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Abstract

The scale of violent intergroup conflict in humans is astonishingly large compared to other mammals [1, 2, 3, 4]. This capacity for war is closely linked to our exceptionally cooperative abilities [5, 6]. The parochial altruism model formally describes how within-group cooperation and between-group competition could be dynamically intertwined [7, 8, 9]. However, whether this influential model correctly captures the fast-paced processes of preference adaptation in humans has not been systematically scrutinized yet. Here, we develop the psychometric toolkit required for this task and test key assumptions and predictions of the model in groups involved in real intergroup conflicts of varying intensities (total N = 1,121). Conceptually corroborating the model, we find that our new measures which cleanly separate interindividual altruism from intergroup parochialism characterize individuals' preferences better than previous metrics and improve behavioral predictions of contributions to conflict. However, our results also show that parochialism varies for different outgroups, a finding that is not anticipated by the model. Thus, the five studies we report here provide new methods for studying individual- and group-level social preferences in the context of intergroup conflict and present new evidence that can inform substantive theoretical improvement.

Keywords: *intergroup conflict, altruism, parochialism, discrimination, preference change, social value orientation*

Introduction

Human history abounds with intergroup violence and war [1, 2]. Such hostilities between groups are created by, and attractive for, individuals with extreme levels of certain dispositional tendencies [10, 11]. However, conflicts and the collateral damages they cause shape the mentality of entire populations. The resulting expanding spirals of hatred, violence, counter-hatred, and counter-violence can be considered 'psychological war traps' [4, 12, 13, 14].

Choi and Bowles [7] developed an influential model describing dynamics that may unfold in populations composed of agents who are able to exhibit different behaviors toward in- and outgroup members. Their model assumes that agents' behavior is determined by the combination of two independent *preferences*. The first one describes how an individual values their own outcomes relative to those of ingroup members and distinguishes *altruistic* individuals, who contribute to producing public goods for the ingroup at a personal cost, from non-altruistic individuals. The second preference concerns the comparison of ingroup to outgroup members' welfare and distinguishes *parochial* individuals, who avoid peaceful interactions with outgroups and provoke costly intergroup

conflicts, from tolerant individuals. Over longer time horizons, then, the model predicts evolving populations to oscillate between two states: relatively peaceful times during which tolerant non-altruists are most prevalent, and warlike times during which parochial altruists are more prevalent.

Importantly, the model can be interpreted in two ways, which have developed distinct lives in the literature since. For one, there is the 'biological' interpretation of the model as describing populations' underlying genetic makeup and its Darwinian evolution over long timeframes. Choi and Bowles [7] and Bowles [8] emphasized this interpretation and proposed several auxiliary assumptions to calibrate their model to this context. However, these auxiliary assumptions were heavily criticized later, to the effect that most scholars consider the biological interpretation of the model implausible today [3, 9, 15, 16, 17].

However, unaffected by these weaknesses of the biological interpretation, the alternative interpretation of the model describes the more fast-paced dynamics of *preference* change during individual agents' lifetimes or across a few generations. Whether this 'cultural' interpretation applies to, and predicts, the fundamental dynamics of preference adaptation in the context of war and peace remains to be scrutinized. This is what we do in the present paper.

Research design and existing evidence

Thorough scrutiny of the cultural interpretation of the parochial altruism model requires testing two of the model's key assumptions (which we label 'A1' and 'A2') as well as two of its main predictions (labeled 'P1' and 'P2'). This section introduces them in turn and relates them to the previous literature.

Assumption A1: "Altruism and parochialism are separate social preferences."

First, the model assumes that individuals' social preferences can be meaningfully decomposed along two dimensions: (individual-level) altruism/non-altruism, and (group-level) parochialism/tolerance. Previous research has shown that (individual-level) altruistic *preferences* and both altruistic and parochial *behaviors* vary substantially across individuals and populations [18, 19, 20, 21], but missed out on assessing (group-level) parochial *preferences* independently from (individual-level) altruistic *preferences*. To overcome this limitation and allow for a conclusive empirical test of assumption A1, we devise a novel measurement toolkit, consisting of separate measures of individual-level and group-level social preferences. We validate the measures' psychometric properties in a convenience sample in Study 1. All subsequent studies then represent consecutive tests of assumption A1.

Assumption A2: "Altruism and parochialism independently contribute to predicting intergroup aggression."

Second, the model assumes that a specific combination of altruistic and parochial preferences within individual agents predicts their harmful *behavior* toward outgroups in intergroup conflict settings. A handful of studies using economic games supposed to model (certain aspects of) intergroup conflict tested the predictive power of (individual-level) altruistic preferences for ingroup beneficial *behavior* that imposes costs on outgroups [22, 23, 24]. Critically, however, these studies are silent on the independent role of (group-level) parochial preferences. Therefore, in Studies 2 & 3, we test

assumption A2 by eliciting altruistic and parochial preferences from members of natural groups with high rivalry and investigating their predictive power for behavior in economic games that allow participants to inflict (financial) damage on outgroup members.

Predictions P1 & P2: "Exposure to intergroup conflict affects individuals' preferences, such that they become more altruistic (P1) and more parochial (P2)."

In addition to these assumptions, the model predicts *preference change* during longer phases of conflict (vs. peace), such that individuals become more (vs. less) parochial and more (vs. less) altruistic over time. Note that P1 and P2 also translate into predictions about the prevalence of different *preference types* at the population level—i.e., we should observe more parochial altruists in populations that are directly affected by intergroup conflicts relative to populations in more peaceful environments.

Consistent with P1, it is quite robustly established that exposure to intergroup conflict increases individuals' prosocial *behavior* toward ingroup members [25, 26, 27]. However, whether conflict exposure also influences individuals' individual- and group-level *preferences*, i.e., increases altruism and parochialism, is much less clear [28, 29, 30]. To close this gap, we provide quasi-experimental tests of predictions P1 and P2. Specifically, in Study 4, we examine altruistic and parochial preferences in the field among participants with high vs. low recent exposure to real-world violent intergroup conflict with a fixed outgroup. We then follow up with a preregistered quasi-experiment in Study 5, recruiting a U.S.-sample to examine how the intensity of conflict that participants perceive for different pairings of in- and outgroups affects their altruistic and parochial preferences.

Measuring individual- and group-level social preferences

The conceptual complexity resulting from the combination of individual- and group-level social preferences in addition to a somewhat lax treatment of the distinction between (revealed) *preferences* and (observed) *behavior* has produced considerable terminological confusion in the literature [16]. Therefore, we start with a simple formalization to sharpen our terminological framework.

Assume an agent's preferences to be described by the utility function

$$u(x, x_i, x_o) = x + \alpha \cdot x_i + \gamma \cdot x_o, \qquad \text{(eq. 1)}$$

wherein x is the agent's own payoff, x_i is a representative ingroup member's payoff, x_o is a representative outgroup member's payoff, and $\alpha, \gamma \in [-\infty, \infty]$ are the individual's preference parameters. Think of this agent's *individual-level* social preferences as being captured in α—just as in the formalization of Social Value Orientation (SVO) by Murphy and Ackermann [31]. Accordingly, an agent's individual-social preferences can be positive ($\alpha > 0$, commonly referred to as 'prosocial' or 'altruistic'), nil ($\alpha = 0$, 'individualistic'/'selfish'), or negative ($\alpha < 0$, 'spiteful'/'competitive'). For all decisions which do not affect marked outgroup members, only α matters, as in these cases $x_o = 0$. If $x_o \neq 0$, however, the agent's *group-level* social preferences become relevant. Think of these as being captured in γ and label them 'ingroup favoring' for $\gamma < \alpha$, 'universalist' if $\gamma = \alpha$, and 'outgroup favoring' if $\gamma > \alpha$. Note that this is a definition of γ relative to α. Beyond this, the sign of γ captures additional information: for $\gamma < 0$ we have 'outgroup hate,' $\gamma = 0$ 'outgroup neglect,' and $\gamma > 0$ 'outgroup love.'

In building our new measurement toolkit for separately assessing individual- and group-level social preferences, we capitalize on one of the most established measures of individual-level social preferences: the SVO slider measure [31, 32]. In its traditional form, the SVO slider measure is a one-dimensional measure of α. We label this dimension 'iSVO' here. The iSVO measure is composed of six items, in which individuals make dictator game-like allocations affecting their own, think x in eq. 1, and an unknown ingroup member's payoff, think x_i. As the second dimension in our toolkit, we add a measure of group-level social preferences, 'gSVO,' analogous to γ in eq. 1, but also capturing the relation of γ to α. Importantly, gSVO is elicited by using the same dictator games as in the iSVO measure, but fixing $x = 0$ and asking participants to make their six allocation decisions for a marked ingroup member, think x_i, and a marked outgroup member, think x_o. Figure 1 maps the resulting two-dimensional preference space for iSVO and gSVO and shows all data points we collected across Studies 1-5. Note that iSVO and gSVO are continuous measures; additionally, Fig. 1 also shows the theoretically derived thresholds separating four discrete preference types along each dimension. For iSVO, we adopt the canonical labels for these types from Murphy, Ackermann, and Handgraaf [32]. For gSVO, we suggest the labels 'xenial', 'universalist', 'weakly parochial', and 'strongly parochial' [33, 16].

Study 1: Psychometric validation

To validate the psychometric properties of our measurement toolkit, we recruited German university students to participate in an online study with two measurement occasions, T1 and T2, two weeks apart from each other ($N = 156$ participants completed both measurements). In both measurements, we assessed participants' individual-level social preferences using the iSVO measure as well as their group-level social preferences using the gSVO measure to evaluate both measures' test-retest reliability. As the marker of in- and outgroup membership, we used students' faculty membership (engineering vs. business). We further elicited several established measures to test their relations with the new gSVO measure, aiming to additionally test its convergent and construct validity (see Methods).

Results showed considerable and comparable stability of the levels of both iSVO and gSVO across measurement occasions: $r = .66$ with the continuous score and 83.3% test-retest classification to the same preference type for iSVO, and $r = .58$ and 79.5% for gSVO. Regarding convergent validity, as expected, gSVO (at T1, with larger values indicating higher xenialism) was negatively associated with stated motivations to maximize the ingroup member's absolute and relative payoff ('max ingroup': $r = -.67$ and 'max rel ingroup': $r = -.33$, respectively), and positively associated with motivations to minimize differences in payoffs between the ingroup and the outgroup member ('min diff': $r = .28$) and to maximize their joint payoffs ('max joint ingroup': $r = .34$ and 'max joint outgroup': $r = .36$, respectively) [34]. We also found a medium-sized correlation ($r = .31$) of gSVO with Honesty-Humility from the HEXACO personality model [35], which captures individual differences in being fair and genuine towards others, and with Social Dominance Orientation ($r = -.29$), which captures individual differences in the support for social hierarchies [36, 37]. Overall, these results support our novel measure's test-retest reliability, convergent validity, and construct validity (see Supplement S1 for further analyses and correlations with trait measures).

Moreover, with respect to assumption A1, we observed a considerable correlation of iSVO and

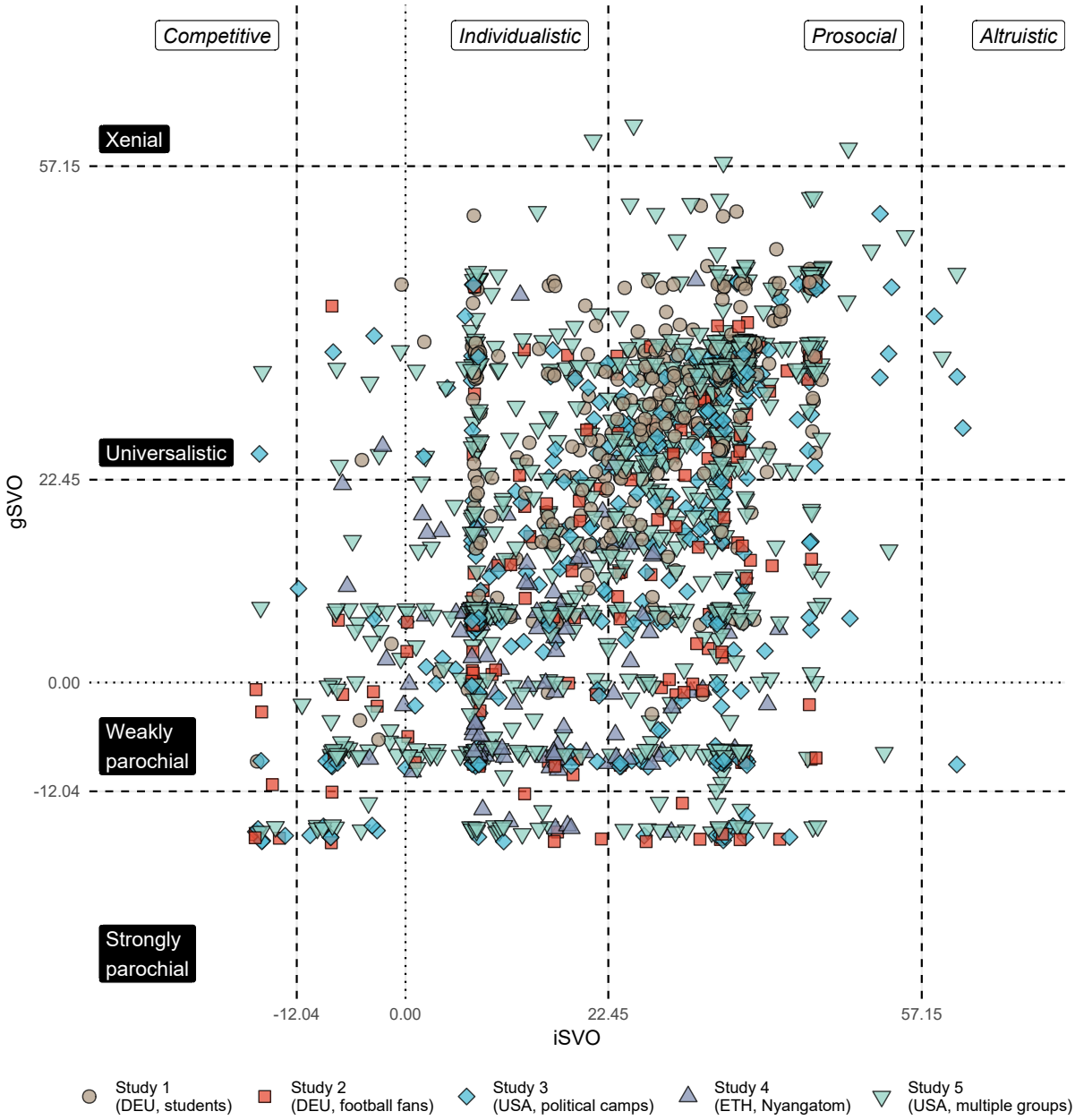

Figure 1: *Scatter plot of all iSVO and gSVO data points collected across the five studies ($N = 2,156$, multiple observations per participant possible); mild jitter was added for better display (up to $\pm$ 0.5 units in each dimension). Noteworthy observations are: (i) almost the entire space of possible iSVO/gSVO combinations is populated; (ii) the bulk of all iSVO/gSVO combinations falls into the four categories of 'universal/individualist' (8%), 'weakly-parochial/individualist' (29%), 'universal/prosocial' (43%), and 'weakly-parochial/prosocial' (14%).*

gSVO in this sample (T1: $r = .54$, $P < .001$, $n_{T1} = 171$; T2: $r = .43$, $P < .001$, $n_{T2} = 156$), but also meaningful variance along both dimensions and in the resulting distribution of preference types. This suggests that by including both iSVO and gSVO in our new measurement toolkit, we are able to assess and dissociate individual- and group-level social preferences.

Studies 2 and 3: Predicting outgroup harm in intergroup conflict games

To test whether iSVO and gSVO both independently predict behavior in intergroup conflicts (and thus show predictive validity), i.e., assumption A2, we conducted two online experiments, sampling participants from natural groups with strong ingroup identification and between-group hostility in contemporary industrialized societies.

Study 2: German football fans

Participants in Study 2 were $N = 193$ supporters of one of two German first-league football clubs rivaling in a long-standing local derby. Football is one of the most popular sports in Germany and many fans are highly committed to their club. Many organized fan groups exist and hostilities among members of conflicting supporter groups are common [38]. For Study 2, we invited fans of Borussia Dortmund and Schalke 04, two clubs which have one of the fiercest derby traditions.

Participants completed the iSVO and gSVO measures and further played a monetarily incentivized intergroup conflict game, the 'Intergroup Prisoner's Dilemma (IPD)' [39]. People who supported the same club were assigned to three-person groups, each of which interacted with another three-person group composed of supporters of the opponent club. Participants were asked to distribute a monetary endowment between a private pool, benefiting only themselves, and a between-group pool, benefiting ingroup members while simultaneously harming outgroup members. Contributions to the between-group pool thus model engagement in intergroup conflict. Note, however, that conflict engagement in the IPD does not fully reveal an individual's preferences: contributions to the between-group pool can be the result of high iSVO, low gSVO, or any suitable combination of the two—see Supplement S3 for a formal breakdown of this fact.

Figure 2 (Panel A) plots participants' contributions to the between-group pool as a function of iSVO and gSVO. When we regress contributions to the between-group pool on iSVO, gSVO, and relevant controls (age and gender), both iSVO ($\beta = 0.34$, $B = 0.08$, $SE = 0.02$, $P < .001$) and gSVO ($\beta = -0.31$, $B = -0.05$, $SE = 0.02$, $P = .001$) show independent effects and no significant interaction. Accordingly, iSVO and gSVO predict choices that simultaneously harm outgroup members while benefiting ingroup members at a cost to the individual better jointly than each of the preferences does alone (model comparison F's > 16.1, P's < 0.001). Moreover, in line with theory, participants with relatively higher levels of iSVO and lower levels of gSVO were particularly inclined to engage in intergroup conflict (for full regression models, see Supplement S2, Table S5).

Thus, corroborating assumption A2, Study 2 supports that iSVO and gSVO both contribute to explaining conflict engagement. With respect to assumption A1, we again observe a correlation of iSVO and gSVO ($r = .46$, $P < .001$), but also more variance along both dimensions and in the resulting distribution of preference types.

Study 3: U.S. political camps

Importantly, in the game used in Study 2, participants can only benefit their ingroup when simultaneously harming the outgroup; thus, the game requires participants to choose between selfish and strongly parochially altruistic *behavior*. Theoretically, though, and in more realistic settings, group members may also be able to benefit the ingroup without having to harm the outgroup, that is, to

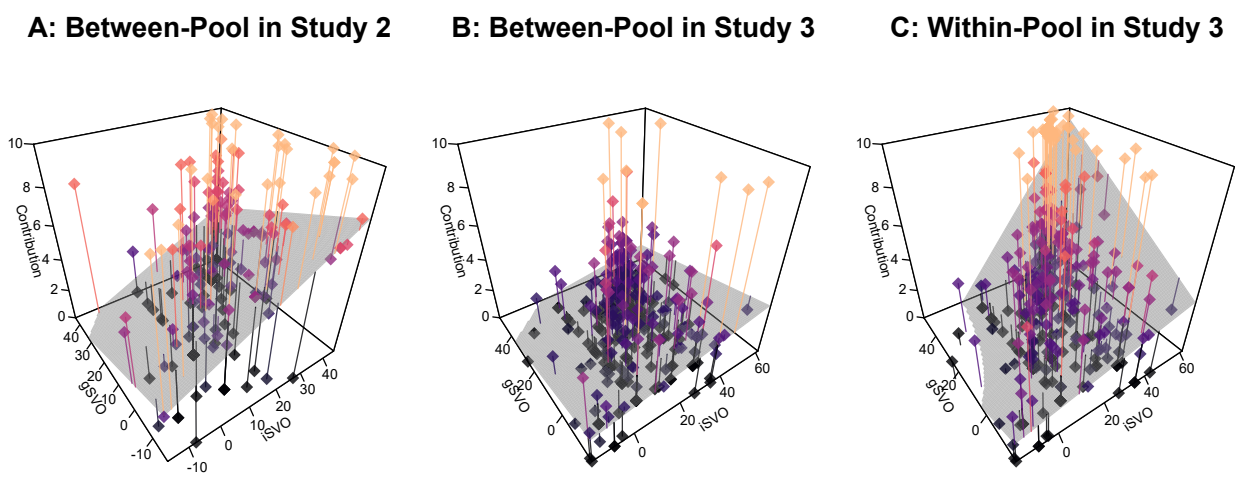

Figure 2: *Costly individual contributions to group-beneficial investment options (z-axis) as a function of iSVO (x-axis) and gSVO (y-axis). A: Contributions to the between-pool in Study 2; B&C: Contributions to the between- and within-pool, respectively, in Study 3. The grey planes indicate predictions by the respectively best fitting regression model from Table S5. Importantly, iSVO and gSVO interact significantly and positively in explaining contributions to the 'peaceful' within-group pool in Study 3, but not in explaining contributions to the outgroup harming between-pool.*

engage in *weakly* parochially altruistic behavior [16]. Study 3 therefore sought to replicate and extend the findings from Study 2 to contexts where participants can also benefit their ingroup peacefully.

The between-group conflict game in Study 3, the 'Intergroup Prisoner's Dilemma-Maximizing Difference (IPD-MD),' accordingly adds a third option allowing participants to choose between behaviors representing weakly or strongly parochially altruistic behavior. Herein, the peaceful, ingroup-beneficial option consists of costly contributions to a within-group pool which produces a public good for the ingroup but does not impose any costs on the outgroup [40]; also see Methods. Note that, based on our two-dimensional preference framework, and relative to Study 2, we now can expect a behavioral separation of preference types: Particularly those individuals who score high on both iSVO *and* gSVO should contribute to the within-group pool. In contrast, individuals who score high on iSVO but low on gSVO should aim to harm the outgroup by contributing to the between-group pool (also see Supplement S3).

Participants were $N = 425$ U.S. Americans identifying as supporters of either the Democratic or the Republican party. These parties are characterized by sharp ideological divides along the liberal-conservative spectrum, which addresses issues such as foreign policy, climate protection, and healthcare. These groups thus constitute strong group identities with between-group hostility [41, 42]. All participants were assigned to three-person groups composed of supporters of the same party that interacted with another group composed of supporters of the opposing party.

Replicating our main result from Study 2, we again found that both iSVO ($\beta = 0.15$, $B = 0.02$, $SE = 0.01$, $P = .008$) and gSVO ($\beta = -0.24$, $B = -0.03$, $SE = 0.01$, $P < .001$) predicted higher contributions to the between-group pool (for full regression models, see Supplement S3, Table S5). That is, participants scoring high on iSVO and low on gSVO again showed the highest level of conflict engagement. Moreover, both iSVO and gSVO predicted peaceful within-group cooperation consistent with theory: for both higher levels of iSVO ($\beta = 0.38$, $B = 0.08$, $SE = 0.01$, $P < .001$) and higher levels of gSVO ($\beta = 0.13$, $B = 0.02$, $SE = 0.01$, $P = 0.01$) contributions to the within-group pool were higher. Beyond this, iSVO and gSVO showed a significant, positive interaction in explaining this

behavior (see Supplement S2, Table S5); Fig. 2 visualizes our results for Studies 2 and 3.

Thus, corroborating assumptions A1 and A2 of the parochial altruism model once more, Study 3 provides evidence that iSVO and gSVO both contribute to explaining conflict engagement; with respect to assumption A1, we again observe a correlation of iSVO and gSVO ($r = .54$, $P < .001$) as well as substantial variance along both dimensions and in the resulting distribution of preference types. Crucially, the ability of our two-dimensional measure to explain the behavioral separation of preference types in the IPD-MD demonstrates the measure's superiority relative to previous one-dimensional approaches, which confounded individuals' individual- and group-level social preferences.

Studies 4 and 5: Testing for preference change in different conflict settings

Having found quite robust support for assumptions A1 and A2 of the parochial altruism model, we next move to quasi-experimental tests of predictions P1 and P2. To this end, we measured iSVO and gSVO in contexts marked by varying degrees of intergroup conflict, testing whether differences in conflict exposure or intensity are systematically associated with different levels of iSVO and gSVO in the respective participants.

Study 4: Exposure to real-world violent intergroup conflict in Ethiopia

We conducted a lab-in-the-field study with members of the Nyangatom, a small-scale society in Ethiopia, living near the borders with Kenya and South Sudan. The Nyangatom regularly engage in cross-border conflicts with other ethnic groups, often resulting in fatalities [28, 43, 44]. Indeed, most Nyangatom have been directly affected by violent conflict, such as having a family member killed or injured. Yet, there are considerable differences in the extent of direct conflict exposure depending on where individuals live. We leveraged this heterogeneity to quasi-experimentally manipulate conflict exposure across participants.

We sampled Nyangatom participants from both a border area in close proximity to hostile groups' settlements ($n_B = 61$) and an interior area several days of walking from neighboring groups ($n_I = 50$). Participants from the border area reported higher involvement in violent conflicts in the previous six months than participants from the interior area (54% vs. 16%, test of proportions $\chi^2 = 15.53$, $P < 0.001$). We assessed participants' iSVO with an unknown other Nyangatom as the recipient. Participants' gSVO was elicited with an unknown other Nyangatom and an unknown member of a specific, hostile outgroup as the recipients.

Contrary to prediction P2, we found no difference in gSVO when comparing individuals from border and interior areas (independent samples t-test: $t(109) = 0.36$, $P = .717$, $d = 0.07$). In fact, the vast majority of our participants in this study, 100 vs. 11, fell into the same gSVO class of 'weakly parochial' (also see Fig. 3). Individuals from the border area did show higher levels of iSVO, though (independent samples t-test: $t(109) = 2.11$, $P = .038$, $d = 0.40$). Furthermore, a significant TOST equivalence test ($t(98.41) = -1.67$, $P = 0.049$), for $d = 0.4$ suggests that if gSVO differed for border and interior participants, this difference did not reach the magnitude of the observed difference in iSVO.

Nonetheless, when we regressed self-reported conflict involvement on iSVO, gSVO, and their

interaction, controlling for approximate age, we found that iSVO ($B = 0.07$, $SE = 0.02$, $P = .004$), gSVO ($B = 0.08$, $SE = 0.03$, $P = .024$), and their interaction ($B = -0.004$, $SE = 0.002$, $P = .018$) were associated with conflict involvement (see Supplement S4 for details). In particular, our regression results imply that participants with high levels of gSVO, i.e., the relatively more universalistic, show a reduced association of iSVO with conflict involvement compared to relatively more parochial participants.

Thus, supporting prediction P1 in this sample, we replicated earlier findings of a positive link between conflict exposure and ingroup prosociality [25, 26, 27]. Moreover, unlike in Studies 1-3, iSVO and gSVO were not correlated in our Nyangatom participants ($r = -0.01$, $P = 0.938$). This provides additional evidence for the independence of the two preference dimensions, thus again supporting assumption A1.

With respect to P2, our quasi-experimental manipulation did not uncover systematic differences in gSVO between more (vs. less) conflict-exposed participants. Nonetheless, the interaction we uncovered indicates that gSVO could moderate the known link between ingroup prosociality and conflict exposure. Alternatively, given the correlational nature of our evidence on individual conflict involvement in Study 4, this pattern could be due to self-selection into conflict by relatively more parochial and more prosocial individuals, which would corroborate A2.

At the same time, almost all of our participants in Study 4 showed high levels of parochialism toward members of the specific outgroup we had selected. Thus, a possible explanation for our null-finding with respect to a more direct effect of conflict exposure on gSVO is that our sampling strategy failed to result in sufficient variance in the intensity of intergroup conflict. That is, most of our participants might have perceived the conflict with the target outgroup as intense, irrespective of where they lived at the time.

Study 5: Perceived intensity of conflict between groups in the U.S.

To overcome this limitation of Study 4, we followed up with our preregistered Study 5, in which we quasi-experimentally manipulated the perceived intensity of conflict between groups. This allows us to test if iSVO and gSVO systematically differ as a function of perceived conflict intensity, independent of an individual's degree of exposure to a conflict.

In Study 5 we presented $N = 236$ U.S.-Americans with five pairings of groups (men/women, meat-eaters/non-meat-eaters, republicans/democrats, Christians/Muslims, and supporters of pro-life/pro-choice). Participants who did not identify with exactly one of the groups in each pair as their respective ingroup were excluded from further participation. Participants then rated the degree of conflict they perceived between the groups in each pair and their degrees of identification with the respective ingroups.

Our quasi-experimental manipulation of conflict intensity consisted in selecting two pairs of groups for each participant based on their individual ratings: the pair with the highest and the pair with the lowest perceived degree of intergroup conflict. For each of these two pairs per participant, we elicited iSVO and gSVO.

Our manipulation of perceived between-group conflict intensity showed a significant effect on gSVO in the hypothesized direction ($M_{high} = 18.54$ vs. $M_{low} = 21.18$, paired $t = 2.18$, $P = 0.03$, $d = 0.14$). We did not find any significant effect of the manipulation on iSVO in Study 5, though

($M_{high} = 24.72$ vs. $M_{low} = 25.14$, paired $t = -0.61$, $P = 0.54$, $d = 0.06$; also see Supplement S5). Furthermore, a significant TOST equivalence test ($t(235) = -1.66$, $P = 0.05$), for $d = 0.15$ suggests that if iSVO differed for participants' 'high conflict' vs. 'low conflict' pairings, this difference unlikely reached the magnitude of the observed difference in gSVO. As in Studies 1-3, iSVO and gSVO showed substantial correlations at both high and low levels of perceived conflict (r's ≥ 0.50, P's < 0.001).

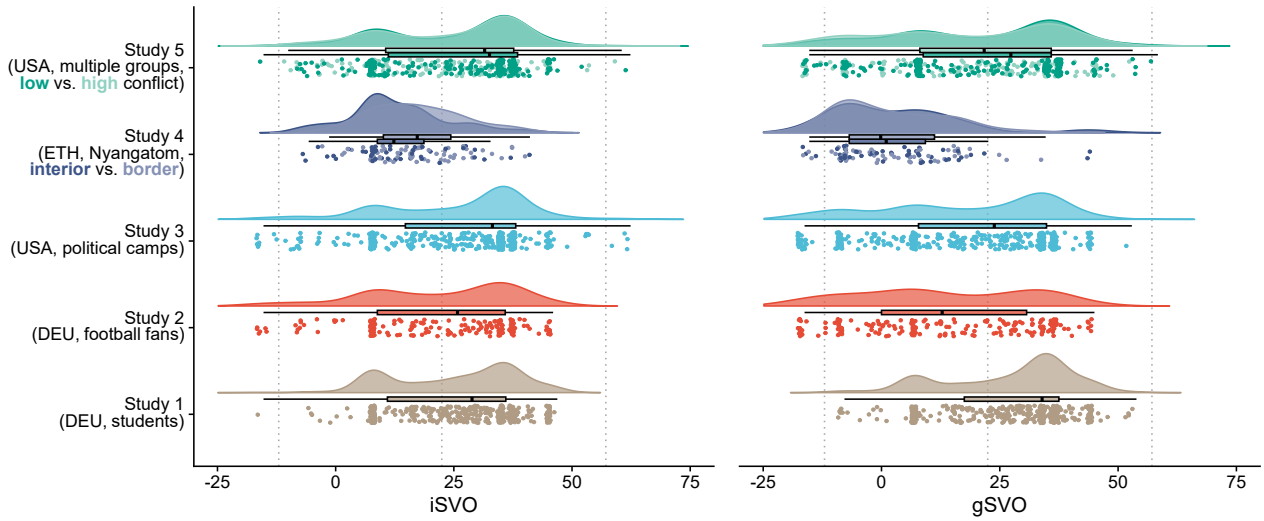

Figure 3: *Rain cloud plot of the distributions of all iSVO and gSVO data points collected across the five studies; broken down by subgroups for Studies 4 and 5 ($N = 2,156$, multiple observations per participant possible); mild jitter was added for better display (up to $\pm$ 0.1 units). Significant differences were found for: (i) iSVO levels in Study 4, and (ii) gSVO levels in Study 5; see main text for details.*

Discussion

Across five studies collecting original data in different cultural contexts and from natural groups with ongoing conflicts of varying intensities, we find that our two-dimensional measurement toolkit of iSVO and gSVO characterizes individuals' social preference types better than previous one-dimensional metrics and that it improves behavioral predictions of outgroup harm in economic games. These findings corroborate two central assumptions of the parochial altruism model: individuals' preferences are indeed separable along the two dimensions required by the theory (A1); and both dimensions meaningfully and independently contribute to explaining intergroup behavior (A2).

With regard to the theoretically predicted dynamics of preference change, our results provide a more nuanced picture, though. If the original model was correct, individuals exposed to conflict should show higher altruism (P2) and higher parochialism (P2), and vice versa for exposure to peace. Supporting P1 but not P2 within a field setting, we find in Study 4 that gSVO does not vary as sensitively with exposure to violent intergroup conflict as iSVO does. However, our successful attempt to manipulate gSVO quasi-experimentally in Study 5 still supports the idea that (perceived) conflict intensity does affect gSVO.

Interestingly, in Study 5 we also observe that gSVO varies within-person for different in- and outgroup pairings, while iSVO does not. This finding is incommensurable with the original parochial altruism model, which does not allow for varying attitudes toward different in- and outgroups, i.e., in different conflicts. Moreover, our finding that iSVO was generally higher in our samples

with lower exposure to intergroup violence and unaffected by our manipulation of conflict intensity suggests that P1 does not hold in general, but needs to be interpreted in narrower terms. Our novel toolkit allows to better connect the parochial altruism model with empirical data, providing new opportunities for theory development and evidence-based refinement.

Our research comes with some limitations. First, as the individual levels of both iSVO and gSVO are endogenous, drawing causal inferences is naturally difficult. Studies 2 & 3 try to overcome this limitation partly by employing quasi-experimental manipulations. Future research may further investigate changes in both individual-level altruistic preferences and group-level parochial preferences as a function of exogenous shocks to the conflict environment. Second, although we study the prevalence and impact of such preferences across various samples and group contexts, future research needs to determine the generalizability of the findings across further geographical and psychological contexts.

In conclusion, our systematic scrutiny of the central assumptions and predictions of the parochial altruism model as applied to malleable preferences contributes two main insights. For one, individual-level altruistic preferences (i.e., iSVO) and group-level parochial preferences (i.e., gSVO) need to be elicited and modelled separately in future micro-level work on intergroup conflict, as they differentially contribute to explaining individual behavior in this context. Second, iSVO and gSVO differ in their dynamics and their scopes: our results suggest that iSVO changes with conflict exposure but not, or much less, with conflict intensity, while gSVO changes with (perceived) conflict intensity but not, or much less, with conflict exposure. The details of this intricate interplay of individual- and group-level preferences with conflict exposure and perceived conflict intensity need to be more systematically scrutinized in future work. The present paper provides the psychometric tools required for this task to enrich and stimulate future research on the very nature of human intergroup conflict.

Methods

In this section we succinctly explain our methods and procedures for Studies 1-5. Additional information and analyses are provided in the Supplements. The instruction materials, original data, and executable analyses script can be accessed via osf.io/rg6vy/.

Study 1: German students

Participants and design

Sample size and recruitment. The study was conducted online and consisted of two measurement occasions, T1 and T2, carried out two weeks apart from each other. Sample size was determined via an a-priori power analysis [45], aiming to detect medium-sized correlations ($r = .21$; based on the mean correlation in social and personality psychology; see [46]) between the social preference measures and the validation measures in a t-test for correlations with sufficient power ($\alpha = .05$, 1-$\beta = .80$). This resulted in a required sample size of 175 participants. To compensate for potential exclusions, a total of 196 participants started the study at T1, 179 of whom completed T1 and 164 of whom completed both T1 and T2 (attrition rate $\approx$ 16%). We further excluded 8 participants who (i) failed to correctly respond to one or more comprehension questions, (ii) completed the HEXACO

personality inventory in less than two minutes (i.e., < 2 seconds per item on average), which implies non-serious responding, or (iii) indicated having not fully understood all tasks, as assessed through a self-report item ("I have understood all tasks."). Thus, the final sample consisted of $N = 171$ participants at T1 and $N = 156$ participants at T2 (final attrition rate ≈ 9 %). They were students from the participant pool of a large German university (of those who completed T1: 41.5% female; age: $M = 23.37$, $SD = 2.71$).

Consent and compensation. All participants provided informed consent. Participants received a flat fee of EUR 8 for completion of both parts of the study, which took about 40 minutes in total. In addition, one third of participants (i.e., $n = 55$) was randomly selected to receive an additional bonus payment based on the decisions made during the study (see below); additional behavior-contingent payment ranged from EUR 8.70 to 11.50 ($M = 10.20$, $SD = 0.74$).

Measures

Group identification. Participants were students from either the faculty of engineering or the faculty of business. To ensure that individuals identified with their ingroup (i.e., students from the respective faculty), at T1 we used four items measuring participants' strength of group identification devised by Doosje, Ellemers, and Spears [47] (e.g., "I am glad to be a [group membership] student.", 7-point scale ranging from 1 = "fully disagree" to 7 = "fully agree"). We computed the responses' mean value (Cronbach's α = .83).

iSVO and gSVO: *Standard measures*. At both T1 and T2, participants completed the standard iSVO slider measure [32] as a measure of their individual-level social preferences as well as the novel gSVO slider measure as a measure of their group-level social preferences. Measurement order was counter-balanced across participants. The iSVO slider measure assesses individuals' general concern for others' welfare relative to own welfare. Specifically, participants make several decisions about how to allocate monetary tokens between themselves and another unknown person (i.e., the recipient). Each of the six (primary) items consists of nine behavioral choice options, with varying tokens for oneself (ranging between 50 and 100) and for the recipient (ranging between 15 and 100; see Table S1 for an overview of all items). The sum of tokens allocated to oneself versus the recipient allows for calculating a continuous iSVO angle that expresses an individual's level of concern for others' welfare. This angle ranges from *competitiveness* (iSVO $< -12.04°$; maximizing the own relative payoff and minimizing the recipient's payoff at personal cost) to *individualism* ($-12.04° \leq$ iSVO $\leq 22.45°$; maximizing the own absolute payoff), *prosociality* ($22.45° <$ iSVO $\leq 57.15°$; minimizing differences between the own and the recipient's payoff and maximizing the joint payoffs at personal cost), and *altruism* (iSVO $> 57.15°$; maximizing the recipient's payoff at personal cost).

In the experiment, the tokens allocated in the iSVO measure were transformed into monetary payoffs at a conversion of 100 tokens = EUR 0.50 and paid anonymously to participants. All participants completed the iSVO measure in the role of the allocator, and it was later randomly determined whether a participant was paid in the role of the allocator or the recipient. To this end, participants were randomly matched with another participant in the opposite role. Exactly one of the six iSVO items became payoff-relevant.

Additionally, we developed the gSVO slider measure to specifically assess participants' concern

for the ingroup's welfare relative to an outgroup's welfare, without involving any personal stakes (thus ruling out individual-level altruistic preferences as a determinant of choices). Specifically, participants allocate monetary tokens between an unknown ingroup member and an unknown outgroup member. Other than that, the six items are identical to the standard iSVO slider measure. Thus, much like for the iSVO slider measure, participants' allocation choices allow for calculation of a continuous score (gSVO angle) ranging from *strong parochialism* (gSVO $< -12.04°$; maximizing the ingroup member's relative payoff and minimizing the outgroup member's payoff at cost of the ingroup member) to *weak parochialism* ($-12.04° \leq$ gSVO $\leq 22.45°$; maximizing the ingroup member's absolute payoff), *universalism* ($22.45° <$ gSVO $\leq 57.15°$; minimizing the difference between the ingroup and the outgroup member's payoff and maximizing the joint payoffs at cost to the ingroup member), and *xenialism* (maximizing the outgroup member's payoff at the cost of the ingroup member).

All participants completed this measure in the role of a (third-party) allocator, and it was later randomly determined whether they were paid in the role of the allocator, the ingroup recipient, or the outgroup recipient. When participants were selected as an allocator, they received a fixed payoff of EUR 2. When they were selected as a recipient, their payoff was determined by the choices of another randomly matched ingroup or outgroup member. Exactly one of the six gSVO items became payoff-relevant.

iSVO and gSVO: *Coin measures*. At T2, we additionally used adapted coin-versions of the iSVO and gSVO measures as described above (shorthand: 'iSVOcoin' and 'gSVOcoin'). These versions were developed in order to use them in populations with low numeracy (such as in Study 4). Therefore, we scaled down the tokens to be allocated in each option from maximally 100 (as in the standard measures) to maximally 20 in the coin measures. Moreover, tokens were presented visually as coins such that no extra conversion step to a monetary payoff was necessary. We allowed payoffs to be either "full" coins (i.e., integers) or "halved" coins (i.e., digits with one decimal place of .5). Additionally, we reduced the number of options for each item from 9 to 7. Note that all these changes retained the item selectivity of the standard scale, that is, each change in payoff due to selecting a different choice option in the iSVO and gSVO standard measures also resulted in a payoff change in the iSVO and gSVO coin measures, respectively. As such, the ordinal structure of payoffs in the standard and the coin measures has the same monotonic increase (or decrease) between the choice options, allowing transformation of responses to the original angle score. The adapted items are shown in Table S1.

Between-group orientations. At T1, we assessed the between-group orientations ('BGO') measure as devised by Bornstein et al. [34]. The BGO measure comprises 10 items asking participants to allocate monetary tokens between an ingroup member and an outgroup member (similar to the gSVO measure just described). Each of the seven choice options represents a distinct motivation: maximization of the ingroup member's absolute payoff ('max ingroup'), maximization of the ingroup member's payoff relative to the outgroup member ('max rel ingroup'), minimization of the payoff difference between ingroup and outgroup member ('min diff'), maximization of the outgroup member's absolute payoff ('max outgroup'), maximization of the outgroup member's payoff relative to the ingroup member ('max rel outgroup'), maximization of the ingroup and outgroup members'

joint payoff favoring the ingroup member ('max joint ingroup'), and maximization of the ingroup and outgroup members' joint payoff favoring the outgroup member ('max joint outgroup'). The total number of choices in line with a specific motivation (ranging from 0 to 10) serves as an indicator of the importance of this specific motivation.

In the experiment, the tokens allocated were transformed into monetary payoffs at a conversion of 100 tokens = EUR 0.50. All participants completed the measure in the role of the allocator, and it was later randomly determined whether they were paid in the role of the allocator, the ingroup recipient, or the outgroup recipient. The allocator received a fixed payoff of EUR 1.00. Recipients received the payoff resulting from the allocator's decision. Exactly one item became payoff-relevant.

HEXACO personality traits. At T1, participants completed the German 60-item version of the HEXACO Personality Inventory-Revised ([48]; available online at https://www.hexaco.org. The HEXACO-60 comprises 10 items to assess each of the six personality dimensions conceptualized in this personality model: honesty-humility (e.g., "I would never accept a bribe, even if it were very large."), emotionality (e.g., "I sometimes can't help worrying about little things."), extraversion (e.g., "When I'm in a group of people, I'm often the one who speaks on behalf of the group."), agreeableness (e.g., "I rarely hold a grudge, even against people who have badly wronged me."), conscientiousness (e.g., "I plan ahead and organize things, to avoid scrambling at the last minute."), and openness to experience (e.g., "I would enjoy creating a work of art, such as a novel, a song, or a painting."). Items are answered on a 5-point Likert-type scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". The 10 items for each personality trait were averaged (after recoding reversed-scored items) to form independent subscales (Cronbach's α: honesty-humility = .79, emotionality = .75, extraversion = .83, agreeableness = .70, conscientiousness = .76, openness to experience = .73).

Social Dominance Orientation. At T1, we used an adapted German translation [36] of the Social Dominance Orientation ('SDO') scale devised by Pratto et al. [37] to assess participants' SDO. The SDO scale comprises 12 items assessing individuals' preference for group-based hierarchies within a social system on a 5-point Likert-type scale ranging from 1 = "do not agree at all" to 5 = "do fully agree". Sample items are "To get ahead in life, it is sometimes necessary to step on other groups." and "In an ideal world, all nations would be equal." (reversed-scored). Cronbach's α for the SDO scale (i.e., mean value of participants' responses on the 12 items) was .89.

Group Authoritarianism. Participants' beliefs about the appropriate relationship between groups and their individual members was assessed at T1 based on the group authoritarianism ('GA') measure by Stellmacher and Petzel [49]. This scale includes 12 items that are answered on a 6-point Likert-type scale ranging from 1 = "do not agree at all" to 6 = "do fully agree". Sample items are "A student should do nothing that contradicts norms or rules of his own department" or "Instructions of a leader of a university department should be obeyed under all circumstances." Cronbach's α for the scale (mean value across the 12 responses) was .84.

Identification With All Humanity (IWAH). We measured participants' identification with all humanity ('IWAH') at T1, conceptualized as an individual's concern for global harmony and equality. We used the 9-item measure originally devised by Macfarlan et al. [50] in the German translation

by Reese, Proch, and Finn [51]. The questions are answered on a 5-point Likert-type scale with varying labels, e.g., "How close do you feel to each of the following groups?" (groups: "people in my community", "Germans", "people all over the world;" scale ranging from 1 = "not at all close" to 5 = "very close"). For each of the three levels (i.e., personal, own country, people all over the world), we computed the mean value. Cronbach's α was .79 for the personal level as well as for the country level, and .83 for the global level.

Procedure

Upon invitation, participants were informed that the study consisted of two parts, with a time lag of two weeks in between. We assessed pseudonymized codes that participants had to provide at both measurement occasions to allow matching their data. After completion of T2, participants could obtain their individual payment at the researchers' offices using their individual pseudonymized code.

For the elicitation of group-level preferences, we relied on natural groups. We recruited social and business sciences students and engineering sciences students. Students of other subjects were not eligible for participation. At T1, participants were asked to which of the two groups they belonged. We then assessed their identification with their respective ingroup with the group identification scale. We referred to this group membership (and the corresponding ingroup and outgroup categories) in the gSVO, gSVOcoin, and BGO measures.

Participants first completed the iSVO and gSVO standard measures in a counter-balanced order (both at T1 and T2). Afterwards, they completed all other measures in randomized order (i.e., HEXACO-60, SDO, GA, and IWAH at T1; iSVOcoin and gSVOcoin at T2). After completion of all measures at T1, participants answered several questions on how seriously they participated in the study. Feedback about payoffs (and thus information about other participants' decisions) was only given upon completion of T2.

Study 2: German football fans

Participants and design

Sample size and recruitment. The sample size was determined based on an a-priori power analysis [45], assuming a small to medium-sized correlation ($r = .21$; based on the mean correlation in social and personality psychology; see [46]) between the social preference measures and contribution behavior in the between-group conflict game ($\alpha = .05$, $1 - \beta = .80$). This resulted in a required sample size of 175 participants. We thus recruited 194 fans of the German soccer clubs Borussia Dortmund and Schalke 04 via supporter clubs, social network groups, and university mailing lists. One participant had to be excluded due to indicating insufficient German language skills, resulting in a final sample size of $N = 193$ participants. The mean age of participants was $M = 26.37$ ($SD = 6.48$), 22.8% ($n = 44$) were female, and 70.5% ($n = 136$) were university students.

Consent and compensation. All participants provided informed consent. Thirty participants were randomly selected to receive behavior-contingent payment based on the payoffs in the iSVO and gSVO measures as well as in the between-group conflict game. Lottery winners were informed via

email, and payments were realized via bank transfer. Individual payoffs ranged from EUR 7.50 to EUR 28.80 ($M = 17.74$, $SD = 5.32$).

Measures and validation

iSVO and gSVO. Participants completed the iSVO slider measure, with the recipient being an "unknown other person." In the gSVO measure, the recipients were a "supporter of [ingroup team]" and a "supporter of [outgroup team]". The tokens allocated in the iSVO and gSVO measure were transformed into monetary payoffs at a conversion of 100 tokens = EUR 10.00. It was randomly determined whether participants were paid in the role of the allocator or the recipient in the iSVO measure, and in the role of the allocator, the ingroup recipient, or the outgroup recipient in the gSVO measure. The allocator in the gSVO measure received a fixed payoff of EUR 10.00. One item of each the iSVO and the gSVO measure was randomly selected for payment.

Between-group conflict game. To measure participants' engagement in between-group conflict, they played the Intergroup Prisoner's Dilemma ('IPD') game [39]. Participants were assigned to a three-person group and matched with another three-person group. They received a personal endowment of 10 monetary tokens (worth EUR 10.00) and could decide how many tokens (if any) to contribute to a private pool, benefiting only themselves, and to a between-group pool, benefiting all ingroup members and harmed all outgroup members at personal cost (see S2 for a formal description).

Further measures. We used a four-item measure of group identification devised by Doosje, Ellemers, and Spears [47] (e.g., "I am glad to be a supporter of [ingroup team].", 7-point scale ranging from 1 = "fully disagree" to 7 = "fully agree"). Cronbach's α for the scale (mean value across the four responses) was .82. Results are reported Supplement S2.

Procedure

Participants were invited to participate in an online study on decision making involving soccer fans. Only supporters of *Borussia Dortmund* or *Schalke 04* were eligible for participation. After the group identification measure, participants completed the iSVO and gSVO measures in counterbalanced order, followed by the IPD game. Before participants made their contribution decision in the IPD, they received a numerical example of potential game outcomes and had to correctly answer three comprehension questions about the rules of the game. At the end, participants were free to leave their email address to participate in the lottery for payment.

Study 3: U.S. political camps

Participants and design

Sample size and recruitment. Because we expected only small contributions to the between-group conflict pool in the between-group conflict game based on previous research [22, 52, 42], we aimed to double our sample size relative to Study 2. A total of 447 U.S. participants completed the study after invitation via Prolific (https://www.prolific.com/). We excluded $n = 22$ participants because they indicated having not fully understood all tasks, as assessed through a self-report item ("I

have understood all tasks."). Thus, the final sample size was $N = 425$ participants. All results are robust to including these participants (as can be checked in the replication materials available from osf.io/rg6vy/). The participants' mean age was $M = 30.71$ ($SD = 10.35$) years, 42.6% ($n = 181$) were female, and 72.7% ($n = 309$) had a college/university or higher degree.

Consent and compensation. All participants provided informed consent. All participants received a fixed payment of USD 1.30 for completion of the 15-minute study. Additionally, 140 participants were randomly selected to receive behavior-contingent payment based on the payoffs in the iSVO and gSVO measures as well as in the between-group conflict game. Bonus payments were executed via Prolific, ranging from USD 0.89 to USD 3.26 ($M = 2.23$, $SD = 0.38$).

Measures

iSVO and gSVO. Participants completed the iSVO slider measure, with the recipient being an "unknown other person" or a member of the ingroup, that is, a supporter of the same political party as the participant. This manipulation was implemented to investigate whether the level of altruism differs between neutral and ingroup recipients (it did not; see Supplement S3). In the gSVO measure, the recipients were a "supporter of [political ingroup]" and a "supporter of [political outgroup]". The tokens allocated in the iSVO and gSVO measure were transformed into monetary payoffs at a conversion of 100 tokens = USD 1.00. The allocator in the gSVO measure received a fixed payoff of USD 1.00. All other procedures regarding measurement and payment were identical to Study 2.

Between-group conflict game. To measure participants' engagement in between-group conflict, they played the Intergroup Prisoner's Dilemma-Maximizing Difference ('IPD-MD') game [40]. The game is identical to the IPD as in Study 2, with the exception that it adds one additional behavioral option: In addition to the options of keeping tokens or contributing them to the between-group pool, participants can also contribute to a within-group pool, benefiting all ingroup members (without harming the outgroup members) at personal cost (see Supplement S3 for a formal description).

Further measures. We used the same four-item measure of identification with one's ingroup as in Study 2 to assess participants' identification with the political group they supported. Cronbach's α for the scale (mean value across the four responses) was .92. Results are reported in Supplement S3.

Procedure

The procedure was the same as in Study 2, with the exception that the group identification measure was assessed after the between-group conflict game. Furthermore, at the end of the survey, participants answered several questions on how seriously they participated in the study.

Study 4: Conflict exposure in the Nyangatom

Participants and design

Sample size and recruitment. We aimed to recruit as many participants as possible within the study period; data analysis only started after data collection was finished. Participants were $N = 111$ male Nyangatom. Participants were recruited in the Kibish area and in the Omo River area near the

town of Kangaten and asked to participate in a study on decision making. The Nyangatom area is approximately 2,600 km^2 within Ethiopia and borders Kenya (Ilemi Triangle) and South Sudan. The border with Kenya is marked by frequent between-group conflict primarily in the form of livestock raids that are often violent [53]. Other areas, particularly by the Omo river, show between-group violence only very rarely due to the distance from other groups and the difficulties of traveling by foot.

To ensure considerable variability in individuals' conflict exposure, we thus sampled from two inhabited areas of Nyangatom. For the high-conflict area, we selected $n = 61$ participants living in the Kibish region near Lokorhlam. This area is approximately two kilometers from the Kibish river and border with Kenya, and it is subject to frequent livestock raids. For example, Yntiso [53] reports nine raids that resulted in 15 deaths during an 18-month period prior to the study. For our low-conflict sample, we randomly selected $n = 50$ participants living in the Omo River area near the town of Kangaten, which is only very rarely subject to between-group violence, having no raids or deaths due to between-group violence in the same 18-month period prior to the study [53]. The approximate age of the participants (as estimated by the experimenter) was $M = 26.17$ ($SD = 7.28$, range $= [18, 50]$), all participants were male.

Consent and compensation. Verbal informed consent was obtained from all participants. Participants received a show-up fee of ETB 15.00 (about USD 0.50 at the time) and could earn additional payment depending on their choices in the behavioral tasks; the aggregated mean payment was $M = 58.63$ ETB ($SD = 5.71$, range $= [40, 68]$; about USD 2.00) for the study.

Measures

iSVO and gSVO. Participants completed coin-versions of the iSVO and the gSVO slider measure (see above). All participants completed the iSVO measure in the role of the allocator and their own payoff depended on their own choice. All participants completed the gSVO measure in the role of a (third-party) allocator and their own payoff was fixed to ETB 15.00, irrespective of the choices they made. The recipients of either measure did not take part as participants in the study (they were recruited separately) to reduce potential reciprocity concerns in choices. One item from each measure was randomly selected for payment.

Conflict exposure. We assessed participant's personal conflict exposure by asking them about the number of conflicts (battles or raids) they had participated in the previous six months or previous three years. As the Nyangatom do not use a calendar, memory over a longer period may probably be distorted, arguably yielding the measures of conflict participation in the previous three years less reliable. Therefore, we built two groups based on participants' responses for the previous six months: those reporting to have experienced one or more conflicts in the past six months (conflict exposure $= 1$) and those reporting not having experienced any conflict (conflict exposure $= 0$).

Procedure

The study was conducted in Nyangatom language. Each participant was tested individually. The experimenter first explained the purpose of the study and asked for participants' consent. Each participant received verbal instructions for the behavioral allocation (slider) tasks. It was explained

that their choices may affect their own and/or other individuals' payment (depending on the measure, see above). The order of the iSVO and gSVO measures was counter-balanced across participants.

For each item, the participants received seven cards—each representing one option—in a fixed, horizontal order (the order was the same as in the original measure by Murphy, Ackermann, and Handgraaf [32], see Table S1). Items were distinguishable for the experimenter by different colors (Figure S1 shows an example choice card). Participants had time to thoroughly examine the behavioral options and then indicated their choice by pointing to one of the cards or by picking it up. After participants indicated their choice, the experimenter placed the selected choice card in an envelope. Eventually, there were six choice cards in the envelope (one for each item of the measure). After participants completed the iSVO and the gSVO measures, they were asked about their individual conflict history.

Study 5: Perceived conflict intensity, U.S. sample

Study 5 was preregistered via aspredicted.org (ID: 140998) and conducted online. This study had two conditions, 'perceived conflict' and 'identification', each with $N = 236$ participants. We only describe the results of the 'perceived conflict' condition in the main text. Procedures and measures for both conditions are described below. Results of the 'identification' condition are reported in Supplement S5.

Participants and design

Sample size and recruitment. An a-priori power analysis for testing our hypotheses with a mixed model ANOVA (two groups and two measurements, assumed correlation between measurements: 0.5), aiming to detect a small effect of $f = 0.1$ at $\alpha = 0.05$ and power $1 - \beta = 0.99$, suggested a minimum sample size of 462 participants, so we aimed to recruit 500 participants. After planned exclusions (see below), a total of $N = 472$ remaining participants, all from the U.S., completed the study after invitation via Prolific. Their mean age was $M = 45.05$ ($SD = 14.42$) years, 50.0% ($n = 236$) were female, and 71.8% ($n = 339$) had a college/university degree.

Consent and compensation. All participants provided informed consent and received a fixed payment of USD 1.50 for completion of the 10-minute survey. Additionally, 100 participants were randomly selected to receive behavior-contingent payment based on the payoffs in the iSVO and gSVO measures. Bonus payments were executed via Prolific, ranging from USD 1.89 to USD 4.20 ($M = 3.30$, $SD = 0.61$).

Procedure

After providing demographic information, participants first saw the five group pairings (gender: male vs. female, political affiliation: democrat vs. republican, diet: meat vs. no-meat, views on abortion: pro-life vs. pro-choice, and religious affiliation: Christian vs. Muslim). For each pairing, participants indicated one group as the one that they identify with; participants who indicated that they did not identify with exactly one of the groups for each pair were excluded from further participation and could, thus, not complete the survey. Next, depending on experimental condition ('perceived conflict' vs. 'identification'), participants were asked to rank the five groups they indicated

according to either (*i*) the levels of conflict they perceived between the two groups within each pair (on a 5-point scale from 'very high' to 'very low') in the 'perceived conflict' condition, or (*ii*) these groups' respective importance for participants' self-conception (from 'least central to whom you are' to 'most central to whom you are' on a 5-point scale) in the 'identification' condition, respectively.

Measures

Individual-level and group-level social preferences. In the 'perceived conflict' condition, participants completed two sets of iSVO and gSVO slider measures. One for the group pairing which the individual participants ranked highest on perceived conflict and one for the pairing they ranked lowest. Presentation order was counterbalanced across participants. Analogously, in the 'identification' condition, participants completed one set of iSVO and gSVO slider measures for the pairing containing their most important ingroup and one for the pairing containing their least important ingroup. The tokens allocated in the iSVO and gSVO measures were transformed into monetary payoffs at a conversion of 100 tokens = USD 1.00. The allocator in the gSVO measures received a fixed payoff of USD 1.00.

Backmatter

This article has accompanying supplementary materials. For ease of peer review, we include them below. All supplements are supposed to appear as an online supplement upon publication.

- S1: Supplementary information and results for Study 1
- S2: Supplementary information and results for Study 2
- S3: Supplementary information and results for Study 3
- S4: Supplementary information and results for Study 4
- S5: Supplementary information and results for Study 5

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Declarations

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- **Conflict of interests:** The authors declare no conflict of interest.
- **Ethics:** Ethics approval was obtained for Study 4 (Committee on the Use of Human Subjects in Research at Harvard University, IRB protocol number: F-17615-105) and Study 5 (Departmental Review Board of the Department of Occupational, Economic, and Social Psychology at the

University of Vienna, IRB protocol number: 2023/W/014A). For Studies 1-3, no ethics approval was required by the authors' institutions, as treatment of participants was in agreement with the ethical guidelines of the German Research Foundation (*Deutsche Forschungsgemeinschaft*) and the German Psychological Society (*Deutsche Gesellschaft für Psychologie*). Across all studies, all participants gave their informed consent to participate voluntarily, were not deceived, were compensated in line with local standards, and were assured that all statistical analyses and reports would be anonymous.

- **Preregistration:** The preregistration of Study 5 is available from aspredicted.org (ID: 140998).
- **Data availability:** All data, experimental instructions, and an executable analysis script can be accessed via osf.io/rg6vy/
- **Open Science statement:** The authors confirm that, for all experiments, they have reported all measures, conditions, data exclusions, and how they determined their sample sizes.
- **Author contributions:** The authors consider their contributions equal and are listed in alphabetical order.

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Supplements

S1 Supplementary information and results for Study 1

iSVO / gSVO slider measures

Table S1 shows the iSVO and gSVO sliders that we used across studies. The coin versions were used in Study 4 to make the task easier for participants with low numeracy. Fig. S1 shows a sample coin slider: number 1, alternative 2. The coins shown are Ethiopian Birrs.

Table S1: *The six (primary) iSVO/gSVO slider measure items in standard and coin versions. Note: Standard version sliders are the same as the Social Value Orientation sliders devised by Murphy, Ackermann, and Handgraaf [S1]. In the iSVO measure, 'self' refers to the payoff of the allocator and 'other' refers to the payoff of an unknown recipient (who can be ingroup or total stranger, i.e., have no marked group membership). In the gSVO measure, 'ingroup' refers to the payoff of an unknown ingroup member and 'outgroup' refers to the payoff of an unknown outgroup member. Choice alternatives were presented in horizontal format in the order in which they appear in the table (from left to right). In the coin version, each payoff value was shown as a picture of multiple coins, e.g., 17 = 17 coins were displayed (Study 1: EUR 0.10 coins; Study 4: ETB 1.00 coins). Also see Figure S1.*

		Alternatives, *standard version*									Alternatives, *coin version*						
Slider		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1	self / ingroup	85	85	85	85	85	85	85	85	85	17	17	17	17	17	17	17
	other / outgrp.	85	76	68	59	50	41	33	24	15	17	14.5	12.5	10	7.5	5.5	3
2	self / ingroup	85	87	89	91	93	94	96	98	100	17	17.5	18	18.5	19	19.5	20
	other / outgrp.	15	19	24	28	33	37	41	46	50	3	4	5.5	6.5	7.5	9	10
3	self / ingroup	50	54	59	63	68	72	76	81	85	10	11	12.5	13.5	14.5	16	17
	other / outgrp.	100	98	96	94	93	91	89	87	85	20	19.5	19	18.5	18	17.5	17
4	self / ingroup	50	54	59	63	68	72	76	81	85	10	11	12.5	13.5	14.5	16	17
	other / outgrp.	100	89	79	68	58	47	36	26	15	20	17	14.5	11.5	8.5	6	3
5	self / ingroup	100	94	88	81	75	69	63	56	50	20	18.5	16.5	15	13.5	11.5	10
	other / outgrp.	50	56	63	69	75	81	88	94	100	10	11.5	13.5	15	16.5	18.5	20
6	self / ingroup	100	98	96	94	93	91	89	87	85	20	19.5	19	18.5	18	17.5	17
	other / outgrp.	50	54	59	63	68	72	76	81	85	10	11	12.5	13.5	14.5	16	17

Additional results

Manipulation check. Results supported that individuals identified with their groups (engineering vs. business students) to some extent, as the mean of the ingroup identification scale ($M = 4.65$, $SD = 1.25$) significantly exceeded the scale's midpoint of 4 (one sample t-test: $t(170) = 6.74$, $P < .001$).

Test-retest reliability. There was a considerable level of stability in the levels of iSVO and gSVO across measurement occasions ($r_{T1 \to T2} = .66$ for iSVO and $r_{T1 \to T2} = .58$ for gSVO). Likewise, there was a high overlap in the classification of individuals into types based on the theoretically derived cut-offs suggested by [S1]. Specifically, 83.3% of participants were assigned to the same iSVO class and 79.5% of participants were assigned to the same gSVO class across measurement occasions. Moreover, of those 28 participants whose iSVO classification changed, 27 were classified to a neighboring category in the second measurement (e.g., change from 'competitive' to 'individualistic'); only a

single participant 'skipped' a category and changed from 'competitive' to 'prosocial.' For gSVO, all 33 participants whose classification changed were classified into a neighboring category in the second measurement (e.g., change from 'strongly parochial' to 'weakly parochial'). We interpret these results as indicating satisfactory levels of test-retest reliability for social preferences over a period of two weeks, both at the individual and the group level [S2, S3, S4, S5, S6].

Figure S1: *A sample alternative of the coin version slider measure: shown is Slider 1, Alternative 2, i.e., ETB 17 for self/ingroup and ETB 14.5 for other/outgroup. In the coin version, the different sliders were color-coded to facilitate understanding of the task.*

Convergent and discriminant validity. Tables S2 and S3 summarize the descriptive statistics of all additional measures assessed in Study 1 as well as their zero-order correlations with gSVO at T1. The tables also indicate our hypotheses about the association between gSVO and the validation measures — based on theoretical considerations or on previous findings on the relation between certain personality traits and individual participation in between-group conflict [S7, S8, S9]. As expected, gSVO was positively correlated with the BGO motivations to maximize equality and joint welfare of both groups (i.e., 'Min diff', 'Max joint ingroup', and 'Max joint outgroup') and negatively correlated with the motivations to maximize the ingroup's absolute or relative payoff ('Max ingroup' and 'Max rel ingroup'; Table S2). There was no association between gSVO and the motivations that mainly focused on maximizing the outgroup welfare without any or even with a negative valuation of the ingroup's welfare (i.e., 'Max outgroup' and 'Max rel outgroup'). Regarding the relations of gSVO with the HEXACO personality dimensions (Table S3), results were likewise in line with expectations. That is, the strongest (negative) association was apparent for honesty-humility ($r = .302$), whereas all other HEXACO dimensions yielded correlations of $r \leq |.155|$. gSVO also showed a negative medium-sized correlation with SDO ($r = -.253$), as expected. Somewhat surprisingly, however, we found only weak associations of parochialism with GA ($r = -.094$) and IWAH (on all levels; see Table S3).

Taken together, with only few exceptions, correlations of our novel gSVO measure with other measures were in line with expectations. Correspondingly, there was also no single correlation that was significantly opposite to the expected association. This demonstrates the convergent validity of the gSVO measure in assessing different levels of parochialism. In turn, the size of the correlations (all r's $< |.60|$) corroborate that gSVO represents a unique construct that is not sufficiently captured by any other measure, additionally supporting its discriminant validity.

Relationship between the standard and the coin-versions of the iSVO and gSVO slider measures. Finally, we tested the convergence of the iSVO and gSVO standard slider measures (as assessed at T2) with the adapted coin-versions of both measures. iSVO and iSVOcoin showed a strong positive

Table S2: *Zero-order correlations of between-group orientations ('BGO') with gSVO in Study 1. Notes: Based on participants' responses at T1 ($N = 171$). BGO: Between-group orientations measure as devised by Bornstein [S10]. High gSVO values indicate high xenialism.*

BGO subscale	*M* (*SD*)	Expected relation with gSVO	Correlation with gSVO	*P*	95% CI of *r*
Max in-group	2.23 (3.24)	–	–.573	<.001	[–.665, –.462]
Max rel in-group	0.21 (0.87)	–	–.332	<.001	[–.460, –.192]
Min diff	2.16 (3.07)	+	.257	<.001	[.111, .392]
Max out-group	0.08 (0.33)	+	–.001	.989	[–.151, .149]
Max rel out-group	0.01 (0.15)	+	.039	.612	[–.112, .188]
Max joint in-group	4.28 (3.24)	+	.257	<.001	[.112, .392]
Max joint out-group	0.93 (1.68)	+	.306	<.001	[.164, .436]

Table S3: *Zero-order correlations of HEXACO personality factors, SDO, GA, and IWAH with parochialism in Study 1. Note: Based on participants' responses at T1 ($N = 171$). HEXACO personality factors assessed via HEXACO-60 [S11]; SDO: Social dominance orientation measured via scale devised by Cohrs and Asbrock [S12]; GA: Group authoritarianism measured via scale devised by Stellmacher and Petzel [S13]; IWAH: Identification with all humanity measured via scale devised by Macfarlan et al. [S14]; gSVO: group-level social value orientation slider measure, high values indicate high xenialism.*

Measure	*M* (*SD*)	Exp'd relation with gSVO	Obs'd correl. with gSVO	*P*	95% CI of *r*
HEXACO					
Honesty-humility	3.23 (0.69)	+	.302	< .001	[.159, .432]
Emotionality	3.03 (0.62)	?	.049	.521	[-.101, .198]
Extraversion	3.41 (0.64)	?	-.155	.043	[-.298, -.005]
Agreeableness	3.15 (0.52)	?	.104	.177	[-.047, .250]
Conscientiousness	3.54 (0.56)	?	-.074	.335	[-.222, .077]
Openness to experience	3.26 (0.63)	?	.047	.539	[-.104, .196]
SDO	3.35 (0.69)	-	-.253	< .001	[-.388, -.107]
GA	3.27 (0.75)	-	-.094	.220	[-.241, .057]
IWAH					
Personal level	4.45 (0.44)	?	-.093	.226	[-.240, .058]
Group level	3.17 (0.58)	-	-.105	.172	[-.251, .046]
Collective level	3.00 (0.65)	+	-.049	.552	[-.102, .198]

Table S4: *Behavioral options and payoff conseuqences in the games used in Studies 2 and 3. IPD: 'Intergroup Prisoner's Dilemma' as devised by Bornstein [S10]. IPD-MD: 'Intergroup Prisoner's Dilemma – Maximizing Differences' as devised by Halevy, Bornstein, and Sagiv [S15]. Marginal payoffs 'X / Y / Z' indicate the changes in payoffs for the respective player (X), each of the contributor' ingroup members (Y), and each of the outgroup members (Z) when the player invests 1 token into the respective behavioral option. 'n/a': Behavioral option not available in that game.*

Game	*Behavioral option*		
	Keep	*Between-group pool*	*Within-group pool*
IPD (Study 2)	$+1/\pm 0/\pm 0$	$+0.50/+0.50/-0.50$	n/a
IPD-MD (Study 3)	$+1/\pm 0/\pm 0$	$+0.50/+0.50/-0.50$	$+0.50/+0.50/\pm 0$

correlation of $r = .83, P < .001$. Similarly, gSVO and gSVOcoin showed a strong positive correlation of $r = .77, P < .001$. These findings indicate that the adapted coin-versions are well-suited as alternative measures of individual- and group-level social preferences in populations characterized by low numeracy.

S2 Supplementary information and results for Study 2

The IPD game

Participants' in Study 2 played the Intergroup Prisoner's Dilemma (IPD) game [S10]. The game is played by an even number of N players i, who are each assigned to one of two groups. Groups are equal in size, that is, each group has $n = N/2$ players, with $I \in \{1, \ldots, n\}$ denoting the set of players in the ingroup and $O = \{n+1, \ldots, N\}$ denoting the set of players in the outgroup. Each player is endowed with e tokens and decides in private how many tokens, g_i, to contribute to a between-group conflict pool (with $0 \leq g_i \leq e$). Tokens not contributed are retained privately.

Table S4 shows the payoff changes for all players per token kept vs. contributed to the between-group conflict pool. Contributions to the between-group conflict pool are multiplied by a constant k (with $1 < k < n$) and are equally distributed among all ingroup players. Thus, each ingroup player receives $(k \cdot g_i)/n$ given a player's contribution g_i. In addition, contributions to the between-group conflict pool are multiplied by a constant k and reduce the payoff of each outgroup player equally by the amount $(k \cdot g_i)/n$ given a player's contribution g_i. Tokens not contributed are directly transferred to the private account of the player (without affecting the payoffs of the other ingroup and the outgroup members). The resulting individual payoff function is:

$$\pi_i = e - g_i + \frac{k}{n}\sum_{j=1}^{n} g_j - \frac{k}{n}\sum_{h=1}^{N} g_h.$$

In our experiment, we set the parameters as follows: $N = 6$ (i.e., each group had the size $n = 3$), $e = 10$, with each token worth EUR 1.00, and $k = 1.5$. Thus, for each token contributed to the between-group conflict pool the payoff of the contributing player and each ingroup member increased by EUR 0.50 and the payoff of each outgroup member decreased by EUR 0.50.

By implication, keeping all tokens constitutes the dominant (selfish-rational) option, maximizing the player's payoff, regardless of what the other players do. Contributing all tokens to the between-group conflict pool maximizes the ingroup's aggregated payoff and minimizes the outgroup's aggregated payoff. Note that contributions to the between-group conflict pool are collectively destructive. That is, if all players contribute to the between-group conflict pool, they are all worse off compared to when they all keep their endowments. This mirrors the structure of between-group conflicts.

Additional results

Manipulation check. Results supported that individuals highly identified themselves with their supporter group, as the mean of the ingroup identification scale ($M = 5.21$, $SD = 1.14$) significantly exceeded the scale's midpoint of 4 (one sample t-test: $t(192) = 14.75$, $P < .001$).

Behavior in the IPD game. The average contribution to the between-group conflict pool in the IPD was $M = 4.13$ ($SD = 3.56$) out of 10 tokens. In fact, 71% ($n = 137$) of the participants contributed at least some tokens to the between-group conflict pool. We conducted linear regression analyses to investigate how participants' level of both iSVO and gSVO affected their contribution behavior. Results are shown in Table S5 and discussed below together with those of Study 3.

S3 Supplementary information and results for Study 3

The IPD-MD game

Participants played the 'Intergroup Prisoner's Dilemma – Maximizing Difference' game devised by Halevy, Bornstein, and Sagiv [S15]. The IPD-MD game is played by N players i, who are assigned to two different groups. Groups are equal in size, that is, each group has $n = N/2$ players, with $I \in \{1, \ldots, n\}$ denoting the set of players in the ingroup and $O = \{n+1, \ldots, N\}$ denoting the set of players in the outgroup. Each player is endowed with e tokens and decides in private how many tokens, g_i, to contribute to a between-group conflict pool (with $0 \leq g_i \leq e$) and how many tokens, h_i, to contribute to a within-group cooperation pool (with $0 \leq h_i \leq e$, and $g_i + h_i \leq e$). Tokens not contributed are kept privately.

Table S4 shows the payoff changes for all players per token kept versus contributed to the between-group conflict pool versus contributed to the within-group cooperation pool. Contributions to the between-group conflict pool are multiplied by a constant k (with $1 < k < n$) and are equally distributed among all ingroup players. Thus, each ingroup player receives $(k \cdot g_i)/n$ from a player's contribution g_i. In addition, contributions to the between-group conflict pool are multiplied by a constant k and reduce the payoff of each outgroup player equally by the amount $(k \cdot g_i)/n$ from a player's contribution g_i. Similarly, contributions to the within-group cooperation pool are multiplied by the constant k and are equally distributed among all ingroup players. Thus, each ingroup player receives $(k \cdot h_i)/n$ from a player's contribution h_i, too. In contrast to the between-group conflict pool, however, contributions to the within-group cooperation pool have no (negative) effect on the outgroup members' payoffs. Tokens not contributed to any pool are directly transferred to the individual account of the player (without affecting the payoff of any other player). The resulting individual payoff function is:

$$\pi_i = e - g_i - h_i + \frac{k}{n}\sum_{j=1}^{n}(g_j + h_j) - \frac{k}{n}\sum_{h=1}^{N} g_h.$$

In our experiment, we set the parameters as follows: $N = 6$ (i.e., each group had the size $n = 3$), $e = 10$, with each token worth USD 1.00, and $k = 1.5$. Thus, for each token contributed to the between-group conflict pool or to the within-group cooperation pool, the payoff of the contributing player and each ingroup member increased by USD 0.50; the payoff of each outgroup member decreased by USD 0.50 for each token contributed to the between-group conflict pool.

As in the IPD, keeping all tokens in the IPD-MD constitutes the dominant (selfish-rational) strategy, maximizing the player's payoff, regardless of what the other players do. Both contributions to the between-group conflict pool and contributions to the within-group cooperation pool maximize the ingroup's aggregated payoff. Thus, players are indifferent between contributions to these pools if they simply want to maximize the ingroup's welfare without considering the outgroup's welfare.

However, contributions to the between-group conflict pool minimize the outgroup's aggregated payoff (indicating between-group aggression or competition), whereas contributions to the within-group conflict pool maximize collective welfare.

Additional results

Manipulation check. Results supported that individuals highly identified with their political group, as the mean of the ingroup identification scale ($M = 5.15$, $SD = 1.18$) significantly exceeded the scale's midpoint of 4 (one sample t-test: $t(424) = 20.07$, $P < .001$).

Robustness test: ingroup vs. unknown/'stranger' recipient in the iSVO. There was no significant difference in the level of iSVO when the recipient was a neutral partner vs. an ingroup member (independent samples t-test: $t(423) = 0.85, P = .396, d = 0.08$). This is in line with previous research showing that the level of prosociality toward unknown others is similar to the level of prosociality toward ingroup members [S16, S17]. We therefore pooled the two conditions for further data analyses.

Behavior in the IPD-MD game. The average contribution to the between-group conflict pool in the IPD-MD was $M = 1.39$ ($SD = 2.09$) out of 10 tokens and the average contribution to the within-group cooperation pool was $M = 3.36$ ($SD = 3.17$). As expected, contributions to the between-group conflict pool were much lower than in the IPD (Study 2) where participants had to engage in between-group conflict to benefit their ingroup. Still, 46% ($n = 195$) of participants contributed at least some tokens to the between-group conflict pool; to the within-group pool 71% ($n = 300$) participants contributed at least some tokens.

The regression results in Table S5 show that both iSVO (positively) and gSVO (negatively) contribute to predicting *between-group pool* contributions in Study Study 2, Models (1)-(3), and Study Study 3, Models (4)-(6). No significant interaction between the two measures in predicting *between-group pool* contributions is observed in these models. In contrast, iSVO (positive) and gSVO (positive) both significantly contribute to explaining *within-group pool* contributions in Study 3, Models (7)-(9). Here, Models (8) and (9) also identify a significant (positive) interaction of the two measures. As can be seen from Figure 2, this interaction is such that gSVO positively predicts contributions at high levels of iSVO, while this relation flattens out, turning eve slightly negative, for low levels of iSVO. All results hold when additionally controlling for participants' age and gender, Models (3), (6), and (9).

Theoretical prediction of behavioral separation in the IPD/IPD-MD game. Assume agents' preferences are described as in eq. 1. For simplicity, also assume that, in case multiple ingroup and/or outgroup members are involved in the respective interaction, their payoffs are simply summed. Then, with mild abuse of notation, the marginal utility of allocating one more unit to pool B, i.e., the between-group pool, in the IPD and the IPD-MD is given by

$$u'(-\frac{1}{2}, 2\times+\frac{1}{2}, 3\times-\frac{1}{2}) = -\frac{1}{2} + \alpha - \frac{3}{2}\gamma$$

and is thus positive when $\gamma < \frac{(2\alpha-1)}{3}$. Moreover, the marginal utility of one more unit in pool A, i.e., the within-group pool, in the IPD is: $u'(-\frac{1}{2}, 2\times+\frac{1}{2}, 0) = -\frac{1}{2} + \alpha$ which is positive for $\alpha > \frac{1}{2}$. Moreover, investing in A is preferred to investing in B when $\gamma > 0$. Figure S2 marks the areas of the (α, γ)-space for which these three conditions hold.

Predicted behavior in the games can be inferred as follows. *IPD:* Agents who prefer investing via pool B (i.e., players whose preferences fall into the '$B \succ P$'-area in Fig. S2) should choose the within-group pool and everyone else should invest via P, i.e., keep their endowment. *IPD-MD:* Here, a

Table S5: *Results of OLS regressions for Studies 2 and 3. The dependent variables are contributions (possible range = 0 - 10) to the respective pools in the IPD game (Study 2) or IPD-MD game (Study 3). Noteworthy observations: (i) iSVO and gSVO independently predict contributions to the between-group pool across studies, i.e., behavior that is (financially) harmful to the outgroup; (ii) for contributions to the within-group pool iSVO and gSVO additionally show a significant interaction. Both results are robust to controlling for age and participants' identification as 'male' (yes/no).*

	Dependent variables:								
	Study 2			Study 3					
	Between-group pool			Between-group pool			Within-group pool		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
iSVO	0.078^{***}	0.081^{***}	0.078^{***}	0.021^{**}	0.026^{**}	0.021^{**}	0.079^{***}	0.060^{***}	0.060^{***}
	(0.018)	(0.019)	(0.018)	(0.008)	(0.009)	(0.008)	(0.011)	(0.012)	(0.012)
gSVO	-0.061^{***}	-0.049^{+}	-0.059^{***}	-0.028^{***}	-0.015	-0.028^{***}	0.024^{*}	-0.029^{+}	-0.029^{+}
	(0.015)	(0.027)	(0.015)	(0.007)	(0.012)	(0.007)	(0.009)	(0.016)	(0.016)
iSVO × gSVO		-0.0005			-0.0005			0.002^{***}	0.002^{***}
		(0.001)			(0.0004)			(0.0005)	(0.0005)
Age			0.043			-0.014			0.003
			(0.038)			(0.010)			(0.013)
Male			0.304			0.053			0.028
			(0.582)			(0.204)			(0.276)
Constant	3.226^{***}	3.195^{***}	1.807	1.349^{***}	1.286^{***}	1.742^{***}	0.905^{***}	1.165^{***}	1.048^{+}
	(0.424)	(0.429)	(1.190)	(0.197)	(0.202)	(0.397)	(0.270)	(0.273)	(0.538)
Observations	193	193	193	425	425	425	425	425	425
R^2	0.114	0.115	0.122	0.040	0.044	0.045	0.214	0.243	0.243
Adjusted R^2	0.105	0.101	0.103	0.035	0.037	0.035	0.210	0.238	0.234
Resid. Std. Error	3.369	3.376	3.373	2.052	2.050	2.052	2.813	2.764	2.770
F Statistic	12.217^{***}	8.212^{***}	6.505^{***}	8.704^{***}	6.393^{***}	4.892^{***}	57.391^{***}	45.073^{***}	26.932^{***}

Note: $^{+}$p<0.10; *p<0.05; **p<0.01; ***p<0.001

third investment option, pool A, is added, so players now compare the marginal benefits of investing via A, B, and P. This 'activates' additional players who now contribute via A instead of keeping via P: those for whom $A \succ P$ but not $A \succ B$. Moreover, introducing pool A makes those players 'switch' from pool B to pool A, namely those for whom $A \succ B$ and $B \succ P$, i.e., players with preferences in the highlighted triangle in Fig. S2. Intuitively, these are players who are sufficiently prosocial, $\alpha > 1/2$, not spiteful toward the outgroup, and moderately ingroup-favoring, $0 < \gamma < (2\alpha - 1)/3$.

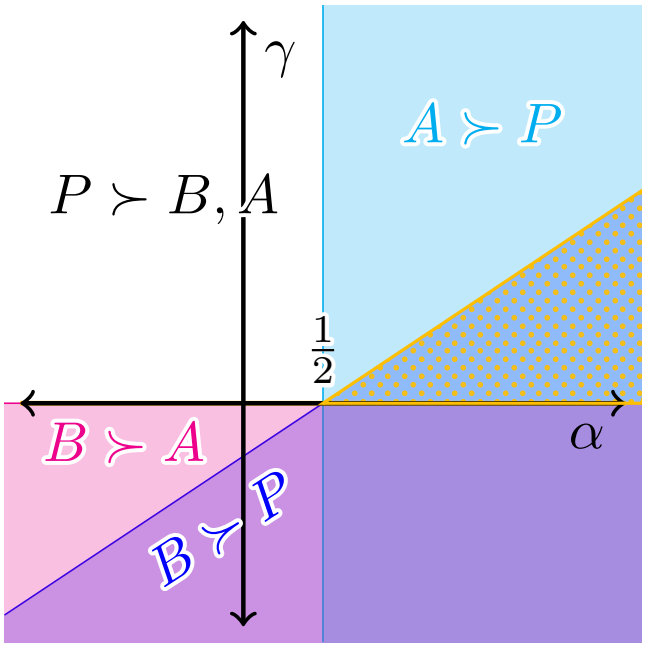

Figure S2: *Investment preferences (coloring) for a marginal unit in the IPD and IPD-MD games given preferences* (α, γ). *'$X \succ Y$' means investment in pool X is preferred to investment in pool Y; pools: P = 'Private', B = 'Between-group', A = 'Within-group'. Individuals with preferences in the dark shaded triangle are those who are predicted to switch from investments via pool B in the IPD to investments via pool A in the IPD-MD.*

S4 Supplementary information and analysis for Study 4

Moderation analysis

Table S6 shows the results of our logistic regressions of self-reported involvement in violent conflict in the last six months (binary variable: yes/no) on iSVO, gSVO, their interaction, and participant age (as estimated by the field researcher, LG). Results show a significant and robust interaction of iSVO and gSVO in predicting conflict involvement. Figure S3 visualizes the predicted association for two levels of gSVO: the 20^{th} and the 80^{th} percentile of the $N = 111$ participants' observed gSVO scores. The interaction result thus implies that participants at high levels of gSVO, i.e., the relatively more universalistic, show a lower change iSVO when exposed to conflict compared to those at low levels of gSVO, i.e., the relatively more parochialistic participants.

S5 Supplementary information and results for Study 5

Robustness

We only report tests for zero-order level differences in iSVO and gSVO in the main text. Our preregistered analysis strategy for Study 5 were respective ANOVAs, though. Results are robust when using the preregistered method. Our replication materials include the respective calculations.

Table S6: *Logistic regression analyses testing the association of reported conflict involvement in the previous six months with gSVO and iSVO and their interaction in Study 4.*

	Dependent variable:			
	Recent conflict involvement (yes/no)			
	(1)	(2)	(3)	(4)
iSVO	0.048^{*}	0.047^{*}	0.070^{**}	0.070^{**}
	(0.021)	(0.021)	(0.024)	(0.024)
gSVO	0.004	0.004	0.074^{*}	0.076^{*}
	(0.017)	(0.017)	(0.034)	(0.034)
iSVO × gSVO			-0.004^{*}	-0.004^{*}
			(0.002)	(0.002)
Approx. age		0.009		0.017
		(0.028)		(0.029)
Constant	-1.298^{***}	-1.529^{+}	-1.696^{***}	-2.139^{*}
	(0.392)	(0.801)	(0.451)	(0.882)
Observations	111	111	111	111
Log Likelihood	−70.208	−70.153	−67.062	−66.887
Akaike Inf. Crit.	146.416	148.306	142.125	143.774
Note:	$^{+}$p<0.10; *p<0.05; **p<0.01; ***p<0.001			

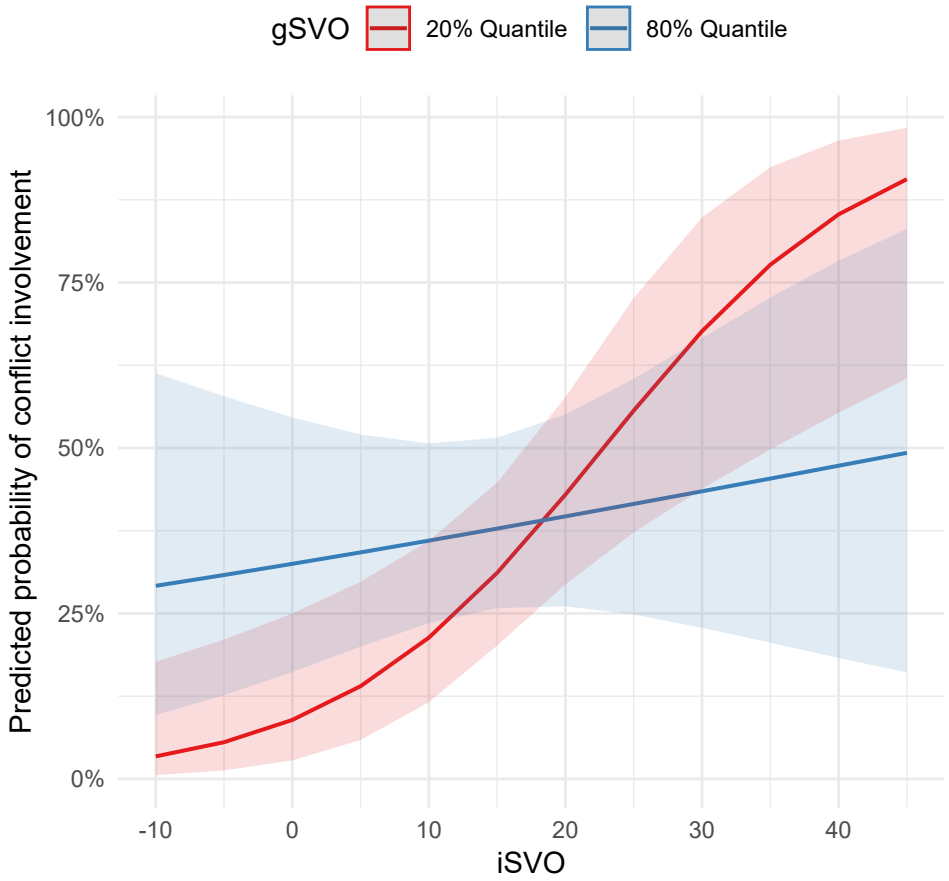

Figure S3: *Predicted association of iSVO with likelihood of self-reported conflict involvement in the six months prior to day of data collection for different levels of gSVO (20^{th} and 80^{th} quantile), controlling for approximate age of participant.*

Additional results

In addition to manipulating perceived conflict intensity between groups, we leveraged the within-participants design of this study to simultaneously test for effects of varying subjective identification strengths with different ingroups on iSVO and gSVO. Participants in the 'identification' condition ($N = 236$) completed the iSVO and gSVO measures twice: once for the group pairing containing the ingroup which they ranked as most important for their self-conceptualization and once for the pair with the least important ingroup. Results showed a significant effect of this manipulation on gSVO ($M_{high} = 18.00$ vs. $M_{low} = 22.56$, $t = 2.47$, $P = 0.01$, $d = 0.25$), but not on iSVO ($M_{high} = 25.60$ vs. $M_{low} = 25.38$, $t = 0.15$, $P = 0.88$, $d = 0.02$).

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