009). In addition to these conflicting results, other researchers did not find any behavioral effects of testosterone during social exchange tasks (Zethraeus et al., 2009) or observed both, anti- and prosocial influences, in decision contexts with or without the possibility of financial betrayal, respectively (Boksem et al., 2013). Important to note are the methodological differences between the above mentioned studies. While some examined the effects of endogenous testosterone levels (Burnham, 2007; Mehta and Beer, 2010) others administered testosterone (Zak et al., 2009; Zethraeus et al., 2009; Eisenegger et al., 2010; Boksem et al., 2013). Additionally, some studies investigated effects in both sexes (Mehta and Beer, 2010), whereas others only tested men (Zak et al., 2009) or females (Eisenegger et al., 2010; Boksem et al., 2013). One study even tested postmenopausal women (Zethraeus et al., 2009).

Another possible explanation for these controversial findings might be that the assumption of a direct link between testosterone and aggressive or prosocial behavior is oversimplifying a rather complex relationship. Taking into account additional factors might help to gain a better understanding of the mechanism by which testosterone shapes human behavior. For instance, group membership and social closeness have been shown to influence altruistic punishment in that ingroup members are protected more often than outgroup members even if this implies personal costs (e.g., Bernhard et al., 2006; Baumgartner et al., 2012; Goette et al., 2012). Preferential treatment of ingroup members and increased hostility toward the outgroup, even at one's own cost, are common human behaviors and have been referred to as parochial altruism (Choi and Bowles, 2007; Bowles, 2009; García and van den Bergh, 2011). A second important aspect is intergroup competition. Several studies have shown that the context of an intergroup competition alters altruistic behavior compared to an individual setting. Rebers and Koopmans (2012) assigned subjects to groups and conducted a version of the n-person prisoner's dilemma that included an option to punish defectors of the own group. They observed more altruistic punishment when the different groups were competing with each other than during a context with no intergroup competition. Other studies examined the effect of intergroup competition using real social groups. For instance, Van Vugt et al. (2007) found that male university students cooperated more with their own group (i.e., fellow students) during an intergroup competition against students from other universities than in an individual setting without group competition. Another study investigated the tendency for cooperation between members of different Swiss Army Platoons (Goette et al., 2012). Results showed that ingroup favoritism and outgroup hostility increased in a group competition between the different Platoons compared to a neutral context, during which subjects also faced counterparts from the different Platoons but played individually for their own payoff. There are also findings from other contexts, such as cognitive tasks, indicating an effect of group competition on the link between testosterone and task performance (Mehta et al., 2009), which suggest that testosterone effects may depend on the type of social challenge (i.e., individual vs. intergroup competition). In addition, there exists a large body of literature on the influence of testosterone levels on behavior during competition. It has been shown repeatedly that testosterone levels rise after winning a competition and that high testosterone levels are associated with competitive drive and the willingness to engage in competitions (for review please see Mazur and Booth, 1998; Archer, 2006; Carré and Olmstead, 2015).

But what leads to assume that parochial altruism and intergroup competition might explain the contradicting results considering the behavioral effects of testosterone during social interaction? According to a recently proposed theory, the "male warrior hypothesis," men are more prone to form coalitions, engage in intergroup conflicts and they display increased altruistic tendencies in the presence of an intergroup competition (Van Vugt et al., 2007; McDonald et al., 2012). Since testosterone is the predominant hormone in men, it might be involved in the modulation of these parochial patterns, thereby also accounting for individual behavioral differences. Based on this assumption, testosterone might enhance different types of behavior depending on the situation (individual vs. competition context) and interaction (own group vs. other group) rather than being restricted to promote either aggressive or altruistic behavior.

Initial evidence for a testosterone-driven modulation of parochial altruism comes from recently published data of male soccer fans playing a single-shot version of the ultimatum game (UG) (Diekhof et al., 2014). In the UG two players interact: the proposer has to offer a share of an initially endowed sum of money or points to the responder. The responder can then decide whether or not to accept this offer (which can vary in terms of fairness). In case of rejection, both players receive nothing. In this study subjects played in the role of the responder and interacted once with different proposers, who were either marked as fans of the subject's own favorite team (i.e., ingroup) or as fans of other teams of different rivalry (i.e., outgroups). The group identities and the offers of the proposers were predetermined by the experimental protocol, but subjects were led to believe that they faced real decisions of former participants. In addition, the UG was played in two different contexts: a neutral session and a competition between the groups composed of fans of the same team. Furthermore, subjects were also asked to switch to the role

of the proposer and offer a share of 10 points to an ingroup member and members of the three outgroups. Regarding the proposals there was no differentiation between a neutral or competitive context and subjects only made one offer to each group. Findings indicate that bargaining behavior is highly influenced by social distance as well as the context. Furthermore, endogenous testosterone was associated with a pronounced degree of parochialism. In the competition context individuals with higher testosterone levels rejected offers by fans of rivaling soccer teams more often. At the same time, high testosterone levels predicted higher and thus more generous offers to ingroup members.

However, norm-compliant proposals in the UG may not capture true altruistic behavior entirely free from selfish motives since the probability of rejection and thus financial loss decreases with higher offers. Therefore, here we report results of a second game paradigm that was conducted in this study cohort. Subjects also performed a version of the prisoner's dilemma (PD), during which they had to decide whether or not they wanted to cooperate with another soccer fan. In the PD two players are asked simultaneously if they want to cooperate with each other or not. If only one player chooses to cooperate, the other one receives maximum payoff, which makes defection (i.e., no cooperation) the preferable strategy from an economic perspective. Nonetheless, it has been repeatedly observed that humans display a tendency toward cooperation (Camerer, 2003; Fehr and Fischbacher, 2003). Here, the PD was applied to test whether endogenous testosterone levels are also linked to prosocial behavior in terms of cooperation, which would confirm the previously observed positive effect on altruistic punishment in the UG. Similarly to the proposer role in the UG, the PD implies a trade-off between personal payoff and expectations on the behavior of the opponent, which will affect the final outcome. However, making an offer in the UG presumably requires even more complex considerations since the expectations on the reactions of the responders might also vary with the different options for proposals that can range between one and five points. In contrast to that, the PD only leaves two options, cooperation or defection, which simplifies the process of weighing up selfish motives against predicted reactions of the opponent. Consequently, the decision to cooperate in the PD might be less ambiguous in terms of a financial trade-off than offering a high share in the UG. Hence, the PD was additionally performed to obtain more evidence complementing the positive association between testosterone and prosocial behavior toward ingroup members in the UG (Diekhof et al., 2014). In accordance with the procedure described in Diekhof et al. (2014) this task was played in two contexts: the neutral setting and the group competition.

We hypothesized that cooperation rates would decrease with increasing social distance to the opponent and that this group-dependent behavior would further escalate in the competition context. Individuals with high testosterone were predicted to show increased ingroup cooperation in combination with decreased outgroup cooperation (i.e., parochial altruism), especially during the intergroup competition.

Materials and Methods

Participants

50 healthy male soccer fans (mean age ± SD: 24.6 ± 3.5) participated in this study, which was approved by the ethics committee of the Medical Council of Hamburg (Aerztekammer Hamburg). Participants were recruited among students of the University of Hamburg via online advertisement and flyers. They were told that they could win up to 15 Euros depending on their outcome during the PD and the UG (results from the latter are reported in Diekhof et al., 2014). All subjects were healthy and reported neither use of medication nor alcohol or drug abuse. Prior to testing, subjects were asked about their general interest in soccer via questionnaire to ensure a strong feeling of group affiliation. This questionnaire included a rating of the question "How much are you interested in soccer?" on a 5-point-Likert-scale as well as questions considering stadium attendance or fan merchandise. Subjects also had to rate all teams of the German Premier League (Bundesliga) as well as one local soccer team of the second division according to their own preferences on a 5-point-Likert-scale ranging from 1 ("my favorite team") to 5 ("my least favorite team"). This rating was then used to assign individualized "fan identities" to the presented opponents in the PD, so that subjects encountered either fans of their own favorite team or fans of other teams of varying rivalry. Inclusion criteria for this study implied that one soccer team was rated as the favorite team (score of 1), another team as the least favorite (score of 5), and that subjects also considered at least one team as "neutral" (score of 3). Written informed consent was obtained from all participants before the experiment.

Experimental Design

Participants performed a version of the PD with 40 single-shot interactions. A repeated version was used to create a more realistic social setting (e.g., Axelrod and Hamilton, 1981) implying several encounters with the same team. They were told that during the experiment they would interact with other soccer fans, who were tested earlier, and be presented with their former decisions. In fact, the decisions and fan identities of the opposing players were predetermined to test subjects' behavior in four different conditions: interactions with (a) fans of the subject's own favorite soccer team (ingroup), (b) fans of the most disliked soccer team (antagonistic outgroup), (c) fans of a soccer team that was rated as neutral by the subject (neutral outgroup), and (d) fans of an unknown cricket team (unknown outgroup). Hence, the teams in the first three different conditions were selected individually according to the participant's prior preference rating. At the beginning of each round in the game both players were endowed with 20 points. If the two players decided to cooperate, both received 40 points. In case of defection (no cooperation) at both sides, the two players both kept their initial 20 points. Maximum payoff, however, could be won if one player decided to keep his points whilst the other cooperated. In this case the defector received 60 points and the other player got nothing. Participants were told that their achieved sum of points over all interactions would later be converted to real money, but the exact conversion factor for points to

Euros was not given in order to prevent the decision making progress being disturbed by concurrent computing. Each of the four conditions was represented by ten trials, of which three involved defection by the other player. Trials were presented in pseudorandomized order and counterbalanced for condition transitions. Each trial began with a start frame indicating a new interaction. After this, participants were shown a male silhouette with small team logos and the written team name beneath it representing the second player. The first name as well as the last name's initial of the in actual fact fictive second player were also presented to increase authenticity of the game and emphasize the social nature of the task (for a similar approach see Sanfey et al., 2003). Next, participants were asked whether or not they would like to cooperate with this person and to indicate their decision via right or left button press. After this, feedback on the second player's decision and the outcome was given (**Figure 1**). The PD was played in two different contexts: during the first session, participants were told to maximize their own outcome (neutral context). In the second session, however, they were instructed that they could win extra points if their own team, which included all fans of the same soccer team, would finally outperform the other teams (competition context). Consequently, in this session participants have to reduce selfish impulses in interactions with ingroup members (i.e., choosing to cooperate instead of defecting) to ensure maximum payoff. Again, we refrained from informing the subjects about the exact amount of extra points to be won during the competition. This was done for similar reasons as with the conversion factor. In fact, the extra reward of the PD competition context constituted 20% of the total points that could be won during the whole experiment. Notably, subjects neither asked for the extra sum of points nor the conversion to money. Written instructions were given before both sessions (see Supplementary Material) and a short training version was conducted before the start of the real session. In both sessions participants also completed a version of the UG (for results see Diekhof et al., 2014). The order of the two games was counterbalanced across participants, but the neutral sessions were always completed first.

Saliva Samples and Assays

Participants provided five saliva samples over a period of 2 h in the morning of the test day to determine salivary concentrations of free testosterone. Sampling began at home directly after waking up and continued with an interval of 30 min to ensure a representative sample controlling for highly variable concentrations due to fluctuating secretion patterns. During collection subjects were instructed to refrain from eating, smoking, chewing gum, and drinking anything besides water. Tooth brushing was allowed after the first sample, but not immediately before collecting the second. Samples were collected in 2 ml polypropylene Eppendorf tubes and frozen at −20°C until further analysis. Before assaying, all samples were thawed and mixed by vortex and centrifuged at RCF 604 × g for 5 min (i.e., 3000 rpm in a common Eppendorf Minispin centrifuge) to separate saliva from mucins and other residuals. Aliquots were prepared by mixing equal volumes of each of the five samples. Samples that were not clear and colorless were left out to exclude blood contaminated saliva. Therefore, some aliquots contained saliva of less than five samples. Salivary concentration of free testosterone was assessed using an enzyme-linked immunosorbent assay (ELISA) kit by Demeditec Diagnostics with a sensitivity of 2.2 pg/ml (denoted intra-assay coefficients of variation: 6.58% at 90.8 pg/ml, inter-assay variation: 7.4% at 74.3 pg/ml). All samples were assayed twice and two control samples (low and high) were also added. Two assay kits were used since the sample size extended assay space.

Statistical Analyses

All statistical analyses were performed with SPSS 19. First, mean cooperation rates for each participant in each condition were determined. One subject had to be excluded from further analyses due to a technical error, which prevented the completion of the second experimental session. Repeated-measures ANOVA was used to test for an effect or interaction of the factors "team" and "context" on the cooperation rates. Wilcoxon-rank tests were conducted as post hoc comparisons. To identify possible associations between testosterone and cooperation

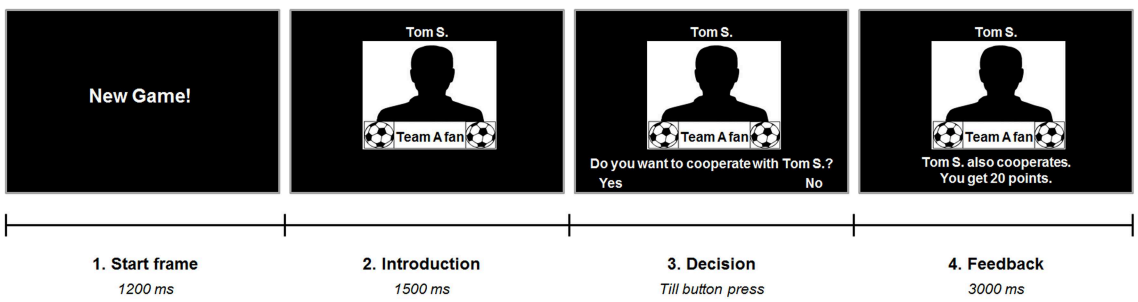

FIGURE 1 | Experimental paradigm. Each trial started with a start frame informing the subject that now there will be a new interaction. Next, subjects saw a male silhouette representing the second player along with two small soccer team logos as well as the written name of the team to indicate the second player's favorite team. The first name and initial of the last name of the opponent was presented to increase plausibility of a real person. After this, subjects were asked to decide whether or not they would like to cooperate with the opposing player. They indicated their response via right or left button press. The second player's decision was then revealed along with feedback on the outcome according to the subject's decision.

rates Spearman rank correlations were used. Furthermore, testosterone levels were compared between subjects displaying a high or low parochial pattern with independent *t*-Tests. For this purpose, the ingroup bias for each subject was determined by calculating the difference between the cooperation rates with the ingroup and the antagonistic outgroup during the competition. Accordingly, a high value of ingroup bias indicated more cooperation with the ingroup relative to the antagonistic outgroup, whereas a low value represented the opposite. Median-split was then used to divide the sample in two groups: subjects with an ingroup bias above the median of 90% (i.e., the "parochialists," $n = 23$; all subjects in this group had an ingroup bias of 100%) and subjects below the median (i.e., the "individualists," $n = 20$; ingroup bias [mean ± sem]: 43.00 ± 7.54%). Significances are reported two-tailed if not otherwise indicated and one-tailed in case of directed a priori hypotheses.

Results

First, we investigated the effect of group membership and context on cooperative behavior. A 4 (team: ingroup, neutral outgroup, unknown outgroup, antagonistic outgroup) × 2 (context: neutral session, competition) repeated-measures ANOVA revealed highly significant effects for context [$F_{(1, 48)} = 12.69$, $p = 0.001$, $\eta_p^2 = 0.21$] and team [$F_{(3, 144)} = 85.22$, $p < 0.001$, $\eta_p^2 = 0.64$] as well as an interaction between the factors team and context [$F_{(3, 144)} = 23.40$, $p < 0.001$, $\eta_p^2 = 0.33$]. *Post-hoc* Wilcoxon signed-rank tests showed that cooperation rates were lower in the competitive context than during the neutral session ($Z = -3.58$, $p < 0.001$, $n = 49$; cooperation rate [mean ± sem]: neutral session = 34.76 ± 3.19%, competition = 25.52 ± 2.10%). Further, cooperation rates increased with increasing social distance resulting in significant differences between the cooperation with the different teams except for the comparison between the neutral and the unknown team, which only reached statistical trend level ($Z = -5.85$, $p = 0.97$, $n = 49$). The "team" × "context" interaction was mainly accounted for by significant higher cooperation rates with ingroup members during the competition than during the neutral session ($Z = -3.03$, $p = 0.002$, $n = 49$) and significantly lower cooperation rates with neutral, unknown, and antagonistic outgroup during the competition than during the neutral session (neutral outgroup: $Z = -4.33$, $p < 0.001$; unknown outgroup: $Z = -4.69$, $p < 0.001$; antagonistic outgroup: $Z = -3.50$, $p < 0.001$; $n = 49$). **Figure 2** shows mean cooperation rates with all teams in both sessions. In addition, **Table 1** lists all mean cooperation rates as well as the behavioral change in cooperation rates during the competition as compared to the neutral context (Δcontext = cooperation rate competition—cooperation rate neutral session).

Considering a possible effect of testosterone on this parochial pattern, a trend for a positive correlation between testosterone and the cooperation rates with the ingroup during the competition was found (Rho = 0.218, $p = 0.051$, one-sided). This relationship was even more pronounced regarding the effect of context as described by the change in cooperation from the competition to the neutral session [i.e., Δcontext (ingroup): Rho = 0.259, $p = 0.036$, one-sided]. Correlations are depicted in **Figure 3**. In contrast to that, there were no equivalent correlations with ingroup cooperation during the neutral session (Rho = −0.139, $p = 0.342$) or with the overall ingroup cooperation rate across both sessions (Rho = -0.013, $p = 0.931$). To further investigate the effect of testosterone on parochial altruism, we compared the testosterone levels between subjects showing an increased ingroup bias during the competition and subjects that did not differentiate so much between the different teams (i.e., the "parochialists" as compared to the "individualists"). Testosterone levels of the parochialists were significantly higher than those of individualists [$t_{(41)} = -2.30$, $p = 0.027$, $d = 0.72$; testosterone concentrations [mean ± sem] parochialists: 135.10 ± 8.66 pg/ml, individualists: 109.18 ± 6.88 pg/ml]. **Figure 4** shows mean testosterone concentrations of both groups. Please also refer to **Table 1** to find mean cooperation rates of parochialists and individualists in comparison with those of the whole sample. Interestingly, by following their strategy of increased outgroup hostility and ingroup favoritism parochialists still achieved fewer total payoffs in the competition than individualists [$t_{(41)} = 5.18$, $p < 0.001$, $d = 1.62$; total points [mean ± sem] parochialists: 1647.83 ± 19.83 points, individualists: 1797.00 ± 20.79 points]. This was also reflected by higher overall cooperation rates of parochialists during the competition compared to the individualists ($U = 56.50$, $p < 0.001$; overall cooperation rate [mean ± sem] parochialists: 37.77 ± 3.12 %, individualists: 20.41 ± 3.10 %).

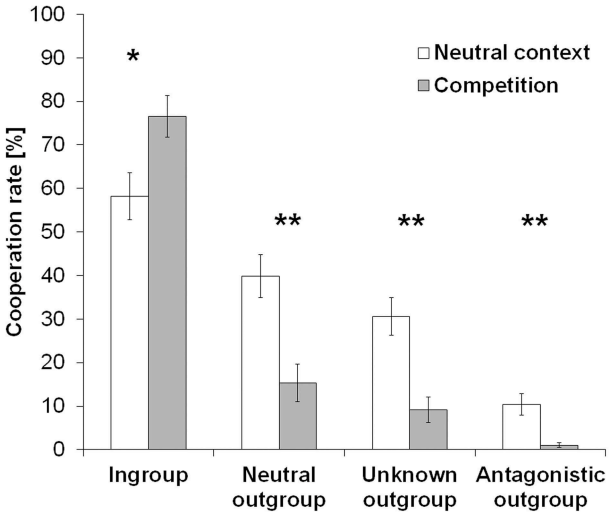

FIGURE 2 | Cooperation rates in the prisoner's dilemma. Cooperation rates decreased with increasing social distance to the opposing player's team. The group competition context further accentuated this parochial pattern resulting in increased cooperation rates with ingroup members whereas outgroup cooperation decreased (*$p < 0.01$, **$p < 0.001$). Error bars indicate standard errors from mean (SEM).

Discussion

The aim of the present study was to resolve the contradiction regarding the behavioral effects of testosterone (prosocial vs. antisocial) by considering two additional factors, namely group

TABLE 1 | Cooperation rates in the prisoner's dilemma.

Team		Mean cooperation rate [%] ± SEM		
	Sample	Neutral session	Competition	Contextual difference of cooperation rates (Δcontext: competitive—neutral session)
Ingroup	All:	58.16 ± 5.46	76.55 ± 4.84	18.39 ± 5.49
	Parochialists:	66.96 ± 8.35	100.00 ± 0.00	33.04 ± 8.35
	Individualists:	46.00 ± 8.22	45.55 ± 7.65	−0.45 ± 7.12
Neutral outgroup	All:	39.86 ± 5.02	15.31 ± 4.34	−24.55 ± 5.09
	Parochialists:	54.78 ± 8,24	25.65 ± 8.52	−29.13 ± 9.62
	Individualists:	22.65 ± 5.86	6.00 ± 2.34	−16.65 ± 5.27
Unknown outgroup	All:	30.61 ± 4.33	9.18 ± 2.99	−21.43 ± 3.58
	Parochialists:	32.17 ± 6.69	10.00 ± 4.87	−22.17 ± 5.90
	Individualists:	25.00 ± 6.18	6.00 ± 3.03	−19.00 ± 5.47
Antagonistic outgroup	All:	10.41 ± 2.54	1.04 ± 0.53	−9.37 ± 2.65
	Parochialists:	12.61 ± 4.76	0.00 ± 0.00	−12.61 ± 4.76
	Individualists:	9.50 ± 2.85	2.55 ± 1.25	−6.90 ± 3.35

Means and standard errors (SEM) for the different experimental conditions (team and context) for all participants (n = 49) and for individuals displaying a high ingroup bias during the competition ("parochialists," n = 23) or a low ingroup bias ("individualists," n = 20).

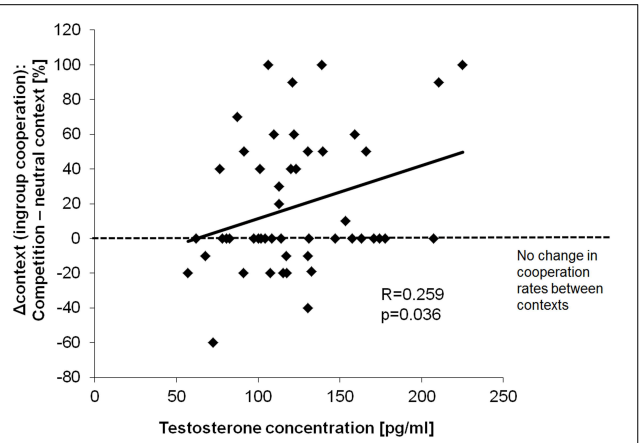

FIGURE 3 | Effect of testosterone on ingroup cooperation. High testosterone levels were associated with increased ingroup cooperation during the group competition relative to the neutral context (Δcontext: cooperation rates competition—neutral context).

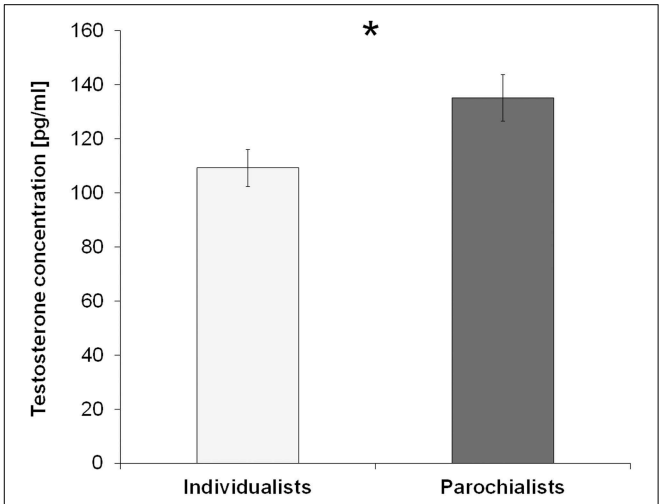

FIGURE 4 | Testosterone levels predict parochialism. Subjects displaying a higher tendency for parochial altruism during the competition (i.e., individuals who showed increased cooperation with the ingroup relative to the antagonistic outgroup) had significantly higher testosterone levels than subjects who did not show such a strong ingroup bias (*$p < 0.05$). Error bars indicate standard errors of the mean (SEM).

membership and intergroup competition. To test this, male soccer fans played the PD twice, in a neutral and in a group competition context, against counterparts marked as soccer fans of other teams of varying rivalry to the subject's own favorite team. Three major findings emerged: firstly, our results demonstrate the parochial nature of human cooperation with increasing social distance and enmity to the opposing player resulting in decreased cooperation rates. This parochial pattern was observed in both contexts, but was even more prominent during the intergroup competition. The presence of external threat by the competing teams seemed to have intensified parochial tendencies.

Secondly, the present findings suggest testosterone to promote prosocial behavioral tendencies during ingroup interactions since high levels of testosterone were associated with increased cooperation rates with ingroup members during the competitive relative to the neutral context. The fact that an association between testosterone and altruistic behavior could only be found in interactions with the ingroup, suggests a modulating role of testosterone in parochial altruism, which might facilitate group coherence. This thought was supported by the observation that

individuals with increased ingroup bias during the competition had significantly higher testosterone levels than individuals who did not differentiate so much between the different groups.

Finally, the observed associations between testosterone and parochial altruism were limited to the group competition or the behavioral adaptation represented by the change in cooperation rates from the competitive as compared to the neutral context. Thus, competition might be a contextual aspect that plays an important role in explaining the effects of testosterone on parochial altruism.

Taken together, the data from the PD complement the previously reported results regarding altruistic punishment in the UG (Diekhof et al., 2014), during which participants displayed the same parochial pattern in their rejection rates (i.e., increasing rejection rates with increasing social distance). Hence, cooperative behavior seems to be affected by parochial tendencies in a similar manner as altruistic punishment. This corresponds to findings from other studies investigating the impact of group membership in social exchange tasks that investigated other types of group membership such as different linguistic language groups of New Guinea (Bernhard et al., 2006) or members of different platoons of the Swiss Army (Goette et al., 2012). Also, the further escalation of ingroup favoritism and outgroup hostility during the competition conforms well to the results of the UG that showed pronounced parochial altruism in a context of intergroup conflict (Diekhof et al., 2014). Important to note, less cooperation with the three outgroups consequently led to higher payoff in the competition than in the neutral context. Nonetheless, the argument that this was due to economically rational behavior rather than parochial altruism is doubtful. First, defection was mainly restricted to outgroups whereas during ingroup interactions altruistic choices for cooperation were observed. Secondly, in the UG outgroup offers were rejected more often during the competition even though in this game this unfavorable treatment involved personal costs (Diekhof et al., 2014). In addition, our results are in line with the observations by Goette et al. (2012), who applied a PD and found that in the context of an intergroup competition between the different Army platoons ingroup cooperation as well as defection in outgroup interactions strongly increased. Hence, the present data fit well into the theoretical framework proposing that intergroup competition may have been the driving force for the co-evolution of parochialism and altruism (Choi and Bowles, 2007). Potentially impeding the interpretation of the present results might be the fact that subjects did not know the exact conversion factor according to which their achieved points were translated into Euros. However, previous studies on decision making during interactions with in- and outsiders have applied all sorts of financial incentives in game theoretic tasks, but nonetheless have all observed prosocial behavior in favor of the own group, which corresponds to our results (e.g., points representing real money in the study by Goette et al., 2012 or even hypothetical endowments as in Campanhã et al., 2011). Further, the sum of the extra group reward was not explicitly mentioned to the subjects, which would allow for an alternative explanation of increased ingroup cooperation during the competition: for all the subjects knew, the extra reward could have as well outweighed the personal loss caused by ingroup cooperation. Nevertheless, when interpreting the subjects' motives to cooperate with ingroup members during the competition it has to be taken into account that only two out of the 50 subjects played completely selfish in the neutral context. This observation is relevant as it suggests that subjects discriminated between the different groups even in the absence of an extra group reward. A possible explanation for this might be that strong emotions of enmity and affiliation between soccer fans dampen the impulse to play economically in the first place (i.e., neutral context). Therefore, it seems plausible that increased ingroup cooperation during the competition indicates parochial altruism rather than a financial strategy.

Considering possible effects of endogenous testosterone, a positive correlation with the change of ingroup cooperation rates from the competitive as compared to the neutral setting emerged. This matches the previous findings from the UG, during which higher salivary testosterone levels were predictive of higher offers to ingroup members (Diekhof et al., 2014). In addition to that, in the UG high testosterone individuals displayed increased outgroup hostility in the form of higher rejection rates toward outgroup proposals during the competitive relative to the neutral context. The PD, however, revealed no specific link between testosterone and outgroup hostility. A possible reason for the absence of an outgroup-directed association between testosterone and aggressive behavior might lie in the specific demands of the PD. While the decision to reject an offer in the UG might in fact indicate an individual's willingness to harm the other player, the decision for no cooperation in the PD might as well result from the intention to protect oneself from exploitation rather than representing an aggressive act against the other player (Rusch, 2014). Thus the PD might not capture outgroup hostility as good as the UG, which could explain the lack of an association between testosterone and outgroup-directed aggression in the present data. In sum, the present results disprove the notion that testosterone is promoting solely antisocial behavior since high levels were associated with increased cooperative behavior in the form of stronger ingroup favoritism. This supports findings from other recent studies reporting prosocial effects of testosterone (Burnham, 2007; Eisenegger et al., 2010; Mehta and Beer, 2010) and points to a more complex role of testosterone in the modulation of human social behavior.

Most importantly, salivary testosterone levels predicted parochial tendencies during the group competition. Testosterone concentrations were higher in subjects displaying a strong ingroup bias than in subjects who treated the teams more equally. Besides the stronger discrimination between the different groups, parochial subjects also won fewer points in the competition than the individualists. This might suggest that besides enhancing ingroup bias, testosterone also facilitates withstanding the impulse to maximize personal payoff for in order to ensure group success. To add further support to this claim we looked again into the data obtained during the UG (Diekhof et al., 2014) and compared behavior in this game between the parochialists and the individualists (as defined here in the present analyses). Matching the findings from the PD, in the UG parochialists showed higher rejection rates in response to unfair offers by antagonistic outgroup members than individualists thereby

refraining from the offered points ($U = 155$, $p = 0.013$; rejection rates [mean ± sem] parochialists: 98.26 ± 1.20 %, individualists: 84.00 ± 6.26 %). The observed association between testosterone and parochial altruism in the PD fits well with our previously proposed hypothesis of testosterone as a driving force of intergroup bias. It also conforms well with the "male warrior hypothesis," which states that specifically males should be more likely to form coalitions and direct aggression toward outgroups during group competitions (Van Vugt et al., 2007; Van Vugt and Park, 2009; McDonald et al., 2012). Since testosterone is the most important sex hormone in males and its role in social behavior has been well described (e.g., Eisenegger et al., 2011), it is reasonable to assume a link between prevalent testosterone levels and parochial altruism in males. The present findings support this assumption by offering evidence for a testosterone-modulated intergroup bias in a group competition context.

Further important to note is that here we report individual differences concerning parochial altruism that were associated with endogenous testosterone levels. However, we cannot exclude possible interferences by other factors, which were not considered in this study. For instance, genetic polymorphisms in the androgen receptor gene might mediate individual behavioral differences that are associated with testosterone. Other open questions that require further research concern influences and interactions by other steroid hormones, such as estrogens, and, especially in this context, if there are comparable effects in females. Against this background, future studies should repeat a similar paradigm and include additional factors to substantiate the observed link between testosterone and parochial altruism.

Conclusion

This study provides further evidence to the view that testosterone does not only promote antisocial behavioral tendencies, but also facilitates altruism. This was shown here to be specifically the case during an intergroup competition in human males. In this context, testosterone was predictive of parochial altruism (i.e., the favorable treatment of ingroup members, whereas aggression is directed toward the outgroup) and thus was associated with both aggressive and cooperative behavior depending on group membership and competition. The present results are therefore in line with previously stated theories on male coalition building (i.e., "male warrior hypothesis"; Van Vugt et al., 2007) and evolutionary theories on the development of altruism and parochialism (Choi and Bowles, 2007). As a novel finding, they propose testosterone to play a key role in these social mechanisms.

Acknowledgments

We would like to thank M. Langbehn for programming the test protocol and analysis batches, Marianne Schwarz and Hanna Ehrenteich for their contribution in the data acquisition and Angelika Kroll for the analysis of hormonal parameters.

Supplementary Material

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fnins.2015.00183/abstract

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 25 November 2015
doi: 10.3389/fpsyg.2015.01789

Accountability Accentuates Interindividual-Intergroup Discontinuity by Enforcing Parochialism

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Interindividual-intergroup discontinuity is the tendency for relations between groups to be more competitive than relations between individuals. We examined whether the discontinuity effect arises in part because group members experience normative pressure to favor the ingroup (parochialism). Building on the notion that accountability enhances normative pressure, we hypothesized that the discontinuity effect would be larger when accountability is present (compared to absent). A prisoner's dilemma game experiment supported this prediction. Specifically, intergroup (compared to interindividual) interaction activated an injunctive ingroup-favoring norm, and accountability enhanced the influence of this norm on competitive behavior.

Keywords: discontinuity effect, accountability, parochialism, prisoner's dilemma, intergroup relations

OPEN ACCESS

Edited by:
Robert Böhm,
RWTH Aachen University, Germany

Reviewed by:
Siegfried Dewitte,
Katholieke Universiteit Leuven, Belgium
David D. Loschelder,
Saarland University, Germany

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *30 June 2015*
Accepted: *06 November 2015*
Published: *25 November 2015*

Citation:
Wildschut T, van Horen F and Hart C (2015) Accountability Accentuates Interindividual-Intergroup Discontinuity by Enforcing Parochialism. Front. Psychol. 6:1789. doi: 10.3389/fpsyg.2015.01789

INTRODUCTION

Interindividual-intergroup discontinuity refers to the tendency for relations between groups to be more competitive or less cooperative than relations between individuals (Insko et al., 2001, 2005, 2013). Most research comparing interindividual and intergroup interactions has done so in the context of experiments with mixed-motive matrix games, like the prisoner's dilemma game (PDG). The PDG involves the interaction between two players who can each select a cooperative or competitive choice.[1] Each player's outcomes are determined by the combination of both players' choices. Each player can maximize his/her outcomes by selecting the competitive choice, regardless of the choice selected by the other player. Yet, paradoxically, when both select the competitive choice, they achieve lower outcomes than they could have achieved by mutual cooperation. Most PDG experiments contrasting interindividual and intergroup interactions have supported the discontinuity effect: interacting groups are more competitive than are interacting individuals (Wildschut et al., 2003). Although the discontinuity effect has been studied predominantly in a PDG context involving participants from individualistic cultures (e.g., US, The Netherlands; Wildschut et al., 2001), it has also been documented in non-laboratory contexts (Pemberton et al., 1996), among participants from a collectivistic culture (Japan; Takemura and Yuki, 2007), in a distributive (i.e., zero-sum) multi-issue negotiation task (Loschelder and Trötschel, 2010), and in a context where the PDG matrix was substituted by a functionally equivalent set of rules governing the exchange of folded origami products (Schopler et al., 2001).

[1]In this article, we refer to the two PDG choices as cooperative choice and competitive choice, respectively. Elsewhere, the competitive choice is also referred to as the non-cooperative choice or defection. The latter labels have the advantage of not suggesting relativistic motivation or a concern with winning. However, we used the "competitive choice" label for ease of exposition and to maintain consistency with previous work on the discontinuity effect (e.g., Insko et al., 2013). By adopting this terminology, we do not mean to suggest that the competitive choice necessarily reflects concern with winning.

THE ROLE OF PAROCHIALISM IN INTERINDIVIDUAL-INTERGROUP

The discontinuity effect is a highly robust and multicausal phenomenon (Wildschut et al., 2007). The ingroup-favoring-norm explanation proposes that the discontinuity effect arises in part because interindividual and intergroup interactions are governed by different norms or moral codes (Cohen et al., 2006; Wildschut and Insko, 2006). On the one hand, norms for interindividual interactions emphasize fairness (Thibaut and Walker, 1975) and reciprocity (Gouldner, 1960)—a set of rules referred to as individual morality (Cohen et al., 2010). On the other hand, norms for intergroup interactions impel group members to support the ingroup at the expense of outsiders—a set of rules referred to as group morality or parochialism (Schwartz-Shea and Simmons, 1991; Baron, 2001; Wildschut and Insko, 2007).

Historical Background

The concept of parochialism dates back millennia. In Plato's (1891, p. 7) *The Republic*, Polemarchus defends the maxim of classical Greek morality that "justice is the art which gives good to friends and evil to enemies." Machiavelli (1515/1952) addressed a similar message to aspiring leaders:

> And yet he must not mind incurring the scandal of those vices, without which it would be difficult to save the state, for if one considers well, it will be found that some things which seem virtues would, if followed, lead to one's ruin, and some others which appear vices result in one's greater security and well-being (p. 93).

Hobbes (1660/1983) captured the essence of this idea in a few simple words. "Force and fraud" he wrote, "are in war the two cardinal virtues." More recently, the theologian Niebuhr (1941) expressed a related viewpoint when he wrote:

> The group is more arrogant, hypocritical, self-centered and more ruthless in the pursuit of its ends than the individual. An inevitable moral tension between individual and group morality is therefore created. . . . This tension is naturally most apparent in the conscience of the responsible statesmen, who are bound to feel the disparity between the canons of ordinary morality and the accepted habits of collective and political behavior (p. 222).

Early social psychological perspectives on group behavior also showed a keen awareness of group morality or parochialism. For example, Le Bon (1895/1896) wrote:

> Taking the word "morality" to mean constant respect for certain social conventions, and the permanent repression of selfish impulses, it is quite evident that crowds are too impulsive and too mobile to be moral. If, however, we include in the term morality the transitory display of certain qualities such as self-abnegation, self-sacrifice, disinterestedness, devotion, and the need of equity, we may say, on the contrary, that crowds may at times exhibit a very lofty morality (p. 43).

In a similar vein, McDougall (1920) observed:

> The group spirit secures that the egoistic and the altruistic tendencies of each man's nature, instead of being in perpetual conflict, as they must be in its absence, shall harmoniously co-operate and re-enforce one another throughout a large part of the total field of human activity (p. 79).

Although influential in the very early days of social psychology, Le Bon's (1895/1896) and McDougall's (1920) ideas fell by the wayside after the centerpiece of their analysis—the group mind concept—was criticized by Allport (1924). As illustrated by this Research Topic, however, parochialism has recently attracted revived interest from across the social sciences (Wildschut et al., 2002; Choi and Bowles, 2007; De Dreu et al., 2014; Rusch, 2014). In the present research, we focus specifically on the contrast between norms governing interindividual interactions and the dictates of parochialism. According to the ingroup-favoring-norm explanation of the discontinuity effect, this contrast can shed light on the enduring question of why relations between groups are more competitive, hostile, and intractable than are relations between individuals.

Empirical Evidence

Initial tests of the ingroup-favoring-norm explanation were guided by the notion that accountability enforces norms (Semin and Manstead, 1983; Tetlock, 1992; Sedikides et al., 2002). Broadly speaking, accountability is "the condition of being answerable for conducting oneself in a manner that is consistent with relevant prescriptions for how things should be" (Schlenker and Weingold, 1989, p. 24). A corollary of the norm-enforcement role of accountability is that ingroup-favoring norms should be more influential when group members are accountable rather than unaccountable to the ingroup. Only when group members are accountable can their actions influence how the ingroup evaluates them (Deutsch and Gerard, 1955). An experiment by Wildschut et al. (2002) supported this line of reasoning. Participants were placed in separate rooms and informed that they were part of a group that would interact with another group located in an adjoining laboratory. They then made individual PDG decisions under one of two conditions. In the public condition, participants were told that, upon completion of the experiment, they would meet the members of their ingroup to discuss their decisions. In the private condition, they were told that they would be dismissed separately from the laboratory. Consistent with the ingroup-favoring-norm explanation, public-condition participants (i.e., those accountable to the ingroup) made more competitive choices than did private-condition participants (i.e., those unaccountable to the ingroup). Pinter et al. (2007) conceptually replicated this finding by demonstrating that group leaders who were accountable to the ingroup made more competitive PDG choices than did unaccountable group leaders or individuals. Beyond the PDG context, Adams's (1976) boundary role theory has stimulated research aimed at understanding how representatives react to constituent pressures in the context of intergroup bargaining. Consistent with the idea that representatives often assume that constituents expect

them to be competitive toward other groups, research indicates that accountable (compared to unaccountable) representatives make fewer concessions, use more contentious tactics, and are less likely to reach agreements (Pruitt and Carnevale, 1993; Druckman, 1994).

There is, then, compelling evidence that, when group members are accountable to the ingroup, normative pressure to support the ingroup can manifest as intergroup competition. Yet, existing research is limited because it examined the effect of accountability on competitiveness in the context of intergroup interactions only. The untested assumption is that, because interindividual interactions are governed by norms of fairness and reciprocity, accountability should not increase (and might even reduce) competition between individuals, and thus accentuate the discontinuity effect. Accordingly, support for the ingroup-favoring-norm explanation is incomplete. The primary objective of the present research was to remedy this by testing the effect of accountability on competitiveness in the context of intergroup *and* interindividual interactions.

ACCOUNTABILITY IN INTERINDIVIDUAL CONTEXT

The effects of accountability on judgment and decision-making in interindividual contexts have been equivocal (Lerner and Tetlock, 1999). One strand of evidence supports the assumption that interindividual interactions are governed by norms of fairness and reciprocity, and, accordingly, that accountability reduces competitive behavior (Reis and Gruzen, 1976; Prentice-Dunn and Rogers, 1982). For instance, De Cremer et al. (2001) demonstrated that, in a social dilemma task, individuals who anticipated meeting their interaction partners were less competitive than those who did not anticipate such a meeting, suggesting that accountability (induced via anticipated future interaction) increased the salience of fairness norms.

Another strand of evidence suggest, however, that accountability may increase, rather than reduce, interindividual competition. Miller (1999; Miller and Ratner, 1996) proposed that, in individualistic cultures, self-interest is considered normative and rational. This norm of self-interest is both descriptive (i.e., relating to which behaviors are typically enacted) and injunctive (i.e., relating to which behaviors are typically approved or disapproved; Cialdini et al., 1990). It is descriptive in the sense that individuals believe that others' behavior is guided by self-interest (Miller and Ratner, 1996, 1998) and it is injunctive in the sense that individuals believe others do not approve behavior that is divorced from self-interest (Ratner and Miller, 2001). Thus, accountability could enforce the norm of self-interest and attendant competition, at least in individualistic, Western cultures.

THE PRESENT RESEARCH

The ingroup-favoring-norm explanation proposes that, whereas intergroup interactions are guided by norms impelling group members to favor the ingroup, interindividual interactions activate norms emphasizing fairness and reciprocity. Because accountability enforces norms (Tetlock, 1992), it should increase intergroup competition and reduce interindividual competition. This, in turn, entails a larger discontinuity effect in the presence (vs. absence) of accountability (Hypothesis 1). Specifically, an intergroup (compared to interindividual) context should render salient the ingroup-favoring norm, and accountability will enhance the influence of this norm on competition (Hypothesis 2). We did, however, also consider the alternative possibility that accountability enforces the norm of self-interest (rather than fairness and reciprocity) in interindividual contexts, in which case it could increase (rather than reduce) interindividual competition.

MATERIALS AND METHODS

Participants and Design

Two hundred thirty-six female University of Southampton undergraduates took part in this experiment for partial course credit or payment (£4.00). All participants earned an additional £1.00 during the experiment. The experiment was reviewed and approved by the University of Southampton Psychology Ethics Committee. All participants provided written informed consent.

The design comprised two manipulated independent variables: interaction type (individuals vs. groups) and accountability (public vs. private responding). The interaction type variable entailed a contrast between interactions involving two isolated individuals with interactions involving two group members who belonged to two separate three-person groups. We manipulated accountability by informing participants in the public condition that, upon completion of the experiment, they would meet the two other participants seated on their side of the laboratory (henceforth, same-side others) to discuss each other's decisions (accountability present). In the private condition, we told participants that they would be dismissed separately and that their decisions would remain anonymous (accountability absent). In the intergroup condition, we informed participants that the same-side others were part of their three-person group. In the interindividual condition, we described the same-side others as participants completing the same experiment.

Procedure

We ran the experimental sessions in a laboratory containing six cubicles, with three cubicles located on opposite sides of the room. In the interindividual condition, these cubicles were numbered 1 through 6. In the intergroup condition, the three cubicles on one side of the room were labeled A1 through A3 and the cubicles on the other side were labeled B1 through B3. Each cubicle contained a desktop computer, a set of headphones, and a web camera. Each participant was seated in a separate cubicle. In the intergroup condition, we assigned participants to groups (A or B) and informed them that the other members of their group would be seated on the same side of the laboratory, whereas the members of the other group would be seated on the

other side of the laboratory. We omitted these instructions in the interindividual condition.

Next, we explained the PDG matrix to participants. In the interindividual condition, we informed participants that they would interact with the person seated in the cubicle opposite theirs and be allowed to keep the money they earned during the experiment. We informed participants in the intergroup condition that they would interact with the member of the other group seated in the cubicle opposite theirs and that, upon completion of the experiment, the three members of their ingroup would share equally the money they had earned. In the public condition, we informed participants that, upon completion of the experiment, they would meet the same-side others to talk about the decisions that they had made. (In fact, this meeting did not occur and we dismissed participants separately.) We informed participants in the private condition that they would be dismissed separately and that their decisions would remain anonymous. Subsequently, participants completed a brief check of their understanding of the PDG and, if necessary, had their answers corrected by the experimenter.

At this point, we told participants that they would interact with the person in the opposite cubicle for one trial. This trial proceeded as follows: participants had one minute to think about the situation privately. After this 1-minute period, participants opened an audio-visual connection with the person in the opposite cubicle. Participants then had one minute to discuss the situation with the person in the opposite cubicle, whom they could hear through their headphones and see on their monitor. Following this communication period, participants had one minute to make their final decision and record it in writing. After participants recorded their decisions, the experimenter collected the decisions and distributed a post-experimental questionnaire with supplemental dependent variables. Finally, we paid all participants a standard amount of £1.00 regardless of their decisions. Debriefing followed.

Dependent Variables

Manipulation Checks

To assess the effectiveness of the accountability manipulation, we asked participants: "Did you expect that the other persons seated in the cubicles on your side of the room would find out what decision you made?" (0 = *no*, 1 = *yes*). Perceived accountability should be higher with public (compared to private) responding. As a check on the interaction-type manipulation, we administered the following item: "Did you expect that every person seated in the cubicles on your side of the room would take home the same amount of money at the end of the study?" (0 = *no*, 1 = *yes*). Perceived outcome interdependence should be higher in the intergroup (compared to interindividual) condition.

Competitive Choice and Choice Reasons

The focal dependent variable was PDG choice behavior (0 = *cooperative*, 1 = *competitive*). Because each of the two PDG choices can be selected for a number of different reasons (e.g., the cooperative choice may reflect a concern for maximizing joint outcomes or a concern for achieving equal outcomes), we also assessed participants' choice reasons. Participants rated 20 items, each designed to measure one of the following reasons: Max Own (e.g., "to earn as much as possible"; "to maximize my earnings"); Max Rel (e.g., "to earn more than the other person"; "to maximize the difference between the two persons in my favor"); Fear (e.g., "did not trust the other person"; "to defend myself against the other person"); Min Dif (e.g., "to minimize the difference between both persons"; "to earn an equal amount"); and Max Joint (e.g., "to earn as much as possible together"; "to maximize the joint outcomes of both persons"). Participants rated these choice reasons on 7-point scale (1 = *not at all important*, 7 = *very important*). The reliabilities for these five 4-item scales ranged from 0.72 to 0.94. We averaged the four items in each scale to create composite measures.

Perceived Strength of Competitive Norms

We assessed both the descriptive and injunctive aspect of perceived competitive norms. To assess the strength of the descriptive competitive norm (i.e., relating to which behaviors are typically enacted), participants estimated the number of same-side others (excluding themselves) who selected the competitive choice (range = 0–2). To assess the strength of the injunctive competitive norm (i.e., relating to which behaviors are typically approved or disapproved), participants indicated which choice they believed the same-side others wanted them to make (i.e., the choice they would approve; 0 = *cooperative*, 1 = *competitive*).

Analysis Strategy

The experiment involved interaction between two participants, arranged in pairs. Because participants within each pair influenced each other's responses, they cannot be treated as independent observations. Accordingly, the unit of analysis was the pair of interacting participants and we analyzed the average response across participants within pairs. PDG choice behavior was coded: 0 = *cooperative*, 1 = *competitive*. When averaged across participants within pairs, this variable could assume the values 0 (both participants cooperate), 0.5 (one cooperates and one competes), and 1 (both compete). We followed the same procedure for the manipulation checks (0 = *no*, 1 = *yes*) and for participants' estimate of the choice same-side others wanted them to make (injunctive norm). This rendered these variables amenable to analysis of variance (ANOVA).[2]

RESULTS

Manipulation Checks

We present relevant means and standard deviations in **Table 1**. As intended, an Accountability (public vs. private) × Interaction

[2]To demonstrate that the results for the dichotomous variables (i.e., manipulation checks, competition, and injunctive norm) are not purely an artifact of our preferred ANOVA strategy, we conducted alternative analyses, using SAS PROC GLIMMIX. In these logistic analyses, the individual participants (rather than interacting pairs) were treated as units of analysis. To control for the dependence between participants within each pair, we included pairs as a random variable in a multilevel model. We specified that the dependent variables have a binary distribution. The pattern of significant (and non-significant) results was identical, with one minor exception: the Accountability × Interaction Type interaction on competition was significant in the ANOVA (see below) and marginal in the multilevel logistic analysis, $\chi^2(1) = 2.97$, $p = 0.085$.

TABLE 1 | Means and standard deviations (in parentheses) for manipulation checks, competitive choice, choice reasons, and perceived competitive norms as a function of accountability (public vs. private responding) and interaction type (individuals vs. groups).

	Public		Private	
	Individuals	Groups	Individuals	Groups
Manipulation checks (0–1)				
Accountability check	0.74 (0.36)	0.86 (0.26)	0.19 (0.32)	0.17 (0.30)
Interaction-type check	0.35 (0.42)	0.89 (0.21)	0.32 (0.42)	0.83 (0.30)
Competitive choice (0–1)	0.14 (0.29)	0.50 (0.50)	0.17 (0.34)	0.26 (0.39)
Choice reasons (1–7)				
Max Own	3.93 (0.95)	4.35 (0.92)	4.01 (0.86)	4.09 (0.88)
Max Rel	2.33 (0.88)	3.05 (1.34)	2.41 (0.86)	2.80 (0.99)
Fear	2.44 (0.94)	2.73 (0.99)	2.46 (1.07)	2.92 (1.30)
Min Dif	5.92 (0.94)	5.30 (1.12)	5.63 (1.24)	5.42 (1.02)
Max Joint	6.07 (1.01)	5.33 (1.16)	5.89 (1.08)	5.38 (1.28)
Perceived competitive norm				
Descriptive norm (0–2)	0.81 (0.49)	1.18 (0.48)	0.75 (0.47)	1.14 (0.64)
Injunctive norm (0–1)	0.14 (0.29)	0.55 (0.40)	0.22 (0.35)	0.50 (0.42)

Type (individuals vs. groups) ANOVA on the accountability manipulation check revealed a significant main effect of accountability only, $F(1,133) = 136.57$, $p < 0.001$, $\eta_p^2 = 0.50$. Participants experienced stronger accountability with public (compared to private) responding. Neither the interaction-type main effect [$F(1,133) = 0.86$, $p = 0.357$, $\eta_p^2 = 0.003$] nor the Accountability × Interaction Type interaction [$F(1,133) = 1.85$, $p = 0.177$, $\eta_p^2 = 0.01$] was significant. As a check on the interaction-type manipulation, we assessed perceived outcome interdependence. As intended, an ANOVA revealed a significant interaction-type main effect, $F(1,133) = 78.22$, $p < 0.001$, $\eta_p^2 = 0.37$. Participants perceived more outcome interdependence in the intergroup (compared to interindividual) condition. Neither the accountability main effect [$F(1,133) = 0.63$, $p = 0.430$, $\eta_p^2 = 0.003$] nor the Accountability × Interaction Type interaction [$F(1,133) = 0.09$, $p = 0.761$, $\eta_p^2 = 0.0004$] was significant. In all, the accountability and interaction-type manipulations were effective.

Competitive Choice

An Accountability (public vs. private) × Interaction Type (individuals vs. groups) ANOVA on competitive choice revealed a significant main effect of interaction type, $F(1,133) = 11.83$, $p < 0.001$, $\eta_p^2 = 0.08$. Interactions between members of different groups were more competitive than interactions between individuals (i.e., a discontinuity effect). The accountability main effect was not significant, $F(1,133) = 2.59$, $p = 0.110$, $\eta_p^2 = 0.02$. The numerical pattern was for participants to be more competitive in the public (compared to private) condition. Importantly, we obtained a significant Accountability × Interaction Type interaction, $F(1,133) = 4.28$, $p = 0.041$, $\eta_p^2 = 0.03$. Tests of simple effects indicated that group members were significantly more competitive than individuals in the public condition, $F(1,133) = 14.64$, $p < 0.001$, $\eta_p^2 = 0.10$, but not in the private condition, $F(1,133) = 0.97$, $p = 0.325$, $\eta_p^2 = 0.01$. As hypothesized, the discontinuity effect was stronger with public than with private responding. Looked at in a different way, accountability significantly increased competition in the intergroup condition, $F(1,133) = 6.72$, $p = 0.011$, $\eta_p^2 = 0.04$, but not in the interindividual condition, $F(1,133) = 0.11$, $p = 0.745$, $\eta_p^2 = 0.001$.

Choice Reasons

A series of ANOVAs on the five choice reasons resulted in significant main effects of interaction type on Max Rel, $F(1,133) = 9.82$, $p = 0.002$, $\eta_p^2 = 0.07$, Fear, $F(1,133) = 4.13$, $p = 0.044$, $\eta_p^2 = 0.03$, Max Joint, $F(1,133) = 10.37$, $p = 0.002$, $\eta_p^2 = 0.07$, and Min Dif, $F(1,133) = 4.87$, $p = 0.029$, $\eta_p^2 = 0.04$. The interaction type effect on Max Own was not significant, $F(1,133) = 2.58$, $p = 0.111$, $\eta_p^2 = 0.02$. We present relevant means and standard deviations in **Table 1**. Group members (compared to individuals) were more concerned with maximizing relative outcomes and feared their opponents more. Individuals (compared to group members) were more concerned with maximizing joint outcomes and minimizing the difference in outcomes between sides. There were no other significant effects.

Perceived Norms

An ANOVA on the estimated number of competitive choices by same-side others (descriptive norm) revealed a significant main effect of interaction type only, $F(1,132) = 17.91$, $p < 0.001$, $\eta_p^2 = 0.12$. Participants in the intergroup (compared to interindividual) condition estimated that a greater number of same-side others would select the competitive choice (the descriptive competitive norm; **Table 1**). An ANOVA on the choice participants thought same-side others wanted them to make (injunctive norm) also revealed a significant main effect of interaction type only, $F(1,133) = 29.47$, $p < 0.001$, $\eta_p^2 = 0.18$. Those in the intergroup (compared to interindividual) condition estimated that a greater number of same-side others wanted them to select the competitive choice (the injunctive competitive norm; **Table 1**). Intergroup (compared to interindividual) interactions rendered salient descriptive and injunctive competitive norms.

Conditional Process Analyses

Group members (compared to individuals) scored higher on Max Rel and Fear, and lower on Min Dif and Max Joint. Furthermore, the (descriptive and injunctive) competitive norm was stronger in the groups (compared to individuals) condition. Could any of these potential mediating mechanisms shed light on why the discontinuity effect was stronger with public (compared to private) responding? To address this question, we tested a conditional process model that Edwards and Lambert (2007) referred to as "direct effect and second stage moderation model" (see also, Baron and Kenny, 1986, p. 1179). In this model, the moderator (accountability) affects the magnitude of the mediators' (choice reasons, perceived competitive norm) partial

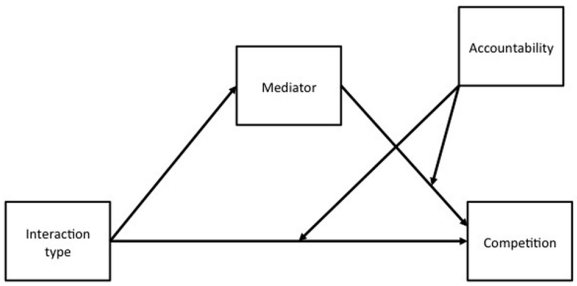

FIGURE 1 | The conditional process model tested in this experiment.

association with the outcome (competition) and this is found in conjunction with a main effect of the independent variable (interaction type) on the mediators (**Figure 1**). This model is appropriate because interaction type influenced the potential mediators, irrespective of accountability. Yet, interaction type influenced competition only in the public condition. We therefore tested the mediated effects of interaction type on competition, conditional upon accountability.

We first examined whether the moderator (accountability) affected the magnitude of the mediators' (choice reasons, descriptive and injunctive competitive norms) associations with the outcome (competition) by testing, for each mediator, the Accountability × Mediator interaction. We present relevant results in **Table 2**. These analyses revealed a significant Accountability × Injunctive Norm interaction effect only (**Table 2**, A × C). Strong (compared to weak) injunctive competitive norms predicted increased competition in the public condition, $B = 0.53$, $SE = 0.13$, $F(1,131) = 16.60$, $p < 0.001$, $\eta_p^2 = 0.10$. In the private condition, the association between strength of the injunctive competitive norm and competition was not significant, $B = 0.19$, $SE = 0.11$, $F(1,131) = 2.73$, $p = 0.101$, $\eta_p^2 = 0.02$. Furthermore, the previously significant Accountability × Interaction Type interaction on competition (**Table 2**, A × B) became non-significant when we controlled for the Accountability × Injunctive Norm interaction. This indicates that the Accountability × Interaction Type interaction was "funneled through" the Accountability × Injunctive Norm interaction (Baron and Kenny, 1986, p. 1179). Accountability did not significantly moderate the association of any other mediator with competition (**Table 2**, A × C row).

As a final step, we used the PROCESS macro to test the conditional process model depicted in **Figure 1**, with the injunctive competitive norm as mediator (model 15; 10,000 resamples; Hayes, 2013). PROCESS calculates bootstrap confidence intervals (CIs) for the indirect effect (denoted as *ab*) of interaction type on competition via a mediator (here, injunctive competitive norm), conditional upon accountability. In the public condition, this indirect effect was positive and significant (i.e., the 95% CI did not include 0), $ab = 0.18$, $SE = 0.06$, 95% CI = 0.08/0.32. In the private condition, this indirect effect was non-significant, $ab = 0.06$, $SE = 0.04$, 95% CI = −0.004/0.17. In all, the discontinuity effect was mediated by an injunctive competitive norm when accountability was present (public condition) but not when it was absent (private condition). That is, the intergroup (compared to interindividual) context strengthened the injunctive competitive norm, and accountability enforced this norm.[3]

DISCUSSION

According to the ingroup-favoring-norm explanation, the discontinuity effect arises in part because interindividual and intergroup interactions are governed by different norms or moral codes (Wildschut and Insko, 2006, 2007). Whereas interindividual interactions activate norms emphasizing fairness and reciprocity, intergroup interactions are guided by norms dictating ingroup-favoritism or parochialism. Because accountability enforces norms (Tetlock, 1992), the ingroup-favoring-norm explanation entails a larger discontinuity effect when accountability is present compared to when it is absent (Hypothesis 1). Results supported this first hypothesis. To be precise, when participants were accountable to others seated on their side of the laboratory (same-side others), intergroup interactions were significantly more competitive than interindividual interactions (the discontinuity effect). In the absence of such accountability, the discontinuity effect was not significant. This latter finding suggests that being part of a three-person group that shares earnings (i.e., outcome interdependence) *per se* may not be sufficient to induce the discontinuity effect. Although outcome interdependence renders salient the injunctive ingroup-favoring norm, accountability is required to enforce this norm.

Examining our findings from a different angle, we found that accountability increased intergroup competition, replicating prior research in PDG (Wildschut et al., 2002; Pinter et al., 2007) and bargaining (Pruitt and Carnevale, 1993) contexts. Matters were more complex in the interindividual context. Based on the notion that interindividual interactions are guided by norms of fairness and reciprocity (Cohen et al., 2010), we predicted that accountability would reduce interindividual competition. However, we also considered the alternative possibility that accountability could enforce a norm of self-interest (Ratner and Miller, 2001), thereby increasing competition. Results revealed that accountability neither decreased nor increased interindividual competition and, thus, neither prediction received support. This null finding could indicate that both predictions are correct and cancel-out each other. That is, in interindividual contexts, accountability may enforce norms

[3]We also conducted a parallel mediation analysis, in which we included simultaneously all six mediators for which the interaction type main effect was significant (i.e., descriptive and injunctive competitive norm, Max Rel, Fear, Min Dif, and Max Joint). In this analysis, the Accountability × Injunctive Norm interaction remained significant, $F(1,120) = 4.19$, $p = 0.043$. Accountability did not significantly moderate the partial association of any other mediator with competition ($ps > 0.076$). In the parallel mediation analysis, the indirect effect of interaction type on competition via the injunctive competitive norm became marginal in the public condition ($ab = 0.08$, $SE = 0.05$, 90% CI = 0.01/0.19) and remained non-significant in the private condition ($ab = -0.03$, $SE = 0.04$, 90% CI = −0.09/0.03). We suspect that the slightly weaker evidence for the injunctive norm in these parallel mediation analyses is due to the inclusion of multiple correlated mediators and resultant multicollinearity.

TABLE 2 | Conditional process analyses: testing the effect of accountabilty on the magnitude of the mediators' association with competition (Effect A × C).

	Mediator											
	Max Rel		Fear		Min Dif		Max Joint		Descriptive competitive norm		Injunctive competitive norm	
	F	*p*	*F*	*p*	*F*	*P*	*F*	*p*	*F*	*p*	*F*	*p*
Accountability (A)	4.90	0.029	3.87	0.051	4.87	0.029	5.95	0.016	2.30	0.132	3.33	0.070
Interaction type (B)	2.36	0.127	7.94	0.006	6.22	0.014	2.42	0.122	4.11	0.045	1.79	0.183
A × B	3.18	0.077	5.40	0.022	2.38	0.126	3.04	0.084	4.12	0.045	0.62	0.434
Mediator (C)	29.75	<0.001	21.48	<0.001	56.00	<0.001	106.07	<0.001	13.28	<0.001	17.25	<0.001
A × C	0.01	0.903	0.08	0.773	0.67	0.416	2.13	0.146	0.00	0.972	3.92	0.049

The dependent variable in each analysis is competitive choice. Denominator degrees of freedom equal 131. For analyses involving the descriptive competitive norm, denominator degrees of freedom equal 130 due to one missing value.

of fairness and equality, as well as the opposing norm of self-interest. This is what McDougall (1920, p. 79) may have had in mind when he wrote that, in the absence of a "group spirit," the "egoistic and the altruistic tendencies of each man's nature [are in] in perpetual conflict." Future research could examine how different individuals weigh these contrasting tendencies. Perhaps the norm of self-interest is more salient to high-narcissists, who value agency over communion, whereas norms of fairness and reciprocity are more salient to low-narcissists, who value communion over agency (Horton and Sedikides, 2009; Hart et al., 2011). If so, accountability should increase interindividual competition among high-narcissists but reduce it among low-narcissists.

Another possible explanation for the absence of a significant accountability effect in the interindividual context is that the accountability manipulation was less impactful there. The manipulation check data indicate that, regardless of interaction type, participants in the public (compared to private) condition expected their decisions to be identified by own-side others. However, we cannot rule out the possibility that the accountability manipulation had less impact on the subjective sense of accountability to own-side others in the interindividual (compared to intergroup) context. This is an important issue to consider in future research.

The conditional process analyses shed additional light on the role of accountability in interindividual and intergroup contexts. We hypothesized that an intergroup (compared to interindividual) context would render salient the ingroup-favoring norm, and that accountability would enhance the impact of this norm on competitive behavior (Hypothesis 2). Supporting this second hypothesis, participants in the intergroup (compared to interindividual) condition estimated that a greater number of same-side others would select the competitive choice (the descriptive competitive norm) and wanted them to select the competitive choice (the injunctive competitive norm). In addition, accountability strengthened the positive association between the injunctive (but not descriptive) competitive norm and competitive behavior. As a result, the discontinuity effect was mediated by an injunctive competitive norm when accountability was present but not when it was absent. The finding that accountability enforced injunctive norms only is consistent with the idea that (a) injunctive (but not descriptive) norms relate to how behaviors are typically approved or disapproved (Cialdini et al., 1990) and (b) only when group members are accountable can their actions influence how they are evaluated by the ingroup (Deutsch and Gerard, 1955).

The conditional process analyses yielded no evidence that accountability bolstered the link between choice reasons and actual choice. Group members reported more concern with maximizing relative outcomes and fear than did individuals. Concern for maximizing relative outcomes and fear, in turn, predicted increased competition irrespective of accountability. Individuals reported more concern with maximizing joint outcomes and minimizing differences than did group members. In turn, concern for maximizing joint outcomes and minimizing differences predicted reduced competition irrespective of accountability (**Table 2**). Note that, even in the public condition, participants' stated choice reasons remained private. We think it is plausible that accountability would strengthen the association between publicly stated choice reasons and behavior because (a) actors whose publicly stated reasons are inconsistent with their behavior (e.g., stating that one wishes to maximize joint outcomes but selecting a competitive choice) would be seen as hypocritical (Barden et al., 2005; Alicke et al., 2013) and (b) such consistency (vs. inconsistency) can only be assessed when accountability is present (i.e., in the public condition). This is another avenue for future research.

Broader Implications

Although these findings provide evidence for the postulated ingroup-favoring norm, one could argue that when a person influences the welfare of other group members and is accountable to them, it is simply rational to take their interests into account to gain their approval and avoid sanctions. Relevant to this point, Thibaut and Kelley (1959) proposed that norms arise from rationality. They illustrated this idea with an example of a husband and wife who like to go out together on weekends. Unfortunately, the wife prefers to go dancing, whereas the husband prefers to go to the movies. Thibaut and Kelley (1959) suggested that the couple can resolve this conflict of interest and maximize joint outcomes over time by alternating between jointly going to the movies on 1 weekend and jointly going dancing on

the next weekend. What is a rational solution at first may then become normative over time, and hence, rationality and norms may become confounded. Thibaut and Kelley's (1959) general argument is compatible with Bentham's (1789/1879) and Mill's (1863) concept of utilitarianism—that norms arise from what is the greatest good for the greatest number.

The concept of an ingroup-favoring norm may also shed light on the question of how individual preferences are combined to reach group decisions. Using a social decision scheme approach, Morgan and Tindale (2002) examined social influence processes within three-person groups by asking group members to make individual PDG choices before engaging in a discussion to reach consensus regarding a group decision. They found that when the individual preferences indicated unanimity among the three group members, the final group decision almost always corresponded to these individual preferences. When the group members' individual decisions were not unanimous, however, an interesting asymmetry occurred. Whereas a competitive group decision was reached in 91% of cases when all but one group member had initially indicated a competitive preference, a cooperative group choice was only reached in 48% of cases when all but one group member had initially indicated a cooperative preference. That is, whereas majorities favoring competition were rarely persuaded to change their view, majorities favoring cooperation were persuaded to change their view in most cases. Morgan and Tindale (2002, p. 49) interpreted these asymmetric social influence patterns in terms of shared task representations or "any task/situation relevant concept, norm, perspective, processing goal, or strategy that is shared by most or all of the group members." They proposed that when arguments are stated that are consistent with a shared task representation, even majority members can be influenced to change their initial position. We think that the ingroup-favoring norm is central to group members' shared task representation when there is a conflict of interest with an out-group.

Limitations and Future Directions

Before generalizing from these findings, it is important to keep in mind that the sample consisted exclusively of Western, female undergraduates. The question whether culture has a bearing on the role of accountability in interindividual and intergroup contexts presents a fruitful direction for future research. A primary dimension on which cultures and their members can be differentiated is individualism-collectivism (Hofstede, 1980). In individualistic cultures (such as the UK, where we conducted the present experiment), the independent, agentic self predominates. In collectivist cultures, the interdependent, communal self predominates (Triandis, 1989). Gelfand and Realo (1999) showed that, in the context of intergroup bargaining, accountability increased competition between group representatives with low levels of collectivism (as in the present experiment with UK participants) but increased cooperation between those with high levels of collectivism. Their findings suggest that the catalytic effect of accountability on interindividual-intergroup discontinuity may be stronger in individualistic than collectivistic cultures.

Nonetheless, there are important differences between the PDG and the tasks employed by Gelfand and Realo (1999). They investigated a combination of distributive (i.e., zero-sum) and integrative bargaining scenarios. Schopler et al. (2001) proposed that, in zero-sum situations, there is no one choice that benefits both players. Because this is true for interactions between groups and interactions between individuals, there is no reason to expect a discontinuity effect in a distributive bargaining context. They further noted that, when an integrative solution is available, mutual cooperation benefits both players more than mutual competition. Because this is true for relations between groups and relations between individuals, there is no reason to expect a discontinuity effect in an integrative bargaining context either. Consistent with these arguments, Schopler et al. (2001) demonstrated that the discontinuity effect arises when, as in the PDG, mutual cooperation benefits both players whereas competition benefits one player over the other (also see Wildschut et al., 2003). Whether Gelfand and Realo's (1999) evidence for the moderating role of individualism-collectivism generalizes to a PDG context is an important question for future research.

Finally, we recruited exclusively female participants because (a) we decided to limit our experiment to same-gender interactions (to eliminate gender composition of experimental sessions as a source of random error) and (b) females vastly outnumber males in our participant pool (∼8:1). To the best of our knowledge, there is no systematic evidence to suggest that gender moderates the effect of accountability in either interindividual or intergroup contexts. Nonetheless, future research on this topic would do well to study both males and females.

Coda

The present findings add to our understanding of why intergroup relations are often more antagonistic and violent than are interindividual relations: accountability enforces parochialism in intergroup contexts. We hope that these and other advances will provide a basis for effective interventions aimed at promoting intergroup cooperation and harmony.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 14 August 2015
doi: 10.3389/fpsyg.2015.01222

Dying the right-way? Interest in and perceived persuasiveness of parochial extremist propaganda increases after mortality salience

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Research on parochial altruism demonstrated that hostility toward out-groups (*parochialism*) represents the dark side of the willingness to benefit one's in-group even at own costs (*altruism*). Parochial aggression thereby emerged mainly under conditions of threat. Extremist propaganda videos, for instance by right-wing extremists, try to capitalize on parochial altruistic mechanism by telling recipients sharing their national identity that this nation is under threat wherefore they for have to join the extremist's cause to prevent the extinction of their nation. Most of the time, propaganda videos are rated as uninteresting and non-persuasive by the target audience. Yet, evolutionary media psychology posits that the interest in and effectiveness of media increases when evolutionarily relevant problems are addressed. Consequently, interest in parochial altruistic right-wing extremist messages should increase under conditions of threat. The current study tested this assumption by randomly assigning German non-Muslims ($N = 109$) to either an existential threat (here: mortality salience) or a control condition and asking them to evaluate extremist propaganda that addressed them as either in-group members (right-wing extremists) or as out-group members (Islamic extremists). In support of the hypotheses, subjects under conditions of threat reported a higher interest in the right-wing extremist propaganda and perceived it as more persuasive. We discuss the results concerning the implications for evolutionary media psychology and the transmission of parochial altruism in propaganda videos.

Keywords: Parochial altruism, mortality salience, right-wing extremism, propaganda, persuasion

OPEN ACCESS

Edited by:
Robert Böhm, RWTH Aachen University, Germany

Reviewed by:
Simon Schindler, University of Kassel, Germany
Benjamin P. Lange, University of Wuerzburg, Germany

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *16 May 2015*
Accepted: *03 August 2015*
Published: *14 August 2015*

Citation:
Frischlich L, Rieger D, Hein M and Bente G (2015) Dying the right-way? Interest in and perceived persuasiveness of parochial extremist propaganda increases after mortality salience. Front. Psychol. 6:1222. doi: 10.3389/fpsyg.2015.01222

Introduction

Extremist propaganda videos have become a frequent part of the contemporary online landscape. In Germany in particular, right-wing extremists such as the "Oldschool Society" and Islamic extremists such as the "Islamic State" use YouTube videos to target recipients who share their nationality or religion in order to gain new followers (Bayrisches Staatsministerium des Inneren für Bau und Verkehr, 2014). Via these videos, the propagandists try to convince the recipients that their nation (respectively, religion) is menaced by extinction (Godall, 2010; Halverson et al., 2011; Kruglanski et al., 2013) due to the "the system" or "the West" and that they have to join the propagandist's fight and be willing to risk life and limb to preserve their group.

The so propagated behaviors of supporting one's in-group members, even at the cost of one's own resources (*altruism*), and of aggressively fighting out-groups (*parochialism*) has gained substantial attention in recent years from evolutionary psychological research under the concept of *parochial altruism* (Choi and Bowles, 2007; Bowles, 2008). Evidence gathered in different research areas has demonstrated that parochial aggression toward out-groups and altruistic cooperation with in-group members are deeply interwoven (Bornstein and Erev, 1994; Rusch, 2014), whereby "people go to war" (Böhm et al., 2015) to defend their fellows. It is on this defense of those sharing one's national or religious identity against the "wicked enemy" that extremist propagators capitalize (Lasswell, 1927). Yet their open call for parochial aggression stands in sharp contrast to contemporary egalitarian norms (Pettigrew, 1995). And, of course, neither the majority of Germans nor the majority of Muslims shares the extremist propagators' attitudes (Decker et al., 2012; Frindte et al., 2012). Prior research demonstrated propaganda to be evaluated very negatively and recipients to deny the effects of propaganda (Arendt, 2015). Moreover, in contrast to the propagators' aims, propaganda was evaluated even more negatively when it was directed to the recipients' national or religious in-group (versus to another audience; Rieger et al., 2013). Nevertheless, single videos *can* raise interest and become viral (Glaser, 2013), and propaganda *has been* discussed as persuading individuals from radical ideologies (Dilanian and Bennett, 2013). Although interest in propaganda does not necessarily lead to radicalization, it is a necessary precondition for further exposure to such messages (McCauley and Moskalenko, 2008; Wilner and Dubouloz, 2009) and an initial step in a potential persuasion processes (Lewis, 1903).

In the current paper, we examined the effects of extremist propaganda from an evolutionary media psychological perspective. We built upon the assumption that media allows the recipient to simulate experiences relevant to his or her level of evolutionary fitness (Tooby and Cosmides, 2001) without "risking life and limb in the real world" (Schwab and Schwender, 2010, p. 31). Media features are recognizable as "design features of an evolved system whose biological function is learning" (Vorderer, 2006, p. 14). Following Schwab (2010) media pique interest when evolutionary problems, such as the threat by predators (Tooby and Cosmides, 2001) or hostile intergroup conflicts are displayed. Thus, the conditions under which parochial altruism increases—namely, the perception of threat and vulnerability (De Dreu et al., 2010; Rusch, 2014; Böhm et al., 2015)—most plausibly also increase the interest in parochial propaganda. Note that we do not suggest that recipients are "entertained" by propaganda such as by entertaining media (Ohler and Nieding, 2006). Instead, we assume that "media events are produced by people for people, they are geared to human needs" (Schwab and Schwender, 2010, p. 21). A larger effectiveness of propaganda thus should be mirrored in a higher perceived persuasiveness of these videos.

Parochial Altruism and the Role of Threat

From a Darwinian perspective human social behavior has developed throughout phylogenies via the adaptation to natural conditions and in order to increase the individual's fitness and maximize its reproductive success (West et al., 2011). Acts of altruism (Hamilton, 1964a,b; Zahavi, 1995) and parochial aggression toward out-groups (Choi and Bowles, 2007) are both puzzling, as they can impair individuals' fitness by reducing resources and hampering lucrative trading. Theories that take only an individual-level perspective on altruistic (or aggressive) behavior such as *kin selection* (Hamilton, 1964b; Riolo et al., 2001) or *reciprocal altruism* (Trivers, 1971; Axelrod and Hamilton, 1981) have failed to explain altruism to non-kin, such as the behavior called for by extremist propaganda, when reciprocation is unlikely.

Recent theories on parochial altruism are more promising for explaining, for instance, self-sacrifices in the name of one's religion (Ginges and Atran, 2009; Ginges et al., 2009) or nation (De Dreu et al., 2014). In contrast to prior theories, the concept of parochial altruism considers both the intragroup and the intergroup level of behavior (Arrow, 2007). Humans are social animals, and group membership increases their odds for survival throughout phylogenies far beyond what would have been possible for a single individual (De Dreu et al., 2014). Thus, humans' self-interest evolved mitigated by their group membership (Brewer and Carporael, 2006). On the intragroup level, altruistic individuals have a lower direct fitness (because altruism is costly). On the intergroup level, however, altruistic individuals increase the fitness of the group by investing more in that group and therewith increase the individuals' indirect fitness (Arrow, 2007). Choi and Bowles (2007) provided evidence for this assumption by simulating groups of agents (tolerant versus parochial, altruistic versus selfish) that interacted with each other over thousands of generations under conditions likely to represent human interactions in early times of humankind. Violent conflicts in this simulation were likely when parochialists formed the majority of at least one group in that interaction. Furthermore, only parochial altruists ("warriors") actively engaged in intergroup fighting (non-altruists would not be willing to do the fighting themselves, and tolerant others would prefer to peacefully interact with the out-group). The results demonstrated that groups with more parochial altruists not only engaged in more conflicts but also tended to win these wars. The societies that emerged within this simulation were stable when parochial altruists or selfish but tolerant trades formed the majority.

Of note, the willingness to parochially aggress out-groups has been observed mainly under conditions of conflict (Bornstein et al., 2002; Halevy et al., 2008; Abbink et al., 2012) when subjects perceived themselves as vulnerable (Böhm et al., 2015), wanted to protect their in-group members (Rusch, 2014), or wanted to sanction someone who had threatened their fellows before (Bernhard et al., 2006). For instance, De Dreu et al. (2010) found subjects to preemptively strike against out-group members in an intergroup prisoner dilemma only when they feared that their in-group would lose resources due to future out-group actions. This is highly compatible with social psychological research demonstrating how threat motivates intergroup biases (Hewstone et al., 2002).

Beyond threats to concrete in-group members, symbolic threats (Stephan et al., 2000; Hewstone et al., 2002; Hogg et al., 2010) can also foster parochial altruism. In particular, research inspired by terror management theory (Greenberg et al., 1986) repeatedly demonstrated existential threats resulting from reminders of one's own mortality (mortality salience, MS) to increase the acceptance of parochially altruistic in-group members (for a review, see Pyszczynski et al., 2008). For instance, Greenberg et al. (2001) demonstrated that, in the absence of MS, white Americans evaluated a white American who claimed to be "proud of being white" as more racist than someone who claimed to be "proud of being black." This effect disappeared under conditions of MS. Similarly, Pyszczynski et al. (2006) found US participants to be more accepting of violent military attacks on Muslim out-group members, and Iranian students to offer a more favorable evaluation of someone expressing parochial altruistic anti-US and pro-martyrdom attitudes under conditions of MS.

With its parochially altruistic content, extremist propaganda most plausibly reaches its targeted audience only after a perceived threat has made these recipients vulnerable to the parochially aggressive narrative. We tested this assumption by conceptually replicating the study by Rieger et al. (2013) on the evaluation of right-wing extremist and Islamic extremist propaganda videos. More precisely, we compared the effects of MS versus a control topic on the evaluation of these propaganda videos in a German student sample. Rieger et al. (2013) found German students to report less interest in and persuasiveness of right-wing extremist as compared to Islamic extremist propaganda, but we predicted that, under conditions of threat, German students would report increased interest (H1) in the right-wing extremist propaganda and perceive the videos as more persuasive (H2). Moreover, increased interest should be positively associated with an increased persuasiveness ascribed to these videos (H3).

Beyond our central questions, our study also had a pair of secondary objectives. First, we expected the effects of MS to represent a general response to parochial altruistic propaganda addressing them as in-group members via their nationality. Consequently, we expected the effects to explain additional variance beyond political or ideological attitudes (e.g., authoritarianism) that have been reported previously to predict interest in extreme ideologies (Altemeyer and Hunsberger, 1992; Fuchs, 2003; Sibley and Duckitt, 2008; Rieger et al., 2013). Second, we wanted to check for gender differences. Prior research often relied on male samples for studying parochial altruism (De Dreu, 2012) or the effects of extremist propaganda (Rieger et al., 2013). Studies including both genders report mixed results. Some studies find stronger parochial aggression among males (Yuki and Yokota, 2009) and parochial aggression to be positively associated with levels of testosterone (Reimers and Diekhof, 2015). Other studies report no gender differences in the acceptance of parochial altruism (Ginges et al., 2009). Finally, Rieger et al. (2013) identified three more factors on which the evaluation of extremist propaganda varied: *shame* and *aversion* after the reception and the *one-sidedness* ascribed to the propaganda videos. They report German students to respond with increased levels of shame to right-wing extremist videos and to evaluate these videos as more one-sided than Islamic extremist videos (aversion ratings did not differ). We wanted to explore whether MS would attenuate these findings.

Materials and Methods

We examined our predictions by presenting German students under conditions of MS (versus a control topic) with parochially altruistic extremist propaganda, addressing them as in-group members (through right-wing extremist videos targeting "the Germans") or as out-group members (through Islamic extremist videos targeting "the Muslims"). The last factor served as a within-subjects factor.

Sample

G*Power calculated that a sample of $N = 92$ would be necessary to prove the smallest effect size observed by Rieger et al. (2013) for interest in right-wing extremist propaganda ($r = 0.19$). A total of 114 subjects finished our study (drop out $n = 33$). To hold the group association between sender and recipient constant, we recruited only subjects who were born in Germany and did not self-identify as Muslims. Five participants did not fulfill these sampling criteria and were excluded from the analyses. The remaining $N = 109$ (all German non-Muslims, 18 male) were on average 25.17 years old (SD = 6.34). The majority of them (94.4%) were students, while the remaining participants were already in the workforce. Gender, current profession (both $\chi^2 > 1$), and age ($F < 1$) did not vary depending on condition. The majority of our participants self-classified as Christians (74%) or atheists (23%); three subjects reported "another" religion. Religion was equally distributed among conditions, $\chi_{exact}{}^2(3) = 3.50$, $p > 0.20$. On an 11-point scale (0 = "totally unimportant," 10 = "totally important") subjects rated their religion as rather unimportant for them ($M = 3.08$, SD = 2.81). Only two of the participants rated religion as "totally important" to them. Relevance of religion did not vary between conditions, $F < 1$. On a 10-point scale (1 = "left-wing," 10 = "right-wing"), subjects were rather left-wing oriented ($M = 4.20$, SD = 1.38). None of the participants was extremely right-wing oriented (Range 1–8). Political attitudes did not vary between conditions, $F < 1$.

Procedure and Materials

Subjects were invited via German university mailing lists to participate in an online experiment about "political videos on YouTube." We rewarded them with the opportunity to participate in a lottery for two Amazon.de vouchers, each worth 30€. At the beginning of the questionnaire, subjects confirmed that they were over 18 years old and that they had read, understood, and accepted the ethical consent form. Afterward, they answered a set of demographic (age, nationality, religious identity, political attitude) and attitudinal questionnaires. To confirm that the effects we found were not solely attributable to interpersonal differences associated with hostile intergroup attitudes, subjects filled out a measure of *authoritarianism* (Petzel et al., 1997); *violence acceptance*

(Wagner et al., 2002); *anomia*, their feeling of value lost (Fuchs, 2003); and *self-esteem* (Rosenberg, 1965). Subsequently, subjects were randomly assigned to either the MS or a control condition.

Salience Manipulation

Participants in the MS condition ($n = 57$) answered the standard two open-ended questions used in terror management research: (1) "Please briefly describe the emotions that the thought of your own death arouses in you." (2) "Please describe, as specifically as you can, what you think will happen to you as you physically die and once you are physically dead" (Rosenblatt et al., 1989). Participants in the control condition ($n = 41$) were given the same instructions, but the references to death were replaced with references to "failing an exam" (Monin, 2009).

Delay

Mortality salience affects intergroup attitudes only distally to death reminders, when the death-related thoughts are no longer in focal attention (Pyszczynski et al., 1999). Hence, to enable their distal defense subjects worked on a set of 35 raven matrices (Raven, 1998) before the next part of the experiment started.

Video Exposure

After the last matrix, participants watched two blocks of extremist videos in randomized order. Each block comprised three videos, either from right-wing extremists (total duration 07:58 min.) or from Islamic extremists (total duration 07:36 min.). We held the formats of the videos constant between the ideologies. We selected the videos from the database by Rieger et al. (2013). The videos in this database did not show explicit depictions of physical violence (such as beheadings) and were approved by the ethics committee of the German Federal Crime Police Office prior to data collection in their studies. Subjects in our study saw one *talking head lifestyle activist* video, one *movie clip* video, and one *extreme clip* video (see Supplementary Table S1, for a summary of their content).

Dependent Measures

Participants rated each video on the five scales that Rieger et al. (2013) introduced. The scales measured the participants' *interest* (e.g., "The video was interesting") in the videos, the videos' *perceived persuasiveness* (e.g., "After the video, I can understand the perspective of its producers better"), and the level of *shame* ("During the reception I felt shame") triggered by the video. Furthermore, we also measured subjects' level of *aversion* during the reception (e.g., "During the reception I felt disgust") and the *one-sidedness* ascribed to the video (e.g., "The video was sensational"), to ensure conditions similar to those in the studies by Rieger et al. (2013). Each of the 14 total items was evaluated on a four-point scale (1 = "totally not," 4 = "totally").

Check for Suspicion

Finally, subjects were checked for suspicion and watched a video debriefing (05:06 min) by the first author, supplemented by a written debriefing and the author's contact details.

Results

Data Aggregation

To ensure that participants had watched the videos, we subtracted the actual length of the video from the time subjects spent on the corresponding page. Subjects who did not watch the whole video received a negative difference; subjects who proceeded with the video after its end received a positive value (due to the response latency between the end of the video and the key pressure). To control for outliers, these scores were then z-standardized. Subjects with a negative value or with $z > 3$ were treated as missing values for the respective video evaluation. Following the procedure by Rieger et al. (2013), we then computed mean scores for each of the dependent variables per ideology, resulting in one value per scale for both the right-wing extremist and the Islamic extremist videos. For the perceived persuasiveness ratings, the internal consistency for the aggregated right-wing extremist as well as the Islamic extremist videos was slightly questionable, both $\alpha = 0.65$. All other scales $\alpha > 0.70$.

Preliminary Analyses

We first examined the association of the included variables with each other via Pearson correlations. Political attitude, anomia, and violence acceptance were not significantly associated with the dependent variables, all $r < 0.20$, hence these variables were excluded from the analyses thereafter (Field, 2013). Preliminary analyses of variance (ANOVAs) using the participants' characteristics as dependent variables revealed that subjects in the MS as compared to the control condition reported lower levels of self-esteem, $F(1,107) = 8.24$, $p < 0.05$, $r = 0.27$. Consequently, the assumptions of analysis of covariance were not met (Field, 2013). Subjects did not differ regarding their level of authoritarianism, $F < 0.1$.

Based on these findings, we analyzed the video evaluation via separate hierarchical regression analyses (see Weise et al., 2008 for a similar approach). Block 1 contained all variables measuring interindividual differences (z-standardized) following the recommendation that predictors based on prior research should be entered first to partialize their effects out before the predictive value of the experimental manipulation is assessed (Field, 2013). Condition (dummy coded, 0 = control, 1 = MS) was entered in Block 2. To assess potential moderations, the two-way interactions between condition, authoritarianism, and self-esteem were entered in Block 3. Parameter estimates were based on 1000 bootstrap samples. The results for the simplest model including only condition as a predictor are provided in the Supplementary Table S2.

Hypotheses Testing

Regarding interest in the right-wing extremist videos, interindividual differences (Block 1) and their interactions with the condition (Block 3) failed to explain variance. As predicted in H1, condition (Block 2) significantly predicted interest, $F_{change}(1,96) = 4.27$, $p < 0.05$. Subjects under conditions of MS reported more interest in the right-wing extremist propaganda than did subjects in the control condition. None of

the models explained the interest in the Islamic extremist videos, all $p \geq 0.20$.

Hypothesis 2 predicted that subjects under conditions of MS would perceive the in-group propaganda as being more persuasive. Block 1 (containing the interindividual differences) reached significance, $F_{change}(4,94) = 3.17$, $p < 0.05$. Higher levels of authoritarianism predicted higher perceived persuasiveness of the right-wing extremist videos. What is more relevant, Block 2 also reached significance, $F_{change}(1,93) = 6.92$, $p = 0.01$. Subjects in the MS condition perceived the extremist in-group messages to be more persuasive than did control subjects. The effect of authoritarianism remained stable. Block 3 failed to explain further variance (see **Table 1**). None of the models explained the perceived persuasiveness of the Islamic extremist videos, all $p \geq 0.20$.

In line with the expectation formulated in H3, correlational analyses showed that interest and perceived persuasiveness for the right-wing extremist videos were strongly associated in the MS condition = 0.67, $p < 0.001$, and had a lower but still significant association in the control condition, $r = 0.30$, $p < 0.05$.

Additional Analyses

Following the procedure by Rieger et al. (2013), our study also included measures of shame, aversion, and one-sidedness. MS had no effects, however, on either reported aversion or one-sidedness ascribed to the videos. Regarding shame after the right-wing extremist videos, only Block 2 (condition) reached marginal significance, $R_{change}^2 = 0.04$, $F_{change}(1,93) = 3.70$, $p < 0.06$. Subjects in the MS condition reported more shame after the right-wing extremist messages than did subjects in the control condition ($b = 0.22$, SE = 0.10, $\beta = 0.20$, CI [–0.33, 0.05]; see Supplementary Table S3). All other models failed to reach significance, all $p > 0.20$. Shame reported after the Islamic extremist videos, in contrast, was significantly predicted by Block 1, $R^2 = 0.13$, $F_{change}(4,93) = 3.39$, $p = 0.01$. Higher self-esteem predicted lower levels of shame ($b = –0.30$, SE = 0.08, $\beta = –0.36$, CI [–0.45, –0.13]). All other models failed to reach significance, all $p \geq 0.20$. Pearson correlations showed that shame had a moderate association with interest, $r = 0.33$, $p < 0.05$, and perceived persuasiveness, $r = 0.43$, $p < 0.001$, in the MS condition but not in the control condition (all $p > 0.10$).

The results so far suggest that interest and shame might increase the perceived persuasiveness of the videos. We explored this idea via a mediation analysis using the PROCESS macro by Hayes (2012). We entered condition as a predictor variable (0 = control, 1 = MS), interest and shame as mediators, and authoritarianism as covariate (*z*-standardized). The results showed that the effect of MS on the perceived persuasiveness of the right-wing propaganda was significantly mediated by interest, $ab = 0.08$, SE = 0.06, CI [0.002, 0.21], but also by shame, $ab = 0.04$, SE = 0.03, CI [0.005, 0.12]. The contrast between these two failed to reach significance, $C_1 = 0.03$, SE = 0.07, CI [–0.07, 0.18]. Meanwhile, the total effect of MS on perceived persuasiveness was significant; the direct effect when both mediators were included was only marginally significant (see **Figure 1**).

Discussion

Right-wing extremists and Islamic extremists propagate parochial altruism to recipients sharing their national or religious identity via Internet videos. Evolutionary media psychology posits that the response to media content works on evolutionary mechanics, whereby media content displaying evolutionary relevant problems (such as parochial altruism in hostile intergroup interactions) creates larger interest (Tooby and Cosmides, 2001; Schwab and Schwender, 2010). Drawing upon research finding that threats increase parochial altruistic behavior in humans, we predicted that existential threats—namely, reminders of one's mortality—would increase the interest in and the perceived persuasiveness of extremist propaganda. Overall, the results confirmed our expectations. German students reported an increased interest in right-wing extremist videos under conditions of MS (Hypothesis 1) and ascribed these videos a larger persuasiveness (Hypothesis 2). Interest and perceived persuasiveness were positively associated (Hypothesis 3). Moreover, additional mediation analyses demonstrated that interest partially mediated the association between MS and perceived persuasiveness. The effects of MS emerged after interpersonal differences in factors such as authoritarianism, self-esteem, or gender were partialized out, underlining the assumption that the response to parochial altruistic in-group members represents a general mechanism. Overall, our findings confirm prior research on parochial aggression (De Dreu et al., 2010; Rusch, 2013; Böhm et al., 2015) and the acceptance of parochially aggressive in-group members (Pyszczynski et al., 2006; Kugler and Cooper, 2010) after MS, and extended these findings to the area of media psychology. Further, MS did not affect the response toward the Islamic extremist videos underlining the crucial role of being addressed as in-group member (and not, for instance, the interest in extremist messages *per se* (Hogg, 2014).

Beyond our predictions, we also found MS to increase participants' levels of shame after exposure to propaganda videos addressing the recipient as an in-group member. Shame further partially mediated the effects of MS on the perceived persuasiveness of the videos. Albeit prior evidence on the relationship between shame and hostile intergroup attitudes is somewhat mixed (Brown et al., 2008; Piff et al., 2012), our results confirm studies showing that shame can motivate parochial aggression (Tangney et al., 1992; Lickel et al., 2005). Nevertheless, the bootstrapped confidence intervals encompassed zero, so our findings should be interpreted cautiously and future studies exploring the role of shame in more detail are necessary.

Overall, our results are meaningful on both a theoretical and an applied level. On a theoretical level, they transfer the perspective of parochial altruism to media psychology. In so doing, they extend earlier theories by showing that not only entertainment (Ohler and Nieding, 2006; Schwab, 2007) but also the response to hostile media evolved from evolutionary adaptive processes. In light of our results, propaganda might be the medium that makes "people go to war" (Böhm et al., 2015). Moreover, our results fit current communication research demonstrating that media satisfy basic human needs (Bartsch

TABLE 1 | Regression analyses for interest and persuasiveness ratings after the right-wing extremist videos.

		Block 1					Block 2					Block 3				
		b	**LL**	**UL**	**SE**	**β**	***b***	**LL**	**UL**	**SE**	**β**	***b***	**LL**	**UL**	**SE**	**β**
Interest	Constant	1.68	1.43	1.98	0.14		1.53	1.28	1.82	0.14		1.53	1.26	1.82	0.14	
	Age	0.00	–0.11	0.13	0.06	0.00	0.00	–0.12	0.12	0.06	0.00	–0.01	–0.13	0.12	0.06	–0.01
	Gender	0.02	–0.31	0.30	0.16	0.01	0.02	–0.29	0.30	0.15	0.01	0.01	–0.29	0.30	0.16	0.01
	Authoritarianism	0.15	–0.08	0.35	0.11	0.15	0.16	–0.08	0.36	0.11	0.16	0.13	–0.23	0.54	0.19	0.12
	Self-Esteem	–0.04	–0.20	0.15	0.09	–0.05	0.00	–0.15	0.18	0.09	0.00	0.07	–0.22	0.32	0.13	0.08
	MS versus Control						**0.25**	**0.004**	**0.46**	**0.12**	**0.21***	**0.26**	**–0.02**	**0.47**	**0.12**	**0.22***
	MS × Authoritarianism											0.05	–0.47	0.52	0.24	0.04
	MS × Self-Esteem											–0.10	–0.40	0.30	0.18	–0.09
		$R^2 = 0.02$					$R_{change}^2 = 0.04$*					$R_{change}^2 = 0.00$				
Persuasiveness	Constant	1.46	1.30	1.615	0.08		1.33	1.15	1.49	0.09		1.34	1.16	1.52	0.09	
	Age	–0.02	–0.13	0.075	0.05	–0.04	–0.02	-0.13	0.07	0.05	–0.05	–0.02	–0.14	0.07	0.05	–0.05
	Gender	0.09	–0.10	0.281	0.10	0.07	0.09	–0.08	0.28	0.09	0.07	0.09	–0.08	0.30	0.10	0.07
	Authoritarianism	**0.24**	**0.06**	**0.410**	**0.09**	**0.31****	**0.25**	**0.07**	**0.41**	**0.08**	**0.32****	0.20	–0.06	0.44	0.13	0.26
	Self-Esteem	–0.07	–0.21	0.066	0.07	–0.11	–0.03	–0.16	0.09	0.06	–0.05	–0.06	–0.34	0.16	0.13	–0.09
	MS versus Control						**0.23**	**0.07**	**0.38**	**0.08**	**0.26****	**0.22**	**0.05**	**0.38**	**0.08**	**0.25****
	MS × Authoritarianism											0.07	–0.27	0.42	0.17	0.07
	MS × Self-Esteem											0.05	–0.22	0.37	0.15	0.06
		$R^2 = 0.12$*					$R_{change}^2 = 0.06$*					$R_{change}^2 = 0.00$				

**$p \leq 0.01$ (two-tailed), *$p \leq 0.05$ (two-tailed). Significant predictors are marked in bold face. Confidence intervals and SE are based on 1000 bootstrap samples. MS = mortality salience.

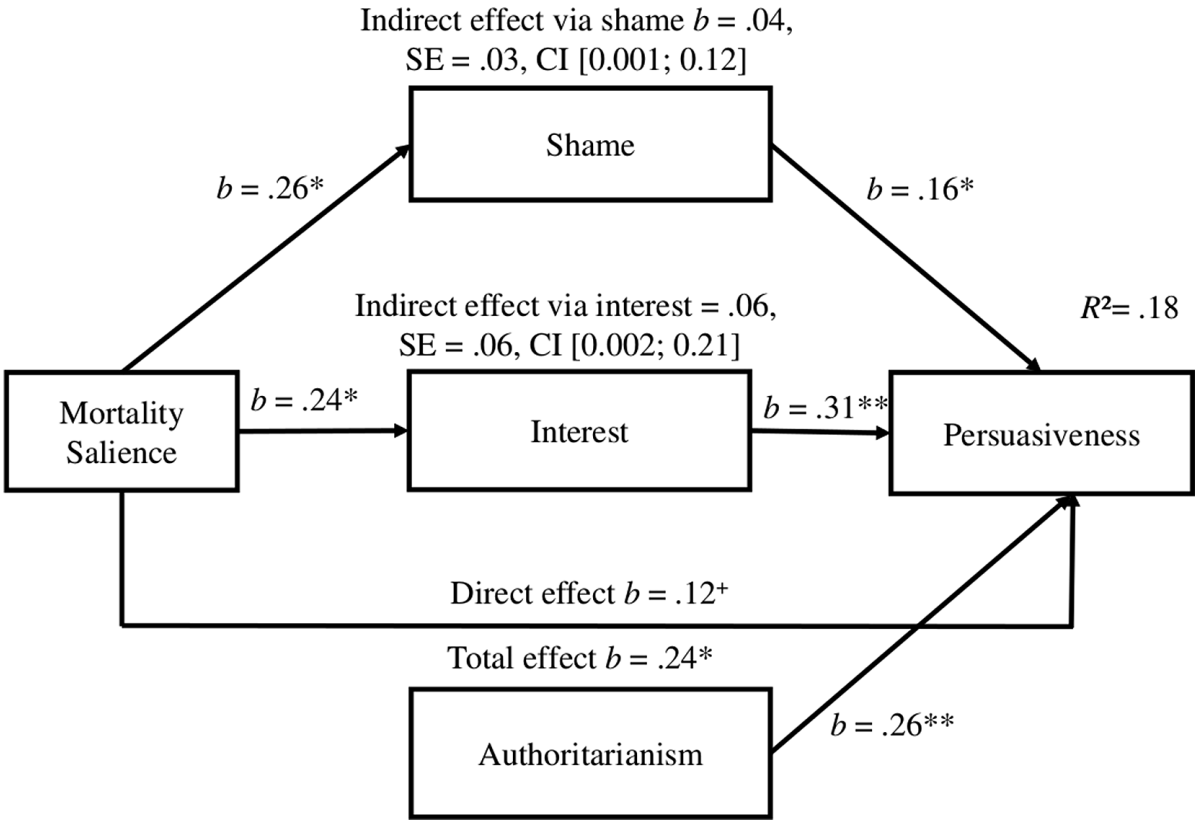

FIGURE 1 | The effect of mortality salience on the perceived persuasiveness of right-wing extremist videos mediated by shame and interest. $^{**}p > 0.01$, $^{*}p > 0.05$, $^{+}p > 0.10$. Parameter estimates are based on 1000 bootstrap samples.

and Schneider, 2014; Roth et al., 2014). Our study suggests that incorporating evolved needs into such theory building might enhance our understanding of media consumption and effects.

Moreover, our findings add to the growing evidence that media serve an anxiety-buffering function (Rieger et al., 2015). Notably, even under conditions of threat, subjects did not react enthusiastically to the propaganda messages; the effects remained small. Yet our finding matches prior studies showing that individuals (in experimental research) overall are not very hostile toward out-group members at all; instead, parochial aggression manifested, for instance, in the refusal to help out-group members (Weisel and Böhm, 2015). Luckily, the exclusive reliance on parochial altruistic behaviors is relatively seldom (De Dreu et al., 2015).

Nevertheless, not all individuals have to serve as "warriors" in intergroup conflicts; accepting them as the dominant group also allows them to foster violent intergroup encounters (Choi and Bowles, 2007). From a media psychological perspective, allowing extremists to voice their opinion might, via spiral process, create the illusion that they already form the majority and therefore reduce anti-extremist voices (Glynn et al., 1997).

On an applied level, the wide distribution of extremist propaganda makes our effects although they are small interesting for practitioners. For instance, our effects were irrespective of gender, suggesting that the current susceptibility of young women listening to the propaganda of Islamic extremists reported by mass media (Wahba and Simon, 2014) might also work on evolved mechanics. Research focusing on gender differences in the context of parochial altruism and extremism could provide meaningful insights here.

In addition, understanding the parochial altruistic mechanisms of propaganda effects could help to attenuate the influence of such videos. For instance, the salience of a certain social category (such as resulting by being addressed as "German" in a right-wing extremist video) is a fluent process and depends on the (potential) cooperation between in-group members. Albeit, we observed MS to increases the interest in extremist messages even among recipients with moderate political attitudes, as long as the videos capitalized on the shared social category, such categorizations are not stable. Kurzban et al. (2001) found that even dominant cues such as ethnicity (Cosmides et al., 2003; Xiaojing et al., 2009) are attenuated by making other group memberships salient. Consequently, distributing so-called *counter-narratives* (Ashour, 2010) capitalizing on *shared* group identities (e.g., being human) could enhance altruism toward others beyond one's national group (Pyszczynski et al., 2008).

Further, in the control group no interest in the parochial in-group propaganda was observed suggesting that removing threat could foster peace (Böhm et al., 2015). But also under conditions of threat, research demonstrating the effects of MS to be sensitive to salient norms (Jonas et al., 2008; Schindler et al., 2013), suggest that making norms of tolerance salient, for instance via counter-narrative media, could reduce the interest in parochial propaganda (Pyszczynski et al., 2008).

Limitations

Some limitations of the current study have to be noted. First, we used a typical student sample. Rieger et al. (2013) found opposed reactions by students and apprentices, therefore a replication of our study in a non-academic sample would be desirable. Prior research identified students as particularly non-susceptible to in-group extremist propaganda; thus, the effects of MS we observed in this sample are particularly meaningful. Accordingly, replicating our study in a Muslim sample who are addressed as "in-group members" in Islamic-extremist videos would extend the generalizability of our findings. Noteworthy, parochial altruism as an evolutionary adaptive response should not depend on the cultural background of the recipients per se. Accordingly, MS has already been demonstrated to increase the acceptance of parochial aggressive in-group members among Iranian students (Pyszczynski et al., 2006). Further, we did not measure participants' subjective identification with nationality. Research has found that people highly committed to their group are more likely to accept parochial altruism (here: religious martydom; Ginges et al., 2010), so including such measures in future studies seems desirable. Nonetheless, parochial altruism has been observed in both minimal and real groups, suggesting that subjective identification is not enough to explain the response to parochially altruistic in-group members.

Regarding our design, it has to be pointed out that subjects participated in an anonymous online questionnaire. Although this format is highly compatible with real-life exposure to extremist Internet propaganda, we cannot dismiss the possibility that subjects might display different reactions offline. For instance, social identity de-individuation theory (Postmes et al., 1998) found subjects in anonymous online interactions to be even more prone to behaving according to situationally salient group memberships. Consequently, the evaluation of in- but also out-group extremist propaganda might vary depending on whether a person watches such material alone online or together with others.

Concerning our materials, it has to be pointed out that we did not find effects of MS on the response to out-group propaganda. At first sight, this contradicts studies showing harsher punishment of out-group terrorists under conditions of MS (Kugler and Cooper, 2010) or harsher punishments of out-group than of in-group perpetrators due to parochial altruistic motivations (Bernhard et al., 2006). However, we focused on positive responses to parochial aggressive propaganda and did not analyze the response to media narratives displaying the *punishment* of out-groups. Our findings imply that such narratives (e.g., killing out-group terrorists in *Homeland*) would also raise interest and be perceived as more persuasive (see Slater and Rouner, 2002, for the concept of narrative persuasion) due to parochially altruistic motivations. Furthermore, it should be noted that extremist propaganda itself can be regarded as threatening, and studies have shown that terrorism itself can induce death anxieties and trigger MS effects (Fischer et al., 2007; Das et al., 2009). Consequently, our participants might have perceived the Islamic extremist videos as more threatening than the right-wing extremist videos. Yet Rieger et al. (2013) found no significant differences in physiological arousal during the reception of the Islamic versus right-wing extremist videos, making this explanation implausible. Further, our selection differentiated between extremist videos offering the recipient to join their cause versus not. MS has been found to increase affiliation (Wisman and Koole, 2003). Consequently, examining the role of affiliation motives in this context in future studies is necessary to compare the turning toward different groups after MS.

As regards to our dependent variables, we focused on the interest in and the perceived persuasiveness of the videos. Although we based our dependent variables on prior research, these variables have to be interpreted cautiously. Interest is only an initial step in a potential process that might increase parochial attitudes and should not be interpreted as a direct measure of parochial altruism. Interest reflects the motivation to get more information about a certain topic (Schwab and Schwender, 2010) and could also reflect an increased desire to restore a sense of control in face of a threat induction (Fritsche et al., 2008; Jonas et al., 2014). However, if the desire to know more about a potential threat instead of the interest in parochial altruistic content would underlie our pattern, we would also find larger interest in the Islamic extremist videos, as Islamic extremism is perceived as particularly threatening (Frindte and Haußecker, 2010).

In that line it has to be noted that the reliability of our perceived persuasiveness measure aggregated for the video blocks was slightly below $\alpha > 0.70$. Although previous research obtained higher reliability scores for this scales (Rieger et al., 2013), and the reliability was good, $\alpha > 80$, when all items per video instead of the aggregated scales per Block were considered, future studies should include additional measures of persuasiveness. Overall, future research is necessary to bridge our findings on the perceived persuasiveness of extremist propaganda with research on liking of parochial altruist persons (Greenberg et al., 2001; Pyszczynski et al., 2006). Our scale measured increased sympathy with the propagators, hence, our findings should also be reflected in greater liking of extremist propagators (Decety and Chaminade, 2003). Relatedly, we did not measure attitudes toward the propagated message directly. Yet, Igartua et al. (2003) found that convincingness of a persuasive video was associated with agreement to these videos' messages and we have initial evidence from an unpublished Bachelor thesis that our perceived persuasiveness scale is associated with the agreement to right-wing statements. Kasztelan (unpublished bachelor thesis) found that the perceived persuasiveness of right-wing videos correlated

at $r > 0.56$, $p > 0.001$ with the agreement to statements in a propaganda video such as "our folk impoverishes everyday more and more meanwhile others live in clover" or "Only a folk without identity becomes an easy victim of the capital." Finally, studying to what extent MS affects hormones that control parochial altruism such as oxytocin (De Dreu et al., 2010, 2011) or testosterone (Reimers and Diekhof, 2015) would provide meaningful insights into the biological mechanisms underlying our observations.

Conclusion

Overall, our study provides initial evidence that the interest in and perceived persuasiveness of extremist propaganda works according to a parochially altruistic mechanics. Existential threats affected the response to extremist propaganda capitalizing on the recipient's national identity but left the response to comparable videos addressing them as out-group members unaffected. Our study thus provided evidence for meaningful insights resulting from an evolutionary perspective on media psychology and propaganda research. We hope that future studies will address the questions that can be drawn from our results.

Supplementary Material

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.01222

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 25 September 2015
doi: 10.3389/fpsyg.2015.01422

"A letter for Dr. Outgroup": on the effects of an indicator of competence and chances for altruism toward a member of a stigmatized out-group

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OPEN ACCESS

Edited by:
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Reviewed by:
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Niklas K. Steffens,
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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *30 May 2015*
Accepted: *07 September 2015*
Published: *25 September 2015*

Citation:
Hellmann JH, Berthold A, Rees JH and Hellmann DF (2015) "A letter for Dr. Outgroup": on the effects of an indicator of competence and chances for altruism toward a member of a stigmatized out-group. Front. Psychol. 6:1422. doi: 10.3389/fpsyg.2015.01422

The lost letter technique is an unobtrusive method to investigate attitudes in a particular population. Ostensibly lost letters from senders who apparently belong to different groups or addressed to recipients from apparently different groups are dispersed in public places, and return rates represent a measure of altruistic or discriminatory behavior toward one group or another. In two field experiments using the lost letter technique, we investigated the influence of group membership and the presence or absence of a doctorate degree as an indicator of competence on the likelihood of receiving helping behavior. Experiment 1 showed that a generic member of a low-status ethnic out-group (Turks living in Germany) was the target of discrimination, while a generic member of a non-stigmatized out-group (French in Germany) was not. Moreover, when the name of the member from the stigmatized out-group was (vs. was not) preceded by a doctorate degree, more of the allegedly lost letters were returned. There were no such differential effects for recipients who were members of the in-group (Germans) or the non-stigmatized out-group (French). Experiment 2 showed that a recipient from the stigmatized out-group (Turk) with a doctorate degree received more letters when the sender was German versus Turkish (i.e., from the recipient's own group). Overall, the sender's ethnic group membership was an important factor for the likelihood of receiving an ostensibly lost letter, in that fewer letters arrived from a sender with a Turkish (vs. German) name. We conclude that the likelihood of altruistic behavior toward out-group members can increase when in-group members intend to communicate with competent out-group members. Therefore, under certain conditions, the presentation of a highly competent member of an otherwise stigmatized out-group may serve as a discrimination buffer.

Keywords: altruism, prosocial behavior, discrimination buffer, competence, lost-letter technique

Introduction

The investigation and analysis of conflicts between groups has been among the core interests of many, if not all, social sciences since their inception. This is particularly true for social psychology where studies on the dynamics of prejudice and intergroup conflict have arguably been the discipline's single most defining research topic over many decades (e.g., Allport, 1954; Sherif et al., 1961). A host of classic studies document reliably that individuals tend to treat members of their in-group more favorably than out-group members (Tajfel et al., 1971; Mullen et al., 1992), and various theories build on this in-group preference to explain intergroup conflict from different perspectives such as the *Social Identity Theory* (SIT; Tajfel and Turner, 1979) or the *Realistic Intergroup Conflict* perspective (RIC; e.g., Sherif et al., 1961). This *in-group favoritism* or *in-group bias* has been found in many different domains such as the assignment of more positive traits to an in-group (vs. out-group) member (Cadinu and Rothbart, 1996). Particularly in the domain of helping behavior, the group membership of a person has been identified as a crucial determinant of the likelihood of providing and receiving help: Belonging to a common group increases help for individuals (see Flippen et al., 1996; Levine et al., 2005).

More recently, research has set out to study how such differential treatment of in-group and out-group members may have evolved in humans in the first place (Choi and Bowles, 2007; for reviews see De Dreu et al., 2014; Rusch, 2014). Drawing on Darwin's basic notion that behaviors benefiting the in-group and harming the out-group should have co-evolved, studies on such *parochial altruism* have used different paradigms and approaches. Prominent studies have used complex mathematical models to gauge the evolutionary advantage of different patterns of behaviors such as mutually beneficial, selfish, spiteful, or altruistic behaviors, where parochial altruism can be defined as a combination of altruism directed at the in-group and spite directed at the out-group (see Rusch, 2014). Following this logic, for example, García and van den Bergh (2011, p. 277) simulated different strategies in a prisoner's dilemma situation, defining parochial altruism as instances of altruism "limited to donors and recipients belonging to the same group." These authors found that such parochial altruism will generally be favored by selection. Given this apparent evolutionary advantage through parochial altruism, however, incidents of out-group directed altruism need to be explored further. One way of circumventing the universality of parochial altruism in humans may be to provide counter-stereotypical information about an out-group member, which can be an indicator of competence for a member of an out-group that is otherwise stigmatized as incompetent (e.g., Sinclair and Kunda, 1999).

We suggest that research on altruism may benefit from methods developed in other research areas, such as classic research on prejudice (cf. Everett et al., 2015). Mathematical modeling, idealized game theoretical situations, or even paradigms exploring the effects of neuropeptides and hormones on parochial altruism (e.g., De Dreu et al., 2010; Reimers and Diekhof, 2015) allow researchers to study the phenomenon under thoroughly controlled laboratory conditions. The present studies used an established field-setting to study altruism under less controlled but highly realistic conditions.

Field studies are particularly helpful if researchers aim to investigate helping behavior toward different groups in an unobtrusive way. Additionally, they do not exclusively rely on student samples, but more ecologically valid samples drawn from the general population. Therefore, field studies are an important instrument to explore moderators of intergroup-discrimination effects under real-world conditions. The two field experiments reported in this article were conducted in order to contribute to previous research on altruism and intergroup behavior. In a nutshell, we tested if helping behavior differs depending on the perceived competence of in-group versus out-group members using the *lost-letter technique* (Milgram et al., 1965).

In-group favoritism as one of two aspects of parochial altruism (also see Dorrough et al., 2015), when, for example, expressed through helping behavior preferably dedicated to an in-group over an out-group member, should be stronger when the out-group is stigmatized in some way than when the reference is a non-stigmatized out-group (for an overview see Penner et al., 2005). Although some conceptualizations of such differential intergroup discrimination appear to be widely accepted (e.g., Fiske et al., 2002; also see Hofstede and Bond, 1984), empirical demonstrations of differential levels of altruism toward members of out-groups with versus without the stigma of incompetence are extremely rare (for an overview regarding stigma and prejudice, see Phelan et al., 2008).

Helping Behavior and Out-Group Member Characteristics

Groups and stereotypes can be classified by means of the Behaviors from Intergroup Affect and Stereotypes-map (BIAS, Cuddy et al., 2007). According to this approach, groups are treated differently depending on how they are perceived on the two dimensions of competence and warmth. For example, members of a less competent group are likely discriminated through *harmful* behaviors, while members of competent groups are deserving of *facilitating* behaviors. Thus, altruistic behavior such as posting a lost letter should be more probable when it is addressed toward a member of the presumably competent in-group compared to the likelihood of altruistic behavior toward a member of an out-group stigmatized as less competent. However, such differences should be less likely when comparing the in-group and a non-stigmatized out-group.

One goal of the present research was to demonstrate that out-groups are not uniformly targets of discrimination, but intergroup discrimination regarding helping behavior may vary as a function of out-group stigma. In Germany, Turks represent the largest ethnic minority out-group (see Klink and Wagner, 1999), and are generally regarded as less competent than members of the German in-group (Asbrock, 2010). In other words, the most salient stigma of Turks in Germany is their ascribed lack of competence. To cautiously foreshadow a result from our own pilot study (see below), other ethnic out-groups such as the French do not suffer from this stigma of relatively inferior competence compared to the German in-group. Accordingly, we expected differences in helping behavior

between in-group and out-group to depend on the quality of stigmatization of the out-group.

While a host of research has addressed discriminatory behavior resulting from differential stereotyping; only few field studies have explored potential ways of buffering such discrimination. In a field experiment, Kaas and Manger (2012) identified one possibility of tackling intergroup discrimination on the job market: These researchers sent out application letters to German companies from applicants with a German vs. Turkish-sounding name. The typical intergroup discrimination effect, that is, more frequent interview invitations for the in-group member (also see Bertrand and Mullainathan, 2004), disappeared once the out-group member's application included a reference letter from a former employer. Such letters of recommendation are likely the most frequently used source of finding out about a job candidate's competence (Kaslow et al., 2007). Thus, there is some evidence that, under certain conditions, indicators of competence can moderate the intergroup discrimination effect. Another possibility to subtly implement an indicator of competence is to simply add a doctorate degree to an individual's name (cf. Gregory, 1995; Sinclair and Kunda, 1999).

The present research also aimed at examining whether such an indicator of the group members' competence (i.e., a doctorate degree) represents one condition, under which the discrimination effect can be attenuated or even be discontinued. In line with our above reasoning, we expected altruistic behavior in terms of posting a lost letter addressed to an ostensibly competent member of an otherwise stigmatized out-group but not to a generic member of the stigmatized out-group. In this context, the term *generic* refers to a member of the respective group who does not hold a doctorate degree.

The Lost-Letter Technique

In the lost-letter paradigm (Milgram et al., 1965), letters are dispersed in specific areas. These letters appear to be lost by their sender. Because these fully stamped letters are basically identical and only variations in the name of the recipient or of the sender or both hints at their particular group memberships, actual intergroup discrimination can then be operationalized as the relative number of letters that are returned for each recipient or sender. When the name of the recipient on an apparently lost letter indicates a different cultural background than the sender's name, the finder of such a letter can actively promote or impede a basic form of intergroup communication.

The Present Research

We focused on three hypotheses: (1) We expected that a generic member of a stigmatized out-group would receive help less frequently compared to a generic in-group member. More precisely, the stigmatized out-group member should receive fewer letters than a member of the in-group. (2) An indicator of the recipient's competence can serve as a buffer against such differences in altruistic behavior, because it may work against the stigma of the out-group. Thus, a member of a stigmatized out-group who is perceived as competent should receive more letters than a generic member of the stigmatized out-group. (3) The recipient's competence serves as a discrimination buffer only when the *sender* is a member of the in-group. More precisely, we predicted that fewer letters would arrive for the out-group member with doctorate degree when the sender apparently belongs to the out-group (vs. in-group). We designed Experiment 1 to test Hypotheses 1 and 2, Experiment 2 was conducted to address Hypothesis 3.

The experiments were carried out in accordance with the recommendations and the approval of the Ethics Committee of the Department of Psychology and Sport and Exercise Sciences at the University of Münster, Germany.

Additionally, in a pilot study, we asked participants to indicate socially shared consensual stereotypes about the German in-group and about Turks as well as the French as out-groups. For this pilot study, we expected to find differential ratings, especially on the dimension of competence, toward the different out-group nationalities mentioned above.

Pilot Study

In addition to previous research (Asbrock, 2010), this pilot study sought to obtain ratings of consensually shared stereotypes toward a stigmatized out-group, namely Turks, in relation to a culturally more proximate out-group, namely the French, and the German in-group.

Method

Participants and Procedure

Respondents were $N = 72$ undergraduate students (56 female, 11 male, 5 did not report their gender) at the University of Münster, Germany, with a mean age of 20.68 years ($SD = 3.56$). Seven participants did not indicate their age. All participants were tested during a break within two parts of an introductory lecture on statistics. Participation took about 5 min, was completely voluntary, and was not compensated.

Participants received a single sheet of paper that constituted the questionnaire, on which they were asked to provide evaluations of different groups based on what they believed most people in Germany thought about the respective group. The instructions stressed that the study was not about the participants' individual evaluation of the presented groups (see Asbrock, 2010).

Measures

Participants were asked to indicate to what extent *most people in Germany* ascribe the subsequent adjectives to the respective group. For the dimension of competence, these items were competent, competitive, and independent, for warmth, these items were likeable, warm, and good-natured. All items were assessed on a scale from 1 (*not at all*) to 5 (*completely*) and were presented in an order alternating between competence and warmth. The presented groups were Germans, Turks, and the French.

The internal consistencies of the dimensions per group were as follows: Warmth Germans, Cronbach's $\alpha = 0.80$, warmth Turks, $\alpha = 0.85$, warmth French, $\alpha = 0.84$, competence Germans,

$\alpha = 0.67$, competence Turks, $\alpha = 0.58$, competence French, $\alpha = 0.74$. For each of the two dimensions, competence and warmth, the corresponding three items were averaged per group so that higher values indicate higher ascriptions on the respective dimension for the respective group.

Results

Means and standard deviations for the three groups' scores on the two dimensions are presented in **Table 1**, which also includes comparisons between the warmth and competence ratings within each of the three groups, Germans, Turks, and the French.

Competence

Overall, the three groups differed significantly from each other regarding ascribed competence, $F(2,142) = 131.49$, $p < 0.001$, $\eta_p^2 = 0.65$. Bonferroni-adjusted pairwise comparisons revealed that the competence ascribed to Germans was estimated as being higher than the competence ascribed to Turks, $t(70) = 15.02$, $p < 0.001$, $d = 1.77$, and to the French, $t(70) = 10.00$, $p < 0.001$, $d = 1.19$. Additionally, the competence ascribed to the French was significantly higher than the competence ascribed to Turks, $t(70) = 6.66$, $p < 0.001$, $d = 0.79$.

Warmth

Overall, the three groups differed significantly from each other in terms of ascribed warmth, $F(2,142) = 11.60$, $p < 0.001$, $\eta_p^2 = 0.14$. Bonferroni-adjusted pairwise comparisons revealed that the warmth ascribed to Germans did not significantly differ from the warmth ascribed to Turks, $t(70) = -1.78$, $p = 0.24$, $d = -0.21$. The French received ratings on the dimension of warmth that were higher than those for Germans, $t(70) = 4.94$, $p < 0.001$, $d = 0.60$, and for Turks, $t(70) = 2.83$, $p = 0.02$, $d = 0.33$.

Discussion

This pilot study sought to replicate crucial aspects of previous research by Asbrock (2010) by assessing consensually shared cultural stereotypes toward the German in-group and the Turks as a stigmatized out-group. Furthermore, it was designed to extend previous research by adding a non-stigmatized out-group nationality to the list, namely the French.

Regarding warmth, the French are regarded as warmer than Germans and Turks. On this dimension, the present data did not reveal a bias in favor of the in-group nationality, which appears to be consistent with previous findings (Cuddy et al., 2009). Still, regarding the dimension of competence, Germans are seen as the relatively most competent group. Even more importantly, the Turkish out-group was clearly perceived as less competent than both the German in-group and the French out-group.

TABLE 1 | Pilot study: standard deviations and means of ratings of warmth and competence regarding three groups.

Group	Competence *M* (*SD*)	Warmth *M* (*SD*)	*t*	*p*	*d*
Germans	4.07 (0.54)	2.72 (0.60)	18.42	<0.001	2.18
Turks	2.54 (0.61)	2.92 (0.76)	−4.36	<0.001	−0.52
French	3.13 (0.68)	3.28 (0.89)	−1.11	0.27	−0.13

Means and standard deviations are based on three items per dimension that were assessed using 5-point Likert-type scales. Statistical values in this table refer to tests of differences between the dimensions of competence and warmth within the respective groups.

Experiment 1

Design and Procedure

Experiment 1 consisted of a 3 (recipient's group: German vs. Turkish vs. French) × 2 (indicator of high competence: doctorate degree present vs. not present) design. In total, we dispersed $N = 180$ letters, $n = 30$ letters per condition, in Bremen, Germany. Consistent with the established procedure for lost-letter-studies (Milgram et al., 1965), all letters were fully stamped and included hand-written addresses for the recipient and the sender and a note on the back of each letter "found next to your car" written in German ("neben Ihrem Auto gefunden") by a research assistant with a different pen to ensure the dispersed letters would be perceived as genuinely lost. Each letter was attached behind a car's windshield. Previous studies with various locations of dispersion have shown that this procedure resulted in especially high return rates as compared to, for example, placing letters on the pavement (Milgram et al., 1965). The letters were shuffled in advance to secure random attachment per area and street. Great care was taken to make sure that no other letter was visible from the position around any car, to which another letter was attached.

The names of the ostensible recipients were Nils Schönfeld (German), Antoine Dupont (French), and Ali Yildirim (Turkish). The sender's name on all letters was Jens Hellmann (German). Each letter contained an invitation to a birthday party, which was included in case any finder opened the letter. The content of the note could not be seen through the envelope. The sender's address was a local address in Bremen, Germany, where the letters were distributed. The dependent variable was the number of letters per condition that arrived at the recipients' address where a letter box displayed the names of all three recipients.

Results and Discussion

We performed χ^2–tests for differential return rates of the letters. Statistical tests reported for the resulting 2 × 2 contingency tables are one-tailed (see Preacher, 2001).

The return rates for in-group members (the German recipient) and members of the non-stigmatized out-group (the French recipient) were each independent of presence of doctorate degree (see **Table 2**). Importantly, however, for the stigmatized out-group (the Turkish recipient), significantly more letters arrived when a doctorate degree preceded his name (Dr. Ali Yildirim) than if no such academic title was present (Ali Yildirim), $\chi^2(1, N = 60) = 3.35$, $p = 0.03$, $\varphi = 0.24$. For the Turkish recipient without doctorate degree (Ali Yildirim), marginally fewer letters were returned than for the in-group recipient, regardless of presence of a doctorate degree of the in-group

TABLE 2 | Experiment 1: return rates of letters as function of the recipient's group membership and presence of a doctorate degree.

	Recipient's group membership		
	In-group (German)	**Stigmatized out-group (Turk)**	**Non-Stigmatized out-group (French)**
Doctorate degree present	25 (83%)	26 (87%)	24 (80%)
Doctorate degree not present	25 (83%)	20 (67%)	24 (80%)

Absolute number of returned letters and respective percentages in parentheses per condition. Percentages are rounded. Dispersed letters per cell were n = 30. The sender was consistently a member of the German in-group.

recipient (Nils Schönfeld or Dr. Nils Schönfeld, respectively), each $\chi^2(1, N = 60) = 2.22$, $p = 0.07$, $\varphi = 0.19$. This finding conceptually replicates previous field demonstrations of discrimination against stigmatized out-group members (e.g., Klink and Wagner, 1999) and is in line with previous research on parochial altruism (e.g., Choi and Bowles, 2007) in showing that altruistic helping behavior is more readily displayed for (generic) in-group members. For the French recipient (Antoine Dupont or Dr. Antoine Dupont, respectively), there were no differences in return rates, indicating that there was no general tendency to discriminate against a member of an out-group that is not generally stigmatized and no differential return rates dependent on the presence of a doctorate degree for this group.

To sum up, the results of Experiment 1 show that whether the German or the French recipient held a doctorate degree did not make any difference with regard to the respective return rates. When the member of the stigmatized Turkish out-group held a doctorate degree, he received significantly more letters than when the address on the letter did not include the doctorate.

However, from the results found in Experiment 1, it was not entirely clear for whom finders of a letter provided help by posting it: in fact, one could argue that finders of a letter who also posted it might have intended to help the *sender*, who apparently lost the letter, rather than the *recipient* who might even be unaware of the letter's existence. In this case, it would be possible that finders simply did not want to help a sender from the German in-group, who had apparently lost a letter intended for a generic member of the stigmatized Turkish out-group. Still, when an in-group member lost a letter addressed to a person holding a doctorate degree, finders may have been motivated to post it to help his or her fellow in-group member communicating with a doctor. We explored this latter notion, which is also in line with predictions derived from views of parochial altruism, in Experiment 2.

We kept the presence of the doctorate degree for the recipient constant in Experiment 2 and designed it to investigate more closely the question of whom finders actually direct their help to, the sender or the recipient of a lost letter.

Experiment 2

Design and Procedure

In Experiment 2, we investigated whether the increase in helping behavior toward the competent member of the stigmatized out-group was due to the in-group membership of the sender who always belonged to the German in-group in Experiment 1. We addressed letters to a doctor whose name was either indicative of an in-group recipient (German) or of a recipient belonging to the stigmatized out-group (Turkish). We also varied the name of the *sender* that signaled his group membership (in-group vs. out-group). There were no recipients without doctorate degree in Experiment 2.

In total, $N = 100$ stamped letters were dispersed, $n = 25$ letters per condition in a 2 (sender's group: in-group vs. out-group) $\times$ 2 (recipient's group: in-group vs. out-group) field study. As per Experiment 1, each letter was attached behind a car's windshield. All letters included hand-written addresses of recipient and sender. The sender's address was a local one in Bielefeld, Germany, where the letters were distributed. The names of the recipients were Markus Schäfer (German) and Ali Yildirim (Turkish). The senders were named Fatih Celic (Turkish) or Frank Meier (German). We included a short note in each envelope that was an invitation to a party in case any finder opened the letter. The content of the invitation could not be read through the envelope.

Results and Discussion

As in Experiment 1, statistical tests based on the resulting 2 $\times$ 2 contingency tables are one-tailed. As **Table 3** indicates, fewer letters arrived when the sender was from the stigmatized Turkish out-group rather than from the German in-group, $\chi^2(1, N = 100) = 4.11$, $p = 0.02$, $\varphi = 0.20$. Importantly, for the Turkish recipient, significantly less letters were returned when the sender had a Turkish name than when the sender had a German name, $\chi^2(1, N = 50) = 2.92$, $p = 0.04$, $\varphi = 0.24$. When the recipient of the letter belonged to the German in-group, this difference was not statistically significant, $\chi^2(1, N = 50) = 1.33$, $p = 0.12$. The overall return rate for the German recipient did not significantly differ from that for the Turkish recipient, $\chi^2(1, N = 100) = 0.16$, $p = 0.34$. This finding is in line with

TABLE 3 | Experiment 2: return rates of letters as function of the recipient's and the sender's group membership as written on the lost letters.

	Recipient's group membership	
	In-group (German)	**Stigmatized out-group (Turk)**
In-group sender (German)	17 (68%)	17 (68%)
Stigmatized out-group sender (Turk)	13 (52%)	11 (44%)

Absolute number of returned letters and respective percentages in parentheses per condition. Dispersed letters per cell were n = 25. The recipient's name was consistently preceded by a doctorate.

Experiment 1, in which we also did not find any difference in return rates when each of the German and Turkish recipients held a doctorate degree.

The motivation to facilitate the correspondence between a letter's sender and a competent member of the stigmatized out-group, or to even make such a communication possible, apparently depends upon the sender's group membership. That an in-group member seeks to interact with a highly competent member of the stigmatized out-group seems to be a key factor in this attenuation of intergroup discrimination.

General Discussion

Together with the pilot study, the results from our two field experiments substantiate claims from previous studies, and importantly, also yield novel insights for research on in-group favoritism as one of two aspects of parochial altruism on various levels (also see Dorrough et al., 2015). Firstly, discrimination in favor of one's in-group over different out-groups apparently depends on the evaluation of these out-groups (cf. Cuddy et al., 2009). In the present research, differences in helping behavior (i.e., posting a letter) directed at in-group and out-group members were only observed when a stigmatized (vs. non-stigmatized) out-group was compared with the in-group. Secondly, the results show that the perceived competence of the respective member of the stigmatized out-group was a moderator of this in-group favoritism; When a member of a stigmatized out-group was perceived as competent (i.e., holding a doctorate degree), he received a number of letters that did not deviate from the amount the in-group member received. Thus, we assumed that an indicator of competence can serve as buffer against discrimination of a stigmatized out-group member under certain conditions (Experiment 1). Thirdly, while our first experiment could not clearly differentiate whether *in-group love* exclusively accounted for the discrimination effect against the generic member of the stigmatized out-group, Experiment 2 revealed the contribution of *out-group spite*. Return rates were particularly low when a member of the stigmatized out-group had ostensibly lost a letter that was addressed to a recipient of the same stigmatized out-group, even though the recipient was highly competent. Thus, it was not only the recipient of the letter *per se* that received help when he was a highly competent individual. Importantly, help in form of posting that letter was granted only when the *sender* who intended to communicate with an out-group doctor belonged to the in-group. This notion is in line with theoretical conceptions of parochial altruism (De Dreu et al., 2014; Rusch, 2014) because it might well be of evolutionary advantage to help in-group members when they intend to interact with highly competent out-group members.

As demonstrated in our pilot study, Germans apparently regard the French as more competent than Turks. To our knowledge, this differentiation in stereotyping between two out-group nationalities has not been reported in the German context yet (cf. Asbrock et al., 2014). Crucially, such differential stereotyping has important implications for research and practice: While previous research mostly focused on identifying stereotypes and stigmatization of one single out-group based on ethnic background (e.g., Lin et al., 2005), the evidence for different degrees or patterns of stereotyping regarding members of different out-group nationalities may enable researchers to articulate more nuanced predictions regarding intergroup perceptions and behavior toward different out-group nationalities and their members.

According to SIT (Tajfel and Turner, 1979), encountering highly competent out-group members might be perceived as threat to the in-group's high status. Dovidio and Gaertner (1981) found empirical support for this assumption. In their classic investigation on helping behavior in an intergroup setting, they showed that White participants were less helpful toward a Black individual, when the Black person was introduced as supervisor (versus subordinate). The perceived stability of intergroup status hierarchy has consequently been studied as an important factor in providing support for empowerment help toward members of a low-status out-group (Cunningham and Platow, 2007): When in-group members perceive that their group's superiority over an out-group might become unstable, they show less helping behavior toward members of the out-group than when they perceive stability in the hierarchy in favor of their own group. However, it is rather unlikely that encountering one single competent individual from an otherwise stigmatized out-group represents a serious threat to the stability of an entire society's socio-economic hierarchy. According to the present results, the letters addressed to a competent out-group member did not lead to a threatened identity, because the return rates of these letters were higher compared to letters addressed to a generic member of the stigmatized out-group. Still, it seems promising to investigate potential underlying processes of parochial altruism linked to threat perceptions (cf. De Dreu et al., 2010), since previous research has provided substantial evidence for the relation of threat and social discrimination (Branscombe et al., 1999).

There is another process that might have influenced our results: In both experiments, all letters contained recipient addresses located in Germany. Accordingly, it might be possible that the superordinate identity of "people living in Germany" became salient, and previous research has demonstrated that a shared identity can explain helping behavior toward members of an out-group (Levine et al., 2005). Independently of a potential salience of a common identity, the present research showed differential return rates depending on the stigma of the out-group. Thus, the results indicate that despite the potential presence of a shared identity via country of residence, differences in helping behavior can be found in a lost letter paradigm.

Many researchers have reasoned that stereotypes make parts of our lives a lot easier (e.g., Macrae and Bodenhausen, 2000). With the indicator of competence, the mechanism that leads to discrimination against members of an otherwise stigmatized out-group was attenuated. It is important to acknowledge that subtyping processes may have contributed to the differences in helping behavior between the members of the stigmatized out-group with versus without the doctorate degree. A subtyping

process becomes probable when group members disconfirm a group stereotype. In order to maintain the stereotypes, such *exceptions to the rule* are clustered together and set aside (Maurer et al., 1995). Thus, adding a doctorate degree to the name of the out-group member could have (mis)lead the finders of the letters to believe that the recipient is a rather atypical member of the out-group that is otherwise stigmatized as incompetent.

We argue that, together with the information that a member of the in-group intended to deliver a message to the out-group member, the negative stereotype against the particular out-group was disconfirmed and the positive stereotype about highly competent exemplars guided the finders' behavior (also see Sinclair and Kunda, 1999). In other contexts, disconfirming a stereotype about an out-group otherwise stigmatized as cold may also lead to an increase in helping behavior. The dimension of warmth also seems to play an important role in providing help for members of an out-group because in-group members may want to deliver a positive, warm picture of their own group (van Leeuwen and Täuber, 2012).

Limitations

We assumed that the vast majority, if not all, of the dispersed letters were found and posted by members of the German in-group and not by members of the out-groups. Due to the nature of lost-letter studies, we do not have any data to support this assumption. However, we note that if letters were found and posted to a large extent by members of an out-group, this would have worked *against* our hypotheses and the present data patterns. As Turks constitute the largest ethnic minority in Germany, a potential finder that did not belong to the German in-group would have most likely belonged to this largest out-group. These finders would presumably not have discriminated against a generic sender or recipient of their own in-group.

Future replications of the present studies might consider using larger samples, that is, distribute more letters to increase statistical power. Especially in our second field experiment, a larger statistical power may have, for example, revealed a significant difference in letter return rates for the in-group recipient between the out-group-sender versus the in-group-sender conditions.

We note that the return rates of letters were lower in Experiment 2 than in Experiment 1. However, more than the absolute return rates; the relative rates between the experimental groups were of interest for the present research. In a recent investigation of differences between culturally diverse districts in the city of Berlin, Germany, Koopmans and Veit (2014) have shown that return rates can vary very strongly even across neighborhoods, namely, between 32 and 88% in their study.

Conclusion

Assumptions about deficient competence in members of stigmatized out-groups can lead to subtle forms of intergroup discrimination. One potential practical implication of the present research is that highly competent exemplars of stigmatized out-groups should not be presented as outstanding, incidental, and atypical instances of this out-group in order to overcome simple subtyping (see Maurer et al., 1995). Instead, interactions between in-group members and competent individuals from stigmatized out-groups should be treated as typical and regular instances. For example, on television programs, members of the in-group could interview particularly competent experts who are members of an otherwise stigmatized out-group. This procedure could be a promising and highly non-reactive avenue in promoting intergroup acceptance by refuting subtle yet socially shared stereotypes against minority out-groups. Future research should explore effects of such media exposure on diminishing intergroup discrimination.

Author Contributions

JH, AB, JR, and DH planned the research. JH, AB, and JR conducted the studies. JH and AB analyzed the data. JH, AB, and JR drafted the manuscript. DH provided comments and revisions. All authors approved the submission of the final version of this manuscript.

Acknowledgments

We are indebted to Christina Hanna for her help in conducting the pilot study, and to Sarah Bebermeier, Hannah Sophie Eich, and Ines Orwaldi for their assistance in letter preparation and distribution. We would also like to thank Laura Fröhlich and Ulrich Wagner for providing invaluable comments on a previous draft.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 20 August 2015
doi: 10.3389/fpsyg.2015.01261

An experiment on individual 'parochial altruism' revealing no connection between individual 'altruism' and individual 'parochialism'

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Is parochial altruism an attribute of individual behavior? This is the question we address with an experiment. We examine whether the individual pro-sociality that is revealed in the public goods and trust games when interacting with fellow group members helps predict individual parochialism, as measured by the in-group bias (i.e., the difference in these games in pro-sociality when interacting with own group members as compared with members of another group). We find that it is not. An examination of the Big-5 personality predictors of each behavior reinforces this result: they are different. In short, knowing how pro-social individuals are with respect to fellow group members does not help predict their parochialism.

Keywords: parochial altruism, in-group bias, pro-sociality, personality

OPEN ACCESS

Edited by:
Robert Böhm,
RWTH Aachen University, Germany

Reviewed by:
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RWTH Aachen University, Germany
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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *29 May 2015*
Accepted: *06 August 2015*
Published: *20 August 2015*

Citation:
Corr PJ, Hargreaves Heap SP, Seger CR and Tsutsui K (2015) An experiment on individual 'parochial altruism' revealing no connection between individual 'altruism' and individual 'parochialism'. Front. Psychol. 6:1261. doi: 10.3389/fpsyg.2015.01261

Introduction

Is parochial altruism an attribute of individual behavior? It is well known from experiments that there is an in-group bias in pro-sociality at a population level. That is, populations reveal that they are nicer to members of their own group than to those of the out-group (e.g., see surveys in Balliet et al., 2014 and Lane, 2015). This is true even for "minimal groups" in which bias is created from the assignment of arbitrary group-memberships (Tajfel, 1970). What is not known is whether the individual variation in the level of pro-sociality (the 'altruism') is connected to the individual variation of the in-group bias (the 'parochialism'). Are those individuals who are most pro-social to insiders also the individuals who are most 'parochial' in their pro-sociality? This is the question we address with an experiment[1].

The question is important because both the social identity and the evolutionary accounts of the emergence of 'altruism' would seem to predict such an individual association with 'parochialism'.

[1]'Altruism' is sometimes used to capture a very specific attention to the interests of others: the individual's utility function representation of his or her preferences is a weighted sum of own and the other person's pay-offs. It is also often used more loosely to describe the motive for behavior that is generally 'nice' toward others (that is attends to the interests of the other in one way or another). This could arise from many specific forms of motivation and not just 'altruism' in the narrow specific sense of the weighted sum utility function. For example, in many settings behaving 'nicely' could arise from a concern with efficiency or equality. We assume here that 'altruism' is used in the general rather than specific sense and so stands generally for other regarding behavior (whatever its precise motivation). Hence, we will hereafter typically refer to individual pro-sociality rather than individual 'altruism' to avoid any possible confusion.

For example, the more you identify with your group under social identity and self categorization theory (i.e., the more parochial you are; Turner et al., 1987), the greater should be your anticipated within-group pro-sociality (because this is how you identify your self). Likewise, the Choi and Bowles (2007) agent based simulations predict (under some conditions) the evolutionary emergence of 'altruism' but only when combined at the individual level with parochialism.

We address the question in two ways. First, we adopt a revealed preference approach. We examine whether the individual pro-sociality that is revealed in two person public goods (PG) and trust (T) games when interacting with fellow group members helps predict individual parochialism. For this purpose, we measure pro-sociality by the level of 'contributing' in the PG and the level of 'giving' and 'returning' in T; and we measure parochialism by the extent to which individuals' pro-sociality toward fellow group members does not extend to members of another group (that is, the in-group bias).

The 'contribution' rate in PG and the 'return' rate in T are commonly taken as an indices of pro-sociality because the selfishly rational individual contributes zero and because a variety of specific non-selfish motivations (like altruism, inequality aversion and a concern for efficiency) predict increasing 'contribution' with the strength of these motivations (e.g., see Elster, 2007, on theoretical justifications for this and Camerer, 2003, for a summary of the experimental evidence). The 'giving' rate in T is not so easily interpreted because a non-zero gift is consistent with selfishness, when a selfish first mover expects (for whatever reason) that the second mover will 'return' a more than compensating amount, as well as with a variety of pro-social motivations like altruism, etc. With this in mind, 'giving' in T, is often treated as index, but a noisy one, of pro-sociality. Three possible group contingent measures of pro-sociality follow.

(1) General pro-sociality (i.e., when there are no groups)
(2) In-group pro-sociality (i.e., when both individuals belong to same group)
(3) Out-group pro-sociality (i.e., when the two individuals belong to different groups).

We now define the following for each individual.

- In-group bias = in-group pro-sociality minus out-group pro-sociality.
- In-group 'love' = in-group pro-sociality minus general pro-sociality.
- Out-group 'hate' = general pro-sociality minus out-group pro-sociality.

The in-group bias is a natural indicator of parochialism because it captures the extent to which insiders are treated differently to outsiders: it is a measure of the extent to which pro-socialitry is restricted to fellow group members. Furthermore, it can conveniently be decomposed with these definitions into in-group 'love' plus out-group 'hate.'

With the background expectation from social identity theory and the Choi and Bowles (2007) evolutionary account, our first approach to the question can now be summarized through H1.

H1: Greater/lesser individual in-group pro-sociality revealed in PG and T is associated, respectively, with greater/lesser individual in-group bias in PG and T.

Second, we complement the revealed preference approach of H1 by considering whether there is a psychological link between altruism and parochialism in the sense that the same personality variables help predict both pro-sociality and the in-group bias. For this purpose, we use the Big-5 personality traits (McCrae and Costa, 1999) as possible predictors. They are 'Openness,' 'Extraversion,' 'Agreeablenes,' 'Conscientiousness,' and 'Neuroticism.' The five factor personality model is widely used and has been found to help predict pro-sociality in PG (e.g., see Koole et al., 2001; Pothos et al., 2011, and Volk et al., 2012), in T (see Dohmen et al., 2008) and in other games (e.g., Ben-Ner et al., 2004, for the Dictator game). Typically 'Agreeableness' is associated with pro-sociality and other traits, less systematically so. We know of no experimental study that has examined whether these traits are associated with in-group bias revealed by individuals.

With the same background expectation, this leads to H2.

H2: The Big 5 personality traits predicting individual pro-sociality in PG and T also predict the individual in-group bias in PG and T.

To our knowledge neither approach to the question of the link between individual 'altruism' and individual 'parochialism' has been examined experimentally before. There are experiments that have addressed a related but different version of H1. In these experiments, individuals are often first identified as either pro-social or pro-self, then they consider whether the group of pro-social individuals are more likely to engage in acts of actual belligerence than the pro-self group. This evidence, we shall suggest, is mixed and not always easy to interpret in part because the definition of parochialism is slippery. It also does not address the connection at the level of individuals.

For example, Abbink et al. (2012) first classify individuals through their play in a prisoners' dilemma game as pro-social or (selfish) egoists. The individuals are formed into two groups of four players and then play a Tulloch group conflict game: that is, each individual makes a contribution to a group fund, the size of which relative to the other group fund, influences the likelihood of winning the prize in the group competition. All members of a group have an equal share if their group wins the prize. They find that those who are classified as pro-social in the prisoners' dilemma game contribute, on average, more in the group competition game than those classified as egoists. In this way, altruism of acting pro-socially in a prisoners' dilemma game and the parochialism of investing in conflict seem to go together. There is a difficulty, however, with this interpretation of the evidence for parochialism (as potentially distinct from altruism). The group contest game has a free rider dimension.

The prize is like a risky PG. Individual contributions have a small effect on the probability of winning the prize and individuals free ride on the contribution of others in this contest. In this context, it is hardly surprising that the pro-socials contribute more to the group contest fund than do the egoists. That is what pro-socials do: they make contributions to PGs when egoists do not[2].

De Dreu (2010) similarly first classifies individuals via a social value test (that turns on choosing allocations between one's self and another) into either pro-socials or pro-selves. Once classified, the subjects choose how much to allocate to a within-group fund and a between-group fund. The contributions to both funds generate a PG for the players' own group. The difference is that a contribution to the between-group fund also lowers the value of the PG for the out-group. Since the latter actually harms the out-group, De Dreu interprets contributions to the within-group and between-group fund as, respectively, in-group love and out-group hate[3]. There is no difference between types in their contributions to the between-group fund but pro-socials as a group contribute more to the within-group fund than pro-selves. Thus, it seems that social value orientation affects in-group love but not out-group hate (in De Dreu's sense of these terms).

If parochialism is associated with out-group hate because it harms another group (in the same way that Abbink et al., 2012, associate parochialism with investments in contests that harm the interests of the other group), then this means (and contrary to the suggestion in Abbink et al., 2012) parochialism is not connected to social value orientation and in-group love[4]. This, however, is not the interpretation of parochialism that De Dreu et al. (2010) offer in a related experiment, where the term 'parochialism' is explicitly used. In this experiment, they associate parochial altruism with in-group love alone. The difficulty with this interpretation is that in-group love in their definition is just what is revealed by contributing to an own group PG and there is no way of judging whether such behavior is parochial because there is no contrasting behavior for what individuals do in the same decision problem when interacting with members of another group. We cannot tell whether their pro-sociality stops at the boundary of their group or not in this experiment: that is, whether it is parochial[5]. It seems that their justification for this interpretation in-group love as parochial turns on an early observation that 'As in-group love furthers the power and effectiveness of one's own group vis- à-vis the competing out-group, in-group love is an indirect way of competing with the out-group (De Dreu et al., 2010, p.1408).' This is perfectly reasonable when groups are indeed in competition with each other. The problem is that in this experiment the groups are not in a competition where this is the case when making contributions to their own group PG.

There are several nested social dilemma experiments where parochialism in our sense of a weakening of pro-sociality when interacting with members of another group and its connection with pro-sociality toward own group members might be examined. In these experiments individuals belong to one of two sub-groups and they have the opportunity to contribute to an own sub-group PG or a collective PG (one that benefits own and the other sub-group members). The contrast between own sub-group PG contributions and contributions to the collective PG could therefore potentially reveal whether pro-sociality weakens beyond the boundary of the own sub-group. The difficulty with interpreting the results of these experiments is that they were not designed for this purpose. Individuals in these experiments have to choose how to allocate their fixed endowment between the two PG accounts and a private one (e.g., see Wit and Kerr, 2002; Polzer, 2004; Halevy et al., 2012). As a result, for any given level of contribution to the private account, there must be a negative association between the contributions to the two PGs accounts. What the relation is between contributions to the two kinds of PGs is not therefore something that is revealed by behavior in these experiments because a negative association is built in by the design of the experiment.

There are four important differences in our experiment. First, by measuring individual pro-sociality by the extent of contributing, giving and returning, we allow for greater granularity in individual pro-sociality than the binary division in these experiments between two types (the pro-social and pro-self). Second, this in turn means that we have individual measures which enable us to examine whether parochialism is associated with pro-sociality at the level of the individual and not just at the level of groups of individuals. Third, we use a natural definition of parochialism (the extent of the in-group bias) that would admit, in principle, Abbink et al.'s (2012) association of parochialism with actual aggression as an extreme case (that is, where pro-sociality has become so weakened as to become negative). It also has the further advantage of being formally connected to our definitions of in-group love and out-group hate: in particular, parochialism can be decomposed into in-group love and out-group hate. Finally, our experiment does not build in any necessary relation between in-group pro-sociality (i.e., 'altruism') and the in-group bias (i.e., 'parochialism').

[2]The clean test to avoid this problem would have had individuals deciding whether to enter an individual contest with a member of the other group.

[3]This, of course, is related to but is not the same as the definition of in-group love and out-group hate that we will be using. The virtue of our definition is twofold. First, the in-groupness (and out-groupness) of behavior is judged relative to what individuals do when there are no groups, whereas in De Dreu's (2010) in-group love is simply contributing to an own group PG and there is no way of knowing whether this is special due to a shared group membership because there is no comparison with altruism when there are no groups (see later comments about the difficulties in interpretation that this lack of a comparison can create). Second, the particular point of comparison that we use in our definition has the further benefit of connecting to discussions of social capital in relatively homogenous (where different group ties are weak) as compared with plural societies (where different group ties are strong).

[4]This 'disconnection' result is also consistent with the closest experiment that we know that considers something like H2. Halevy et al. (2012) where in a similar set up to De Dreu (2010), they find that those who contribute to the within group fund gain 'prestige' while those who contribute to the between group fund are regarded as 'dominant.' In other words, in-group love and out-group hate involve different psychological currents.

[5]This is a natural definition of 'parochial' and it admits the Abbink et al. (2012) definition as an extreme version where the weakening is so extreme that hostility actually emerges in relation to other groups.

Materials and Methods

Our subjects engage in two counterbalanced tasks. The first task consists of two decision making experiments where pro-sociality has typically been revealed in varying degrees across individuals: the PG and Trust (T) games. The second task is the DeYoung et al. (2007) version of the Big 5 personality survey test. These tasks are counterbalanced to enable control for any possible priming effect of one task upon the other. There are two treatments for the PG and T decisions: one with no group affiliations and the other with minimum, artificial group affiliations where subjects belong to either the red or the blue group. We chose the PG and T games and we used a minimal, artificial group affiliation mechanism because they have revealed the in-group bias in pro-sociality in previous experiments (see Chen and Li, 2009 and Hargreaves Heap and Zizzo, 2009).

In both treatments, subjects anonymously make the PG and T decisions (in a random order) eight times in two separate stages. The decisions are always made with a randomly drawn co-player but in the group treatments the randomness is constrained to ensure equal numbers of interactions with own-group and out-group members. In the T decision, a player occupies the first and second mover roles four times each (i.e., twice in each stage). In the group treatments, subjects know their own color group and that of their co-player; and the random matching is constrained to produce two interactions with co-players from the same group and two from the other group in each of the two stages. At the end of stage 1, a table is shown with the mean contribution rate in the PG and the mean giving and return rates in T. In the group treatment, these values are reported for the following four cases: in-group matching of Blue to Blue and Red to Red, and out-group matching of Blue to Red and Red to Blue. The interactions are split into two stages to allow for possible learning and the introduction of information.

The pay-off details for the PG and T decisions are as follows.

PG: Each player is endowed with 50 experimental points and each must decide how much individual investment to make in the common fund. Individual payoff = 50 – Individual Investment + 0.7 (Total Investment in Common Fund).

T: The first mover is endowed with 50 experimental points and must decide how much (='x') "to give" to the second mover. This sum (x) is multiplied by three and so the second mover receives $3x$. The second mover decides how much (='y') of $3x$ to return to the first mover. Hence

$$\text{First mover payoff} = 50 - x + y;$$
$$\text{Second mover payoff} = 3x - y.$$

Our index of individual pro-sociality (for all three group contingent settings) is the amount of 'contributing' in PG and 'giving' and 'returning' in T (with a suitable qualification regarding the possible noisiness in relation to 'giving'). We express these in terms of % of endowment for 'contributing' and 'giving' and as % of what becomes the second movers endowment in T (i.e., three times what has been 'given' by the first mover).

Our measure of individual parochialism is the in-group bias: the difference in individual pro-sociality when interacting with an insider and outsider. That leaves open the question of whether this should be measured as an absolute number or normalized, say by the level of insider pro-sociality. We normalize because using the absolute value of the gap necessarily builds in a relation between this and individual pro-sociality. To see this, let the mean individual in-group and out-group contributing/giving/returning rate of subject i, who participated in the two-group treatment, be X_i and Y_i, respectively. Now suppose that everybody simply treated all outsiders a constant fraction ('b') less nicely than insiders (i.e., $Y_i = bX_i$, $b < 1$), then the absolute value of the in-group bias (X_i–Y_i) would grow with X_i. But this would not reflect any difference in treatment of outsiders relative to insiders (since they are always treated less well by the same fraction 'b'). Normalizing the absolute value of the in-group bias by the level of in-group pro-sociality avoids this false association with in-group pro-sociality.

The model we use in testing H1 is therefore given by

$$\frac{X_i - Y_i}{X_i} = \beta_0 + \beta_1 X_i + Z_i\beta + \varepsilon_i \ldots\ldots\ldots \quad (1)$$

where Z_i is the vector of dummy variables. For returning rate, Z_i includes the mean points given by out-group coparticipant for the 'returning' decision.

Since X_i appears on both sides of the above equation, we obtain the reduced form:

$$Y_i = (1 - \beta_0 - Z_i\beta)X_i - \beta_1 X_i^2 - \varepsilon_i X_i \ldots\ldots\ldots \quad (2)$$

If there was an association between the in-group bias and pro-sociality, then β_1 should be positive (i.e., X_i^2 the coefficient on in equation (2) should be negative).

The experiment was conducted at the University of East Anglia[6]. Subjects were recruited through postings on an online participant pool and message board. A total of 110 subjects were involved in eight sessions. Five sessions with 62 subjects in total had no groups to serve as a control group, and the other three sessions with 48 subjects were our experimental group, which had two groups[7]. The instructions, the control questionnaire and the experiment were computerized with zTree (Fischbacher, 2007). There was a show-up fee for the personality survey test and subjects were paid on the basis of a randomly chosen round from each stage in the PG and T games. For this purpose, experimental points were converted at a rate of 4 p per point[8].

[6]The experiment received approval from the Ethics Committee of the School of Social Work and Psychology at UEA. This committee reports to and acts on behalf of the Social Science Faculty Ethics Committee at UEA. All subjects gave written informed consent at the beginning of the experiment.

[7]Two no-group sessions were conducted with eight subjects. One two-group session was conducted with 14 subjects. Other five sessions had 16 subjects.

[8]The experiment reported here was part of a larger set of experiments examining discriminatory behavior. The instructions for the full set are contained in the electronic Appendix. Subjects earned on average £16.21 in the experiment that lasted around 90 min and they received a £15 show-up fee for a set of survey questions that lasted between 70 and 90 min.

Results

Table 1 provides a summary of the results on the average rates of 'contributing,' 'giving,' and 'returning' under different conditions. They reveal typical levels of pro-sociality in the first column when there are no groups (see Camerer, 2003). The in-group bias is apparent in the comparison of the second and third columns where the 'contributing,' 'giving,' and 'returning' between insiders and outsiders, respectively, is set out for the group treatments. The no-group treatment provides the baseline from which to judge the effect of group membership and the respective contributions of in-group love and out-group hate to the in-group bias. **Table 1**, therefore, suggests that the in-group bias in PG arises from in-group love; whereas in T it arises from a mixture of in-group love and out-group hate.

A non-parametric analysis reports only mild significance of the in-group bias in PG due to few independent observations. The small number of independent observations at this aggregate level arises because the analysis requires two levels of clustering: subjects nested within sessions and the session (as subjects interact with each other as games are repeated). Hence we now test for the significance of these insights by running an individual regression on 'contributing,' 'giving,' and 'returning' rates using three-level models. There are two dummies: one for the group sessions, which is labeled as 'In-group Matching + Out-group Matching,' and the other for when the interaction in groups is with outsiders, 'Out-group Matching' An in-group bias is picked up by the latter, because controlling with the first dummy for groups sessions, it reveals any difference in behavior toward outsiders. This is Specification A in **Table 2**, where we also control for possible order effects, stage, and round effects and possible reciprocation effects in the 'return' equation by including the amount 'given.' The regressions reveal an in-group bias: the out-group matching dummy is significant and negative in all equations.

We also test for whether there is a distinct in-group love/out-group hate origin for this bias. The fact that outsider dummy in Specification A is significantly negative shows that there is a significant difference between the behavior toward insiders and outsiders, but it cannot easily test for whether this comes from either in-group love/out-group hate or some combination of the two. We do this through the regressions in Specification B where we have separate dummies for insider and outsider matching in the group sessions. The only significant coefficient at 95% level is on the insider matching dummy in the 'contributing' equation. Hence, there is clear in-group love in PG which could account for the bias. The insider dummy is only weakly significant in the 'giving' equation and so it is more likely that some combination of in-group love and out-group hate generates the bias in T.

Result 1: *There is evidence of individual parochialism in the form of in-group bias in PG and T. In-group love could alone account for this in PG but it is more likely to be a combination of in-group love and out-group hate that explains the in-group bias in T.*

Thus we have an experiment where subjects display 'altruism' and 'parochialism,' we now turn to a test of our two hypotheses concerning the relation between them. Is individual altruism associated with individual parochialism?

Figure 1 provides a preliminary view on H1. We plot individual in-group 'contributing,' 'giving,' and 'returning' against the individual in-group bias in each decision when, respectively, normalized by the level of in-group 'contributing,' 'giving,' and 'returning.' The visual evidence is not strong.

We test statistically for this association by estimating equation (2). Due to the potential problem of the heteroskedasticity of the error term, we use the GLS. Recall if there is an association between the normalized in-group bias and pro-sociality, then β_1 should be positive (i.e., the coefficient on X_i^2 should be negative). This, however, is not what is revealed in **Table 3**. The coefficient on squared insider pro-sociality (X_i^2) is insignificant in all regressions. The coefficient on X_i is significant and positive, suggesting that our subjects simply contributed/gave/returned to outsiders a fraction of what they do to insiders.

Result 2 (against H1): *There is no association between normalized individual pro-sociality and individual parochialism in PG and T. There is evidence that individual pro-sociality toward outsiders is a constant fraction of individual pro-sociality toward insiders.*

H2 takes up our second approach to the question of whether individual altruism is connected to individual parochialism. **Table 4** reports on the signs of the significant coefficients when we introduce the Big-5 personality predictors into the regression equations like those in **Table 2** on 'contributing,' 'giving,' and

TABLE 1 | Summary of results.

		No groups	Insiders	Outsiders
Contributing rate (PG)	Mean	0.256	0.400	0.258
	Somers' *d*-value		0.328	−0.004
	(*p*-value)		(0.071)	(0.986)
Giving rate (T)	Mean	0.399	0.486	0.337
	Somers' *d*-value		0.167	−0.137
	(*p*-value)		(0.455)	(0.538)
Returning rate (T)	Mean	0.218	0.224	0.176
	Somers' *d*-value		0.017	−0.210
	(*p*-value)		(0.909)	(0.313)
Number of subjects		62	48	

Contributing [giving] rate = the ratio of the contributed [given] points to the endowment of 50 points. Returning rate = the ratio of the returned points to the points the second mover has received. We apply a non-parametric method to test if contributing, giving, and returning rates when matched with insiders or outsiders are larger than these values in the no-group treatment. Each observation is the mean value at the subject level, thus the sample size is 110. Since subjects interact each other as games are repeated, the independent observation is at the session level. Therefore Somers'd is employed to use clustering, instead of a Wilcoxon rank-sum test. The d-value can be interpreted as follows: the contribution rate to insiders is 32.8% more likely to be higher than the contribution rate in the no-group treatment than vice versa. The significance of the d-value is reported inside parentheses.

TABLE 2 | Individual pro-sociality regressions.

Variable (Game)		Contributing (PG)	Giving (*T*)	Returning (*T*)
Personality survey before PG&T		0.174 (0.291)	0.0880 (0.326)	−0.110 (0.317)
PG Game before trust game		0.343 (0.319)	−0.131 (0.364)	0.387 (0.353)
Session of eight (vs. 14 ≤) Subjects		1.040*** (0.385)	0.852** (0.401)	0.955** (0.418)
Second stage		−0.184*** (0.0179)	−0.142*** (0.0213)	−0.239*** (0.0279)
Round		−0.0699*** (0.00820)	−0.0247** (0.0104)	−0.153*** (0.0135)
Specification A	In-group matching + Out-group matching	0.771** (0.315)	0.679* (0.361)	0.133 (0.348)
	Out-group matching	−0.382*** (0.0267)	−0.374*** (0.0325)	−0.219*** (0.0424)
Specification B	In-group matching	0.771** (0.315)	0.679* (0.361)	0.133 (0.348)
	Out-group matching	0.388 (0.315)	0.305 (0.361)	−0.0858 (0.348)
Given by first Mover				0.0523*** (0.00123)
Constant		1.771*** (0.256)	2.421*** (0.291)	0.875*** (0.282)
Observations		880	440	360

*Regressions are three-level mixed-effects poisson model. Since the range of the dependent variables is non-negative integers, we assume poisson distribution instead of t-distribution. These are with random intercepts at both the session and the subject-within-session levels since subjects interact each other as games are repeated. For each regression, we tried two models: specifications A and B. The dummy variable In-group Matching is one if the session has two groups and the subject is matched with a member of the same group, otherwise zero. Out-group Matching is one if the session has two groups and the subject is matched with a member of the other group, otherwise zero. In-Group Matching + Out-Group Matching is equal to one in the two-group treatment and zero in the no-group treatment. Significance levels: *p < 0.10, **p < 0.05, and ***p < 0.01.*

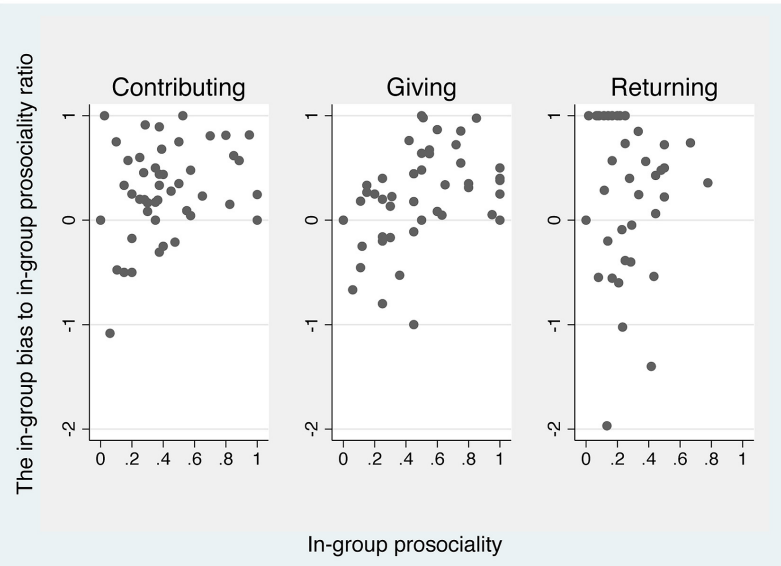

FIGURE 1 | In-group bias and pro-sociality. For each subject in the two-group treatment, in-group pro-sociality is derived as the mean in-group contributing/giving/returning rate. The in-group bias is defined as the mean contributing/giving/returning rate of in-group minus that of out-group. When in-group pro-sociality is zero, the observation is omitted except the case in which out-group pro-sociality is also zero. The ratio is set to be zero in this case.

'returning.' Each personality trait is introduced by itself to capture its general possible influence and in interaction with the two dummies for group sessions and inter-group matching. It is the latter, recall, that captures any influence on the in-group bias. Hence, when the interaction dummy coefficient is negative, this trait contributes to the bias, while a positive coefficient means that the trait counters the bias by promoting pro-sociality toward outsiders. The full regression results are contained in the Appendix, we focus in **Table 4** only on the sign of the personality variables that are significant in predicting pro-sociality in general and the in-group bias.

'Agreeableness' is the only personality trait that (positively) predicts general pro-sociality, i.e., in 'contributing' and 'giving.' 'Agreeableness' also predicts positively pro-sociality with respect to outsiders in 'contributing' and 'returning.' Thus the one personality predictor of pro-sociality in general works against the in-group bias because it also helps predict pro-sociality with outsiders. There are several traits that have a negative effect in

TABLE 3 | Insider and outsider pro-sociality.

Variable	Mean out-group contributing rate	Mean out-group giving rate	Mean out-group returning rate
Personality survey before PG&T × X_i	0.195*** (0.00635)	0.0970*** (0.00207)	0.293*** (0.0516)
PG game before trust game × X_i	0.0191 (0.0534)	0.231*** (0.00450)	0.350*** (0.0933)
X_i	0.659*** (0.0551)	0.458*** (0.0809)	0.859*** (0.258)
X_i^2	−0.227 (0.140)	−0.0315 (0.109)	−0.599 (0.391)
Mean out-group given rate × X_i			−0.590 (0.607)
Observations	48	48	47

*Each observation is the mean value at the subject level. Regressions are GLS with clustering at the session level. Significance levels: *$p < 0.10$, **$p < 0.05$, and ***$p < 0.01$.*

TABLE 4 | Big 5 Predictors of general pro-sociality and in-group bias.

	General		Out-group matching	
	Contributing	Giving	Contributing	Returning
Big 5				
Openness			+	
Extraversion			+	−
Conscientiousness			+	−
Agreeableness	+	+	+	
Neuroticism			−	−

out-group matching (i.e., contribute to the in-group bias) but none helps predict pro-sociality in general.

Result 3 (against H2): *There is no personality trait that helps predict both individual pro-sociality and individual in-group bias in either PG or T.*

Discussion and Conclusion

The central role of 'agreeableness' in predicting pro-sociality is a common finding in the literature where the Big-5 has been used to predict behavior in the PG, T (and Dictator) games (see Koole et al., 2001; Ben-Ner et al., 2004; Dohmen et al., 2008; Pothos et al., 2011; Volk et al., 2012). In this respect, along with the general levels of pro-sociality, our results are consistent with those in the experimental literature. Furthermore, our results tend to support the suggestion in the literature that the in-group bias comes predominantly from in-group love rather than out-group hate (see Balliet et al., 2014). There have been earlier examinations of whether 'altruism' is associated at the individual level with 'parochialism.' The evidence is not always easy to interpret and is mixed. We are the first, to our knowledge, to examine whether individual pro-sociality is linked to individual parochialism (as captured by the in-group bias) in such detail. This association is important because it is an implication of both social identity and evolutionary accounts of the origins of altruism.

Our measure of pro-sociality is 'contributing and 'giving' and 'returning' in the PG and T games, respectively. Our measure of parochialism is the in-group bias in these decisions: the extent to which subjects are less pro-social with outsiders than insiders. We find there is no association. There is an in-group bias, but this does not vary with the level of pro-sociality toward insiders. This result is reinforced by the analysis on the personality predictors of pro-sociality and the in-group bias. 'Agreeableness' is the only predictor of pro-sociality and it does not predict its diminution with outsiders (which is what would be expected if altruism was to be linked with parochialism at the individual level). Instead, 'agreeableness' positively predicts pro-sociality with both insiders and outsiders. This personality variable, therefore, would lead one to expect that pro-sociality toward insiders moves in tandem with that toward outsider. This is, indeed, what we find. In a complementary result, we find that there are a range of personality predictors of the in-group bias, but none helps predict pro-sociality in general.

Of course, these results are preliminary and need further investigation. One problem is that there are no operational, agreed definitions of the term 'parochial altruism.' We have used what we regard as natural definitions, but with different definitions, there may be different results. This suggests the need for further work to clarify how best to define the term. Another problem that future research should address is that our results apply to only two decision settings. It would be good to examine whether the same results hold across further decision problems (e.g., the dictator game, contest games, etc). Nevertheless, if pro-sociality is not tied to parochialism at an individual level, in the way that we have found, then it carries an encouraging implication. An increase in individual 'altruism' need not be accompanied by the growth of individual 'parochialism.'

Acknowledgment

We would like to thank CBESS and Economic and Social Research Council through the Network for Integrated Behavioral Science (Grant reference ES/K002201/1).

Supplementary Material

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.01261

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

frontiers in Psychology

ORIGINAL RESEARCH
published: 27 November 2015
doi: 10.3389/fpsyg.2015.01790

Inter-Group Conflict and Cooperation: Field Experiments Before, During and After Sectarian Riots in Northern Ireland

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The idea that cooperative groups out-compete less cooperative groups has been proposed as a theoretical possibility for the evolution of cooperation through cultural group selection. Previous studies have found an association between increased cooperation and exposure to inter-group violence, but most have not been able to identify the specific target of cooperation and are based on correlational data making it difficult to establish causality. In this study we test the hypothesis that inter-group conflict promotes parochial altruism (i.e., in-group altruism and out-group hostility) by using longitudinal data of a real-world measure of cooperation—charity and school donations—sampled before, during and after violent sectarian riots between Catholics and Protestants in Belfast, Northern Ireland. We find that conflict is associated with reductions in all types of cooperation, with reduced donations to a neutral charity, and both in-group and out-group primary schools. After the conflict, both in-group and out-group donations increased again. In this context we find no evidence that inter-group conflict promotes parochial altruism.

Keywords: parochial altruism, real world behavior, donations, in-group favoritism, cooperation and conflict, evolution of cooperation

OPEN ACCESS

Edited by:
Benedikt Herrmann, University of Nottingham, UK

Reviewed by:
Matt Joseph Rossano, Southeastern Louisiana University, USA
Birte Siem, FernUniversität in Hagen, Germany

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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *28 May 2015*
Accepted: *06 November 2015*
Published: *27 November 2015*

Citation:
Silva AS and Mace R (2015) Inter-Group Conflict and Cooperation: Field Experiments Before, During and After Sectarian Riots in Northern Ireland. Front. Psychol. 6:1790. doi: 10.3389/fpsyg.2015.01790

INTRODUCTION

Inter-group competition is often put forward as a prominent factor in the evolution of cooperation (Boorman and Levitt, 1973; Choi and Bowles, 2007; Bowles, 2009). Specifically, models of cultural group selection depend on competition between groups for traits that favor the group to evolve, in which groups compete over access to resources such as food, mates or territory (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011). Cultural group traits that provide an advantage to groups in conflict, such as altruism, will proliferate at the expense of other cultural traits that do not, eventually leading to group extinction through conquest and assimilation (Henrich, 2004). In these theoretical models of the evolution of cooperation through inter-group conflict, biased altruism toward the in-group co-evolves alongside out-group hostility—in what is termed parochial altruism—as a way of groups maximizing their payoffs (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011). In these models, inter-group conflict promotes the co-evolution of in-group altruism and out-group hostility, which leads to the logical inference that in situations of conflict levels of in-group altruism should be negatively associated with levels of out-group altruism (Arrow, 2007; Choi and Bowles, 2007).

The findings from the models pointing to an association between parochial altruism and inter-group conflict are also supported by empirical data in both the lab and field. Several studies have shown increased in-group altruism and social cohesion in response to violent conflict, in which individuals who had experienced violence were found to be more cooperative in experimental scenarios than individuals without exposure to violence (Bellows and Miguel, 2009; Gilligan et al., 2011; Gneezy and Fessler, 2011; Voors et al., 2012; Bauer et al., 2014). While it should be noted that this type of cooperative behavior is not necessarily associated with altruism *sensu stricto* (i.e., lifetime fitness costs to the actor) as described in the models of parochial altruism (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011), the findings from these studies are normally put forward as supporting empirical evidence for the theoretical models of parochial altruism (Bernhard et al., 2006; Puurtinen and Mappes, 2009; Gneezy and Fessler, 2011; Voors et al., 2012; Bauer et al., 2014). In contrast to these findings, our previous study using naturalistic measures of cooperation in Northern Ireland found that exposure to inter-group conflict between Catholics and Protestants was associated with reduced donations to out-group schools and the return of out-group lost letters, but there was no evidence that it influenced in-group cooperation. Rather, socio-economic status was the major determinant of cooperative behavior (Silva and Mace, 2014).

One possibility for the conflicting results is that studies finding increased levels of cooperation associated with inter-group conflict are based on economic games and do not use real life groups with a history of conflict in their experimental set-up. Instead they employ abstract concepts of in-group and out-group, such as children from the same classroom as in-group and children from a different school as out-group (Bauer et al., 2014) or anonymous neighbors who may or may not have shared group membership (Voors et al., 2012). Furthermore, these studies do not use a control group and are not able to distinguish between different types of cooperative behavior by conflating in-group cooperative behavior with unbiased cooperation and—with the exception of Bauer et al. (2014)—also fail to measure out-group altruism. The accurate identification of the specific type of cooperation is crucial, as the hypotheses for the evolution of cooperation through inter-group conflict require cooperation to be biased toward the in-group, not to be indiscriminately applied (Arrow, 2007; Bauer et al., 2014).

Our previous study in Belfast addressed some of these issues by determining the role of conflict on cooperation toward in-group, out-group, and neutral institutions using naturalistic measures of cooperation, donations and lost letters (Silva and Mace, 2014). However, Silva and Mace (2014) was still reliant on cross-sectional data and therefore limited in being able to establish a causal link between inter-group conflict and parochial altruism. To our knowledge, Gneezy and Fessler (2011) is the only study that has looked into this relationship using longitudinal data. They conducted ultimatum (UGs) and trust games (TGs) between Israeli senior citizens before, during and after the 2006 Israel–Hezbollah war and found that during the war participants were more likely to reject low offers in the UGs, and transfer back more money if the initial offer was high in TGs. There were no significant differences for the initial amounts offered in either game. These results were interpreted as evidence that in wartime people are more likely to incur a cost to reward cooperative behavior and punish within-group uncooperative behavior.

The study in Israel provides an interesting, if partial, insight into how cooperation is affected by inter-group conflict. First, the lack of significant differences in the initial amounts offered over time suggest that cooperative tendencies may have remained unchanged through the conflict; although the interpretation of these behaviors is complicated as selfish strategic considerations in UGs and TGs can also result in increased offers (Dawes et al., 2007; Brañas-Garza et al., 2014). Second, the games were conducted at the same time as the Lebanon and Israel war, but only between Israeli senior citizens of the same ethnic group living in a housing facility in Tel Aviv. No salient group affiliation was used, so it is not possible to establish how conflict affects cooperation differently toward the in-group or out-group.

In this study, we use a naturalistic donation experiment to assess how a temporary sharp increase in violence between Catholics and Protestants in Northern Ireland affects cooperation toward the in-group, out-group and an unbiased institution, which is used as a control group. The context of Northern Ireland provides a valuable case study on the dynamics of inter-group interactions. These two groups have an on-going history of violence that has resulted in over 3500 people being killed (Sutton, 2012) and tens of thousands injured (Breen-Smyth, 2012) in the past decades, alongside marked levels of residential and education segregation, with the majority of the population today living in areas made up of over 80% of their own religious group (Byrne et al., 2006) and 94% of all children attending predominantly Catholic (run by the Catholic Church) or Protestant (run by the state or Protestant Churches) schools. The use of donations to primary schools in the experiments intends to reflect actual inter-group grievances between Catholics and Protestants in Northern Ireland associated with school funding (BBC News, 2001). The individuals in the study are not aware that the donations are part of an experiment, minimizing the artificiality typical of most lab and field based economic games.

In this study, we make use of an eruption of sectarian violence that started in December 2012 over a dispute related to the flying of Union flag in public buildings.

On the 3rd December 2012, the Belfast City Council passed a motion to restrict the flying of the Union flag to 18 designated days in the Belfast City Hall (Belfast City Council, 2012). The flag had previously been flown all year round and this change sparked protests from the Protestant community (who mostly feels an affinity with the United Kingdom), leading to an escalation of violence throughout the region, which resulted in violent riots over the next few months. The riots spread through the city with buses being set alight, cars being hijacked and skirmishes between Protestants, Catholics and the police involving water cannons, rocks, and petrol bombs (BBC News, 2013b). During this period, numerous violent clashes led to 560 people being

charged and arrested (BBC News, 2013a), 157 police men and women injured and an estimated £70 million costs in material damages, reduced business revenues and increased policing (BBC News, 2013c, 2014).

The violent clashes in Belfast continued through January and at this time we went back to Belfast to repeat the survey and donations experiment previously conducted in May 2012 during a more peaceful time. We then went back again in May and June 2013 to investigate the aftermath of the riots. This allowed us to have a longitudinal dataset of cooperative behavior and attitudes at the neighborhood level that now enables us to assess the role of inter-group conflict on cooperation in a quasi-experimental framework.

MATERIALS AND METHODS

We conducted an impromptu natural experiment when sectarian riots erupted in Belfast in January 2013 by conducting the survey and donation experiments at the time of the riots in two previously sampled neighborhoods, Ballymacarrett 1 and Bellevue 2. The neighborhoods represent the UK Census lower super output areas, a UK standard geographic unit generated taking into account "population size, mutual proximity and social homogeneity" (ONS, 2005, 2) (**Figure 1**). We also conducted the surveys and donations experiments in the aftermath of the riots in the same two neighborhoods in May and June 2013. We conducted a total of 228 donations experiments, including 49 donations experiments in the pre-riot period, 77 during the riots and 102 after the riots (4 donations data points were not included in the final analysis due to missing covariate data).

The survey was completed in person by 6 trained assistants at the houses of the respondents between 10.00 and 20.00. Each assistant was allocated a set of streets in the neighborhood and then knocked on doors asking residents if they would like to take part in the survey. The total number of attempts and responses were only recorded during 14 days in May and June 2013 in Ballymacarrett 1 and Bellevue 2 and from this sample out of a total of 1267 attempts, there was no answer on 69% of the houses, 23% refused to take part and 8% filled in the questionnaire, which matched our subjective personal experience from the previous sampling periods (see Table S1 for the sample representativeness).

The questionnaire consisted of 50 questions, required about 10 minutes to complete and was structured with multiple-choice responses that the researcher read out and for which the

FIGURE 1 | Map of Belfast with the neighborhoods Ballymacarrett 1 and Bellevue 2 in green and the 4 primary schools used in the donations experiments before, during and after the sectarian riots. Catholic primary schools (green markers) and Protestant primary schools (red markers).

respondent chose the most appropriate choice. The questionnaire addressed a range of issues with a focus on questions about the respondents' socio-economic characteristics status (S.E.S.) and experiences of the conflict, specifically questions on whether the individual had been attacked or felt threatened by the other group. We used these variables to create a sectarian threat index from a factor analysis of variables related to the individual exposure to sectarian attacks and threat, which we used as a measure of inter-group conflict (see Table S3 for more detail on this factor variable) in addition to the time of the riots.

The donations experiment was conducted immediately after the completion of the questionnaire. The participants were informed in the beginning that they would receive a £5 financial incentive at the end for completing the questionnaire and could choose to donate or keep the money. After the completion of the questionnaire, the researcher handed the participant the financial incentive in the form of 5 pound coins and presented in view of the participant a charity box with the name of the local school or charity (Figure S1), where the participant can drop some or all of the coins (see SI for protocol). There were three treatments—one for each of the local schools and one for the charity—and participants were only given the choice to donate to one of the three options, which was randomly allocated, making it a between-subject experimental design. The amount donated to the local school treatments measures in-group (if participant is of the same religion as the school) and out-group cooperation (if participant is of a different religion as the school), and the charity treatment measures unbiased cooperation (see Table S2 for raw data). The school donation is a natural experiment that has essentially the same payoff structure as a dictator game (Kahneman et al., 1986), albeit one that is administered surreptitiously and involves real life cooperative behavior involving donating to an institution rather than an individual. The selection of the primary schools was conducted by choosing the nearest Catholic and Protestant school to the centroid of the neighborhood using Google Maps. This study was approved by the UCL Research Ethics Committee (ID: 2390/002) and all participants provided written informed consent to take part in the research.

ANALYSIS

The main hypothesis is derived from the theoretical models of inter-group conflict and parochial altruism (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011), which predict that conflict promotes increased in-group cooperation and reduced out-group cooperation (i.e. parochial altruism). Specifically, we predict that parochial altruism will increase during the riots in comparison to before and after the riots.

We ran four linear regressions to predict the (i) overall and the specific amount donated over time to (ii) the unbiased charity (*Save the Children*), (iii) the in-group, and (iv) the out-group primary schools. The continuous outcome variable was the amount donated in British pounds. The main explanatory variable was the time of the sampling (dummy coded as pre-riot, mid-riot and post-riot). We also control for household income, highest educational level achieved, age, gender, religious background, and neighborhood. We also ran a model with the individual sectarian threat as an alternative explanatory variable to determine how sectarian threat affects donations overall.

We performed a manipulation check to determine if the riots caused a different shift in people's perception of sectarian threat using a linear regression with the factor sectarian threat as the outcome variable.

RESULTS

There was a significant reduction in overall donations during the riots compared to before the riots ($\beta = -1.03$ [−1.83; −0.24], $p < 0.05$; Table S4 and **Figure 2**). When looking at the different types of donations, we find that in-group donations suffered the most during the riots, with £1.23 less being given to in-group primary schools during the riots compared to before the riots ($\beta = -1.23$ [−2.58; 0.11], $p < 0.1$; Table S4 and **Figure 2**). After the riots, donations to the in-group and to the out-group increased again ($\beta = 1.04$ [0.02; 2.06], $p < 0.05$; $\beta = 0.44$ [−0.69; 1.58], $p > 0.1$), but only the increase of in-group donations was significant at conventional levels (Table S4 and **Figure 2**). Household income significantly predicted increased levels of cooperation, with high-income individuals donating 84 p more than low-income individuals ($\beta = 0.84$ [0.09; 1.59], $p < 0.05$; Table S4 and **Figure 2**)

People experienced a marginally significant increase in the feelings of sectarian threat during the riots, compared to before and after the riots ($\beta = 0.25$ [−0.03, 0.52], $p < 0.1$; Table S5). Sectarian threat is felt most by young people ($\beta = -0.01$ [−0.02, −0.00], $p < 0.01$; Table S5) and Protestants feel marginally

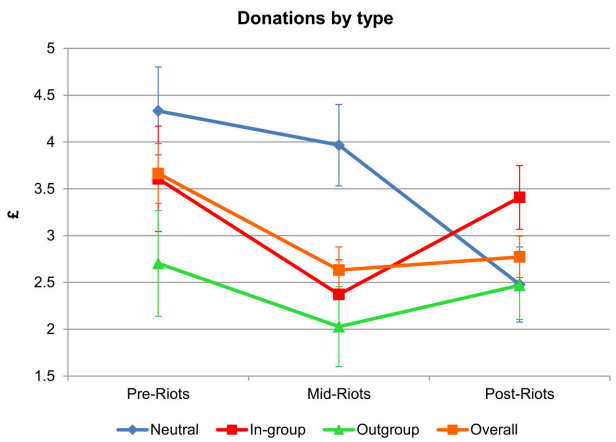

FIGURE 2 | Predicted donations by type over time. Predicted value (£) of an individual donating to the neutral charity *Save the Children*, an in-group primary school, an out-group primary school and all combined donations over time (before, during, and after the riots). These predicted values are controlled for individual household income, educational level, age, gender and religion. Error bars represent the standard errors.

less threatened than Catholics ($\beta = -0.18$ [−0.38, 0.03], $p < 0.01$; Table S5). Overall, individuals with higher levels of sectarian threat were significantly less likely to donate to out-group primary schools ($\beta = -0.97$ [−1.73, −0.20], $p < 0.05$), but sectarian threat had no impact on in-group or neutral donations (Table S6).

DISCUSSION

Overall, there was a significant trend toward a reduction in cooperative behavior during the riots, which suggests that in the context of Northern Ireland inter-group conflict does not promote cooperation. There is a marked decline in all types of cooperation in both neighborhoods during increased inter-group conflict. Specifically, the decline in in-group cooperation is most substantial during the riots with an average of £1.23 less donations to an in-group primary school than before the riots. The overall levels of cooperation remained lower in the aftermath of the riots compared to before, but the levels of in-group and out-group donations appear to be returning back toward the original levels. This suggests that the impact of this conflict may not be long lasting and cooperation can return to normal levels after a few months. This may be especially true in the context of Northern Ireland where people might be somewhat desensitized to sectarian violence with inter-group tension always present and low-level conflict between the two groups being a frequent occurrence.

In contrast with previous studies, the results from this study do not support the hypothesis that conflict promotes cooperation. In relation to Gneezy's and Fessler's (2011) results, the differences may be related to the fact that they use ultimatum and trust games to measure punishment and trusting behavior, while this study focuses on cooperative behavior. The behavior in ultimatum and trust games is difficult to interpret as it can stem from various psychological mechanisms other than altruistic preferences, such as status seeking, spite, or fairness (Dawes et al., 2007; Brañas-Garza et al., 2014). The concepts of cooperation and punishment are often assumed to be linked (Boyd et al., 2003; Bernhard et al., 2006; Hauert et al., 2007), but recent evidence points to a lack of association between propensity of cooperation and punishment within individuals (Yamagishi et al., 2012; Brañas-Garza et al., 2014; Peysakhovich et al., 2014). It is possible that conflict increases the propensity to punish, although it is not clear whether this would be directed toward the in-group or the out-group (Bernhard et al., 2006; Mathew and Boyd, 2011) and no out-group members were included in the Israel study.

Our study is the first to test the longitudinal effect of conflict on cooperation using real-world measures and groups, so it is also possible that previous results are artifacts from the use of cross-sectional economic games. The validity of traditional economic games as measures of human cooperative behavior has started to be questioned with multiple studies failing to find correlations between behavior in experimental games and in real life measures in the field (Laury and Taylor, 2006; Levitt and List, 2007; Benz and Meier, 2008). These games may cue the subjects to play according to specific real life cooperative social norms that are not particularly relevant to the hypothesis being tested (Laury and Taylor, 2006; Binmore, 2010). Furthermore, participants in games may not understand the cost and benefits inherent to the games' processes making it difficult to interpret their behavior (Burton-Chellew and West, 2013). This study highlights the importance of capturing real life cooperative behavior using natural experiments in the field to understand the effects of inter-group conflict on cooperation.

Current theoretical models of parochial altruism build on the assumption that increased pro-sociality or in-group altruism results in a group advantage in a situation of inter-group conflict by setting the cost accrued by the in-group altruist to always be lower than the benefit accrued to the group (or another individual in the group) (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011). Lab based empirical results supporting these models are also based on a game payoff structure in which altruistic groups always out-compete selfish groups in a situation of group conflict (Bornstein, 2003; Puurtinen and Mappes, 2009). Here, we question whether these assumptions are realistic and argue that it is not generalizable to all situations where groups are in competition or conflict. In the case of Catholics and Protestants in Northern Ireland, recent conflict between the two groups has mostly been over issues related to schools, housing and symbolic displays (Nolan, 2012); it is possible that in these situations increased group cohesion does not provide a group advantage, or that the individual cost of helping the group out-weighs the potential group advantage. Conflict appears to have a negative impact on cooperation, arguably in a similar way to other adverse environments that affect levels of inter-personal trust—such as income deprivation and low levels of social capital—and that also lead to a reduction in cooperative behavior (Putnam, 2000; Holland et al., 2012).

The results from this study show that the effects of conflict may be multi-faceted. The levels of sectarian threat as measured by the survey questions appear to mostly affect cooperation toward the out-group, corroborating the results from the cross-sectional data in Silva and Mace (2014). However, the effects of conflict may not be entirely captured by these survey measures as the riots lead to a reduction of all types of cooperation and not just toward the out-group. It is also important to note that the sample sizes used are small (although comparable to Gneezy and Fessler, 2011) and as result the findings from this study alone are not conclusive. These results do, however, strengthen the findings from the cross-sectional data (Silva and Mace, 2014) and together do not support the models of inter-group conflict and parochial altruism, putting into question the theoretical idea that cooperation could have evolved through increased group pay-offs via inter-group conflict (Bowles et al., 2003; Choi and Bowles, 2007; García and van den Bergh, 2011).

In situations of conflict, individuals may not necessarily behave altruistically and there are perhaps more evolutionarily parsimonious explanations for the behavior of individuals during conflict, such as reputation concerns (Nowak and Sigmund, 1998), enforcement mechanisms (Mathew and Boyd, 2011) or hierarchical dominance structures (Guala, 2012). It may also be that only behaviors directly related to the threat in

question (such as joining the army in the face of military invasion) are influenced by external threat, rather than more generalized cooperation. A recent review of inter-group warfare in small scale societies found that individual benefits—mostly related to reputation and status—better explain the intensity of conflict than group-level benefits (Glowacki and Wrangham, 2013). Our findings also suggest that altruism may not be an important motivation in inter-group conflict and demonstrate how conflict can have a pernicious effect on all types of cooperative behavior.

ACKNOWLEDGMENTS

This project was supported by the Fundação para a Ciência e a Tecnologia.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: http://journal.frontiersin.org/article/10.3389/fpsyg.2015.01790

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frontiers in Psychology

OPINION
published: 07 July 2015
doi: 10.3389/fpsyg.2015.00861

Economic games and social neuroscience methods can help elucidate the psychology of parochial altruism

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Keywords: parochial altruism, ingroup favouritism, preferences, beliefs, economic games, oxytocin, testosterone

OPEN ACCESS

Edited by:
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Reviewed by:
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The University of Queensland, Australia
Mikael Puurtinen,
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Specialty section:
This article was submitted to Evolutionary Psychology and Neuroscience, a section of the journal Frontiers in Psychology

Received: *11 May 2015*
Accepted: *11 June 2015*
Published: *07 July 2015*

Citation:
Everett JAC, Faber NS, Crockett MJ and De Dreu CKW (2015) Economic games and social neuroscience methods can help elucidate the psychology of parochial altruism. Front. Psychol. 6:861. doi: 10.3389/fpsyg.2015.00861

The success of *Homo sapiens* can in large part be attributed to their highly social nature, and particularly their ability to live and work together in extended social groups. Throughout history, humans have undergone sacrifices to both advance and defend the interests of fellow group members against non-group members. Intrigued by this, researchers from multiple disciplines have attempted to explain the psychological origins and processes of *parochial altruism*: the well-documented tendency for increased cooperation and prosocial behavior within the boundaries of a group (akin to ingroup love, and ingroup favoritism), and second, the propensity to reject, derogate, and even harm outgroup members (akin to "outgroup hate," e.g., Tajfel and Turner, 1979; Brewer, 1999; Hewstone et al., 2002; Choi and Bowles, 2007; De Dreu et al., 2014; Rusch, 2014). Befitting its centrality to a wide range of human social endeavors, parochial altruism is manifested in a large variety of contexts that may differ psychologically. Sometimes, group members help others to achieve a positive outcome (e.g., gain money); and sometimes group members help others avoid a negative outcome (e.g., avoid being robbed). Sometimes, group members conflict over a new resource (e.g., status; money; land) that is currently "unclaimed"; and sometimes they conflict over a resource that is already held by one group.

In this paper, we take stock of exciting new directions and methods in the psychological study of parochial altruism. We argue that to enrich our understanding of the psychological processes underlying parochial altruism, researchers could (continue to) incorporate methods and insights developed and popularized in adjacent disciplines, such as behavioral economics and social neuroscience. First, we highlight how the discipline of behavioral economics and its associated methodology of *economic games* can enrich our psychological understanding of parochial altruism through exploring the manifestation of, and psychological mechanisms driving, parochial altruism in both gains and losses contexts. Second, we consider the social neuroscientific approach, highlighting how research into neuromodulators has advanced our understanding of parochial altruism by outlining differential influences of the neuromodulators testosterone and oxytocin on ingroup cooperation and outgroup discrimination. Given that parochial altruism is at root an interdisciplinary phenomenon, it would be a pity if each discipline that studies it does so from and within its own silo. With greater incorporation of these new directions in parochial altruism, scientists can enrich their understanding as to when, why, and how people help members of their own group more than other groups, and even harm members of other groups.

Economic Games: Structuring Conflict and Cooperation

In recent years, the study of parochial altruism—in evolutionary biology, behavioral economics, and social psychology—has increasingly drawn on the methodology of economic games, inspired by both psychological research (e.g., Tajfel, 1970; Pruitt and Kimmel, 1977; Komorita and Parks, 1995) and behavioral game theory (e.g., Camerer, 2003). In a conscious tradeoff, researchers using economic games sacrifice the real-world validity of field-based studies in social psychology and opt instead for tightly controlled experiments that test how people make incentive-compatible choices concerning resource distribution. The core feature of economic games is their simplicity, where one player usually has a strictly dominant strategy if they are self-interested, and where this selfish strategy is salient and easy to understand in all cases. If and when a player does not choose this selfish strategy we can infer that they did not do so because they had some other motive (e.g., Deutsch, 1949; Messick and McClintock, 1968; Fehr et al., 2006). This possibility to being able to draw strong inferences about the extent to which individual sacrifice immediate self-interest is a clear advantage offered by economic games, relative to some other paradigms used to study intergroup discrimination and parochial altruism.

Within this approach, the conceptual apparatus of preferences and beliefs is particularly useful for explaining intergroup prosocial behavior (Everett et al., 2015). Preferences refer to a person's tendency toward certain behaviors and outcomes in a given context based on the expected utility to be derived from them, while beliefs refer to the expectations that people have about uncertain outcomes in a game (Camerer, 2003). In any given context, preferences and beliefs can either promote or hinder prosocial behavior. Economic games differ in the extent to which they measure both general and specific preferences and/or beliefs. In some games, behavior can be explained primarily by social preferences—for example, preferences involving fairness (e.g., the *Dictator Game*: Kahneman et al., 1986), or preferences to either help ingroup members or to also (or even exclusively) harm outgroup members (e.g., *Intergroup Prisoner's Dilemma—Maximizing Difference*: Halevy et al., 2012; Buttelmann and Böhm, 2014). In other games, behavior seems driven primarily (but often not exclusively) by beliefs—for example beliefs regarding trustworthiness (e.g., the *Trust Game*: Berg et al., 1995), reciprocity (e.g., Public Good Games: e.g., De Cremer and Van Vugt, 1999; Fischbacher et al., 2001), or expectations of norm enforcement (e.g,. the *Ultimatum Game*: Güth et al., 1982). But to what extent is parochial altruism driven by preferences and beliefs? Economic games allow researchers to address this question not only by teasing apart dominant processes in explaining parochial altruism, but also by elucidating moderating conditions (e.g., whether a decision is public or private; or whether the behavior is costly or cheap). A central advantage of economic games is that their simple structure allows small modifications that change some psychologically relevant feature while preserving the incentive and payment structure. For example, researchers can manipulate whether games are played publicly or anonymously (e.g., Yamagishi and Mifune, 2008), whether games are repeated or played just once (e.g., Gächter et al., 2010), or whether the games are played with artificial or real groups (e.g., Jackson, 2008).

One example of how using economic games has the potential to elucidate basic psychological mechanisms operating in parochial altruism comes from the consideration of loss aversion. For example, most experimental research on parochial altruism has looked at situations in which a participant helps an ingroup (vs. outgroup) member gain something positive. Yet one of the most established findings in cognitive psychology—loss aversion—is that people are more sensitive to losses than gains such that people strongly prefer avoiding losses than achieving gains (Kahneman and Tversky, 1979). Research suggests that because inflicting a loss is seen as more harmful and fairness-violating than withholding a gain, individuals are more likely to help another avoid experiencing a harmful outcome than they are to help provide a positive outcome (De Dreu and Kret, 2015). Moreover, in an intergroup context, outgroup hate is typically manifested as the absence of helping, rather than inflicting harm (Mummendey and Otten, 1998; Weisel and Böhm, 2015). But how might specifically ingroup-favoring prosocial behavior be differentially manifested in losses vs. gains context? This remains an open question, for almost no research has examined the effects of gains and losses in specifically intergroup contexts, nor the extent to which ingroup favoring prosocial behavior is driven by the same preference or belief-based psychological processes in gains and losses contexts. Given the centrality of parochial altruism to any psychological or evolutionary discussion of prosocial behavior and morality, this constitutes an exciting opportunity for future research. For example, it might be predicted that because fairness concerns are more salient in interactions with ingroup members than with outgroup members, and because fairness concerns are more prominent in loss contexts than in gain contexts, that people might show greater ingroup favoritism in loss contexts.

Neuromodulation of Parochial Altruism

Social neuroscience has already made substantial advances in our understanding of parochial altruism, particularly in elucidating whether and how different brain regions, such as the amygdala and the prefrontal cortex are associated with group-related behavior (for recent reviews see Molenberghs, 2013; Amodio, 2014; Baumgartner et al., 2014; Cikara and Van Bavel, 2014). Comparatively little work has focused on how specific neuromodulators underlie parochial altruism, even though this could be a promising new direction to understand parochial altruism. If parochial altruism has fitness functionality that explains its evolution (Rusch, 2014) such that humans are biologically prepared for parochial altruism, then humans may have neuromodulatory systems that regulate this behavior. Consequently, understanding these neuromodulatory systems can contribute to the understanding of intergroup prosocial behavior. Here, we discuss the role of two neuromodulators in parochial altruism, oxytocin and testosterone.

Oxytocin

Recent work has implicated the neuropeptide *oxytocin* in parochial altruism (De Dreu et al., 2014; De Dreu and Kret, 2015). Oxytocin has a range of effects on the brain, body, and behavior, but here we focus on two of its psychological effects: reducing anxiety and fear of betrayal, and up-regulating positive regard for others (De Dreu and Kret, 2015).

To the extent that oxytocin is a neurohormonal system involved in parochial altruism, pharmacological studies involving administration of oxytocin to participants playing economic games should give insight into the biological and psychological processes underlying parochial altruism. Directly testing whether oxytocin influences ingroup love or outgroup hate, De Dreu et al. (2010) looked at behavior in economic games (the Intergroup Prisoner's Dilemma—Maximizing Difference and between-group Prisoners Dilemmas) under conditions of intranasal oxytocin administration vs. placebo. They found that across three experiments, individuals administered oxytocin displayed more ingroup trust and ingroup love, but did not display more outgroup hate and outgroup distrust, relative to the placebo condition. In a follow-up, De Dreu et al. (2012) took advantage of advantages of the possibility offered by economic games to make simple changes to the structure of the intergroup conflict game so as to elucidate whether oxytocin-modulated outgroup competition was motivated by a desire to protect oneself and/or fellow group-members against high threat outgroups. Results again showed that oxytocin-modulated parochial altruism was driven by a "tend-and-defend" functionality—under oxytocin individuals display more ingroup love and stronger tendency to aggressively protect oneself and fellow group members against threatening outsiders. In addition, and of key relevance here, is that this work, and the specific methodological approach of combining advantages of economic games and social neuroscience methods, can provide new and exciting insights into both psychological and biological mechanisms underlying parochial altruism.

Testosterone

A second neuromodulator that has been implicated in parochial altruism is testosterone. Testosterone is a steroid hormone that is secreted in mammals in the male testes and, to a lesser extent, the female ovaries. Testosterone has been shown to be associated with reduced trust (Bos et al., 2012), vicarious experiences of group success (Bernhardt et al., 1998), status seeking (Eisenegger et al., 2011), dominance (Mehta and Josephs, 2010), and aggression (see Montoya et al., 2012 for a review).

Comparatively little research has explored the role that testosterone plays in parochial altruism specifically, yet it seems likely that testosterone—like oxytocin—plays an important role. Consider, for example, a recent study by Diekhof et al. (2014), who had fifty male soccer fans with a strong group identity respond to Ultimatum Game (UG) offers that were either fair or unfair, and proposed either from an ingroup member or by fans of one of three other teams (two soccer teams and one cricket team). In the UG, one player makes a proposal to the other player (the responder) for how to divide a pool of money between them. If the responder accepts the proposed split, both players receive the allocated money. However, if the responder rejects the proposed split, both players receive nothing. Behavior in the UG is typically seen as reflecting norm enforcement of "fair" allocations. Results showed that unfair offers were rejected more frequently than fair offers, and that overall rejection rates increased with social distance to the outgroups (ingroup < neutral outgroup < unknown outgroup < antagonist outgroup). Furthermore, endogenous testosterone was associated with lower rejection of ingroup offers and with increased rejection of outgroup offers—especially in the context of explicit intergroup competition. High endogenous testosterone, then, underlies parochial altruism through increased prosocial tendencies during interactions with the ingroup, as well as through an escalation of costly outgroup hostility in intergroup competition. Apart from advancing our knowledge of how testosterone underlies parochial altruism, such work highlights the way in which ingroup love and outgroup hate are distinct but complementary psychological processes explaining parochial altruism. Moreover, such work highlights the importance of the context in which the intergroup prosocial behavior takes place: oftentimes it is not merely the presence of group members that leads to parochial altruism, but rather the existence of intergroup competition. As with oxytocin, it would be fruitful for future research to explore further this relationship by examining the way in which administration of testosterone influences ingroup love and outgroup hate in economic games.

Conclusion

Parochial altruism is a complex and interdisciplinary phenomenon, and so it stands to reason that to understand parochial altruism we should turn to a range of different techniques from a range of disciplines. Economic games are especially useful due to their isolation of distinct preference and belief-based psychological processes (e.g., Everett et al., 2015) and the way in which they can be easily accommodated with other methods, such as pharmacological manipulations, that highlight how humans are biologically prepared for parochial altruism and have neuromodulatory systems that regulate this behavior (e.g., De Dreu and Kret, 2015). Through greater incorporation of different methodologies and perspectives—such as the use of economic games—, researchers can come to a more complete understanding of the psychological processes that explain how, when, and why people help members of their own group more than others.

Author Note

JE drafted the paper and NF, MC, and CD provided comments and suggested revisions.

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