# War's Enduring Effects on the Development of Egalitarian Motivations and In-Group Biases

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## Abstract

In suggesting that new nations often coalesce in the decades following war, historians have posed an important psychological question: Does the experience of war generate an enduring elevation in people's egalitarian motivations toward their in-group? We administered social-choice tasks to more than 1,000 children and adults differentially affected by wars in the Republic of Georgia and Sierra Leone. We found that greater exposure to war created a lasting increase in people's egalitarian motivations toward their in-group, but not their out-groups, during a developmental window starting in middle childhood (around 7 years of age) and ending in early adulthood (around 20 years of age). Outside this window, war had no measurable impact on social motivations in young children and had only muted effects on the motivations of older adults. These "war effects" are broadly consistent with predictions from evolutionary approaches that emphasize the importance of group cooperation in defending against external threats, though they also highlight key areas in need of greater theoretical development.

Violent conflict among groups is an enduring part of the human experience that likely reaches deep into our species' evolutionary past (Bowles, 2009; Keeley, 1997). Although understanding how intergroup conflict affects people has long been an important interest in psychology (Campbell, 1965; Sherif, 1988), few researchers have studied postconflict societies to assess how the experience of war shapes people's cooperative tendencies and social development across the life course. To address this, we combined survey data with a battery of simple social-choice experiments administered to children and adults (3–84 years of age) in two postconflict societies: the Republic of Georgia in the Caucasus and Sierra Leone in West Africa.

Our work was motivated by evolutionary approaches to human prosociality, which have long emphasized the role that intergroup competition and other external threats (e.g., pathogens) have likely played in shaping social psychology (Alexander, 1987; Choi & Bowles, 2007; Darwin, 1873/2012). Because humans are an ultra-social species, individuals' survival and reproduction are often linked to the fate of their groups, especially when intergroup competition is intense. Via different evolutionary avenues, these approaches all suggest that humans should be sensitive either to cues of external threats or to direct experiences (e.g., war) during ontogeny to

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calibrate their psychological mechanisms, including social motivations. More specifically, these approaches propose that cues to or experiences of intergroup conflicts should increase within-group cooperation, which may increase motivations related to in-group altruism, leveling or in-group equality, and both norm adherence and the punishment of norm violators. This may also sharpen individuals' sense of group identity (*parochialism*), which would generate fertile ground for out-group hostility (Bornstein, 2003; Bowles, 2006; Choi & Bowles, 2007; Gneezy & Fessler, 2012; Hamilton, 1975).

The existing empirical work broadly supports the effect of intergroup competition on social behavior. In the laboratory, economic experiments have shown that intergroup competition intensifies group-based prosociality (Bornstein, 2003; Bornstein & Ben-Yossef, 1994), whereas studies using priming techniques have indicated that cuing uncertainty in a number of domains, including mortality and intergroup threat, makes people more likely to favor in-group members and to punish norm violators (Heine, Proulx, & Vohs, 2006; Hohman, 2011; Kollack, 1994; Navarrete, Kurzban, Fessler, & Kirkpatrick, 2004). In the field, survey evidence has shown that violent war experiences may actually increase participation in voting (Blattman, 2009) and local collective action (Bellows & Miguel, 2009).

Despite such diverse evidence, a direct link between the real-life experience of intergroup violence and the development of enduring prosocial motivations toward one's in-group has not been empirically established. One reason for this is the rarity of experimental measures from postconflict societies. In the research reported here, we tested the specific prediction that the experience of intergroup conflict shifts individual psychological motivations to favor in-group egalitarianism. We administered a battery of social-choice tasks, which were designed to isolate in-group egalitarian motivations from selfish or generalized egalitarian and altruistic motivations, to more than 1,000 children and adults who were differentially affected by war in both the Republic of Georgia and Sierra Leone.

We focused on the ontogeny of social motivations for both theoretical and empirical reasons. On the theoretical side, our effort aims to bring together two strands of evolutionary thinking: one based on cooperation and intergroup competition, and the other based on life-history theory. Life-history theory proposes that evolutionary processes balance adaptive trade-offs related to (a) maintaining a capacity to adapt facultatively (i.e., on the fly) to novel circumstances throughout adulthood; (b) investing in, calibrating, and partially fixing certain abilities or motivations in response to local conditions encountered during a developmental window or critical period (when, e.g., brains are relatively more plastic);

and (c) genetically hard wiring a developmental process (Kaplan, Hill, Lancaster, & Hurtado, 2000). Which of these is favored by natural selection for any particular phenotype will depend on a wide range of factors that include the costs of maintaining flexibility over the life course, the variability in environments, and the fitness costs of failing to adapt. In a cultural species such as humans, these kinds of processes are particularly relevant because individuals find themselves in an extraordinarily diverse range of social environments with different norms and fitness consequences and because our species maintains a long juvenile period of increased neural plasticity that extends at least through the second decade of life (Giedd et al., 1999; Henrich, 2008; Kaplan et al., 2000). Influenced by these trade-offs, social motivations may—like other aspects of human psychology, language, and physiology—be disproportionately calibrated and set during middle childhood and adolescence (Henrich, 2008; Minoura, 1992).

On the empirical side, existing research demonstrates that prosocial motivations develop substantially during childhood and adolescence, which suggests the potential existence of a sensitive period in their development (Eisenberg, Fabes, & Spinrad, 2006). In anonymous settings designed to rule out prosocial behavior driven by selfish motives (as used in the present research), Western children become substantially more prosocial between 3 and 12 years of age (Bauer, Chytilová, & Pertold-Gebicka, 2013; Fehr, Bernhard, & Rockenbach, 2008; Harbaugh & Krause, 2000), with more sophisticated notions of fairness and stronger fairness motivations developing during adolescence (Almås, Cappelen, Sørensen, & Tungodden, 2010; Fehr, Rützler, & Sutter, 2011). Meanwhile, the strength of egalitarian motivations in adults varies substantially across diverse societies, from barely detectable to quite strong (Henrich et al., 2006). Taken together, the evidence suggests that humans, at least in some societies, may acquire and internalize much of their social behavior during childhood and adolescence.

This background sets up the following hypotheses. Work on the evolution of cooperation via intergroup competition suggests that the threat or experience of war may have important effects on human social motivations toward in-group members given that intergroup conflict may have shaped human evolution. However, in light of life-history trade-offs, this effect may be (a) hardwired (reliably developing, as with, e.g., mating motivations), (b) responsive to experience during a critical period in the early decades of life (as with, e.g., accents), (c) facultative, or (d) some combination of these. Our findings suggest that an impact of intergroup competition runs, at least partly, through experience during a sensitive window.

# Method

## Sample

We explored the link between intergroup violence and prosocial motivations in the Republic of Georgia and in Sierra Leone because of both the timing and the nature of their recent wars. In terms of timing, we wanted to test for both the short- and long-term effects of war. Starting in the Republic of Georgia, we collected data only 6 months after the Russia–Georgia war and studied the impact of conflict exposure on children between 3 and 12 years of age—that is, children in the age range that we hypothesized might contain a sensitive period for the formation of prosocial motivations. Then, to assess long-term impacts, we turned to Sierra Leone, where a civil war had ended a decade earlier. There, we sampled adults to explore whether the effects of war are more enduring if experienced during ontogeny compared with adulthood.

In terms of the nature of the conflict, we looked across the globe for situations in which the effects of war on populations could—at least arguably—be seen as independent of differing social motivations. Studying, for example, a self-selected population of refugees or a group of army volunteers would make the predicted effects harder to confidently distinguish because possessing certain social motivations (before the war) could have made people more likely to experience the war. Essentially, we were looking for natural experiments to provide quasirandom assignment to treatment groups, with war as the treatment.

In Georgia, 6 months after the war with Russia over South Ossetia, we tested children (*N* = 543) from 17 primary schools and kindergartens scattered across the afflicted region. Although brief, this war devastated areas of South Ossetia and its bordering districts, causing more than 100,000 civilians to flee their homes (European Union, 2009; Human Rights Watch, 2009). It is unlikely that Russian soldiers could have selectively targeted families with certain characteristics because (a) most of the fighting involved aerial, artillery, and tank fire strikes (Human Rights Watch, 2009); (b) the soldiers did not have prior knowledge of the local population; and (c) the war was brief (lasting only 1 week), providing little opportunity for precise targeting or selection of victims. Moreover, the lack of any preemptive exodus indicates that civilians did not anticipate the conflict, which mitigates statistical concerns about biases regarding the types of people who were affected by the war (European Union, 2009; Human Rights Watch, 2009).

In northwestern Sierra Leone, we recruited adults (*N* = 586) across a diverse age range (18–84 years) from 21 villages where evidence indicated substantial variation in war exposure (Bellows & Miguel, 2009). Many participants (*n* = 162) were children or adolescents during the Sierra Leone civil war (1991–2002), one of the most horrific civil conflicts in African history. The conflict resulted in the deaths of more than 50,000 civilians and temporarily displaced half of the population. Villagers became the victims of brutal attacks from rebel groups and, in many instances, from Sierra Leone's army. Important factors for why the civil war spread around the country and lasted for so long were access to alluvial diamonds and an opportunity to loot civilian property. Rebel groups represented a serious existential threat for the population, and many communities organized local self-funded fighting groups to protect themselves from the terror of rebels (Bellows & Miguel, 2009). Notably, studies based on large and representative household surveys have not revealed systematic targeting of individuals based on observable characteristics, such as ethnicity, religion, and education (Bellows & Miguel, 2009; Humphreys & Weinstein, 2006), which mitigates the concern that people were selectively victimized on the basis of observable characteristics. Below, and in Supplemental Design and Results in the Supplemental Material available online, we discuss and present further tests of the exogeneity of war exposure in both Georgia and Sierra Leone.

## Victimization indices

Within each sample, we distinguished three levels of war exposure on the basis of our participants' survey replies. In Georgia, *nonaffected* children made up 32% of the sample; these children reported not having heard or seen any fighting, not having had a relative injured during the conflict, and not having seen any soldier or injured person. Of the remaining 68% of our sample, 24% were both affected and internally displaced persons (*affected IDPs*) at the time of the experiment, whereas 44% were affected but not internally displaced (*affected non-IDPs*).

To address concerns about systematic biases in the ability of children, especially the youngest participants, to accurately report their level of war exposure, we correlated two different measures of victimization status (*displacement* and *witnessing fighting*) as reported by (a) the child and (b) his or her teacher (see Table S5 in Supplemental Design and Results). The results revealed strong positive correlations for both younger and older children for both measures—displacement: $r = .47$ for 3- to 6-year-olds, $p < .001$; $r = .66$ for 7- to 12-year-olds, $p < .001$; witnessing fighting: $r = .63$ for 3- to 6-year-olds, $p < .001$; $r = .65$ for 7- to 12-year-olds, $p < .001$. We also found that children's reports of war exposure did not correlate with age, which indicates that at worst, younger children introduced noise into the data as opposed to systematic bias.

To identify conflict exposure in Sierra Leone, we used the same questions used in a recent nationally representative survey (Bellows & Miguel, 2009): "Were any members of your household killed during the conflict?" and "Were any members injured or maimed during the conflict?" As in Georgia, we distinguished three levels of war exposure. *Least-affected* individuals (45%) reported not having had anyone from their household killed or injured during the civil war; *midaffected* individuals (33%) reported having somebody from their household who was either killed or injured, whereas the *most-affected* individuals (22%) reported both types of violent outcomes.[1] Additional details can be found in Supplemental Design and Results.

### Experimental protocol

At each site, building on earlier protocols (Fehr et al., 2008; Silk et al., 2005), we ran four mini–dictator games in which participants chose between two ways of allocating tokens to themselves and an anonymous partner (Fig. S1 in Supplemental Design and Results shows the choice situation). Here, we focus on the two costly games, which are particularly interesting because they unambiguously distinguish among purely selfish, egalitarian, and altruistic motivations. Our two costless games provided convergent findings, but because they were designed to tap the social preferences of even entirely selfish actors (Silk et al., 2005), the costly games yielded more decisive insights.

In the Sharing Game, participants in Sierra Leone chose between the equal allocation (10, 10)—10 tokens for both the participant and the partner—and the unequal allocation (15, 5)—15 tokens for the participant and 5 for the partner. By providing this choice, we pitted self-interest against equality and, thus, were able to measure motivations to reduce advantageous inequality. Because choosing the egalitarian option benefits an anonymous partner at a cost to the participant, selfish participants should never make this choice (except as an error). We measured the same motives in Georgia by letting children choose how to allocate prizes—equally (1, 1) or unequally (2, 0).

In the Envy Game, the decision maker chooses between equal (10, 10) and unequal (13, 16) allocations in Sierra Leone and between equal (1, 1) and unequal (2, 3) allocations in Georgia. In this case, the unequal choice leads to higher rewards for both players, but it also creates disadvantageous inequality for the decision maker. Thus, the egalitarian choice—(10, 10) in Sierra Leone or (1, 1) in Georgia—indicates motivations to reduce personally disadvantageous inequality. Table S1 in Supplemental Design and Results summarizes payoffs in games at both sites. For more details about the procedure, see Supplemental Experimental Instructions in the Supplemental Material.

### Conditions

Participants were randomly assigned to either the in-group or the out-group condition. In Sierra Leone, the anonymous in-group partner came from the same village as the decision maker, whereas the out-group partner was from an unspecified distant village. In Georgia, the in-group partner came from the same classroom as the decision maker, whereas the out-group partner came from a different Georgian school and was unknown to the participant. These conditions allowed us to assess the extent of participants' preferential treatment of their own group members. Note that because the experimental out-group members were not enemies (e.g., Russians), these theories do not predict more spiteful actions, although more self-regarding behavior should be favored.

In Sierra Leone, participants were paid in private and received cash—each token represented 500 Sierra Leone Leones (SLL). The experimental rewards were at least 5,000 SLL ($1.25; approximately the mean daily per capita income in Sierra Leone), and all participants received 10,000 SLL as a show-up fee. In Georgia, children exchanged their tokens at an experimental store for different kinds of sweets, pencils, and small toys (on average, they earned five items). We gave the children one token as a show-up fee and asked them to exchange it for a reward before the experiment to ensure their understanding of the link between tokens and rewards (which was also explained verbally).

### Results

The Sharing Game results, shown in Figure 1a (Georgia, children aged 7–12) and Figure 1b (Sierra Leone, adults aged 7–20 during the civil war), revealed that among the participants least affected by war in both sites, there was no difference between the in-group and out-group conditions. For those who were more affected, rates of egalitarian sharing choices increased among those sharing with an in-group member but either declined or did not change for those sharing with an out-group member. In Georgia, the gap in rates of sharing between those interacting with in-group and out-group members increased from near zero in the nonaffected group ($n = 118$, Fisher's exact test: $p = 1.00$[2]) to 36% in the affected-IDP group ($n = 75$, $p = .003$). This is because the frequency of egalitarian sharing choices in the in-group condition ($n = 107$) increased from 49% in the nonaffected group to 68% in the affected-IDP group ($p = .07$), whereas the frequency diminished from 51% to 32% ($p = .12$) in the out-group condition ($n = 86$). Panel A of Table S2 (columns 1–6) in Supplemental Design and Results presents results from a probit regression showing that the same patterns emerged when controlling for gender, age, and sibling composition. This regression
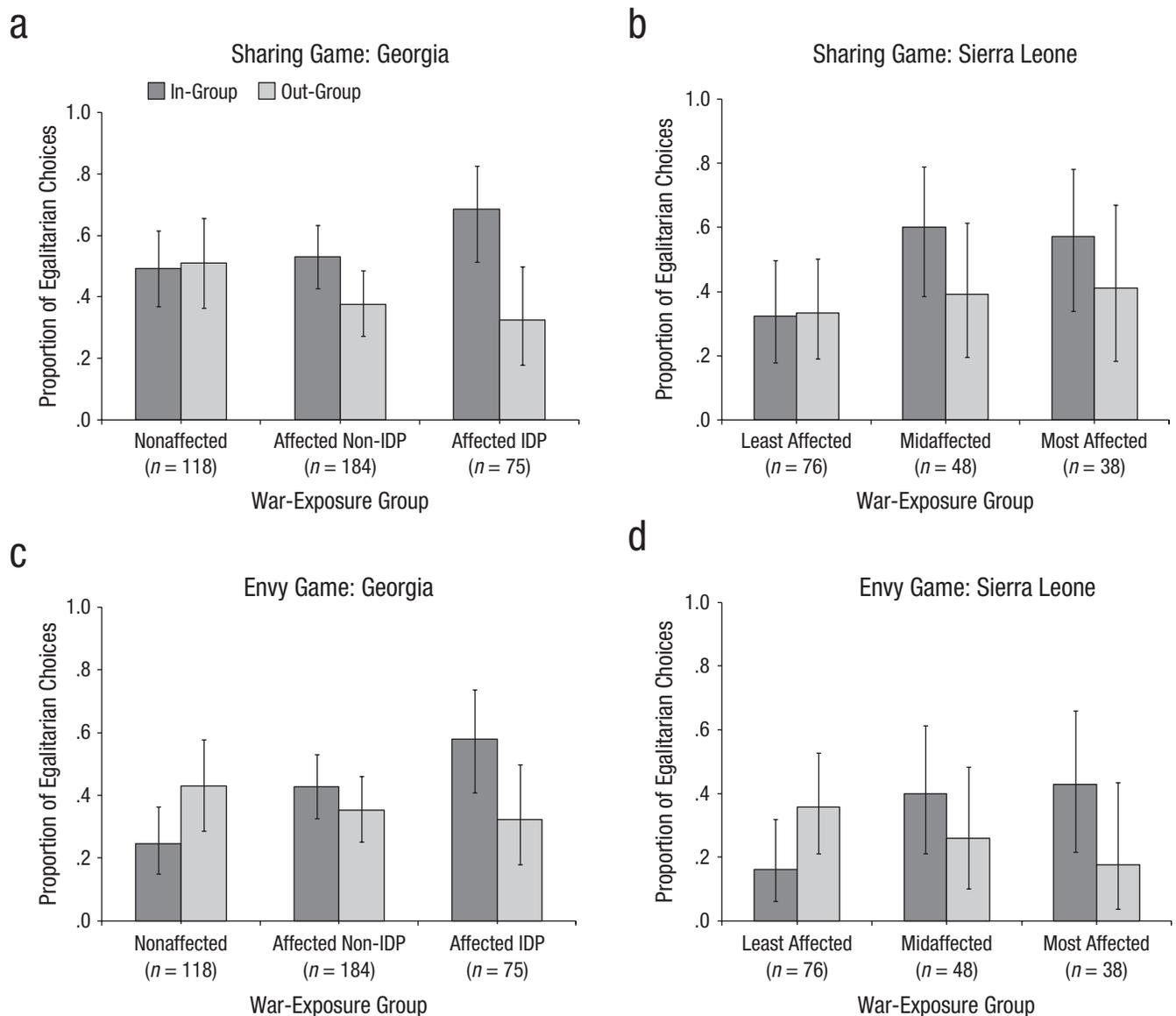
**Fig. 1.** Results: frequency of egalitarian choices in the Sharing and Envy Games. The plots in the top row show the mean proportion of egalitarian choices made in the Sharing Game as a function of the level of war exposure and in-group/out-group condition; results are shown separately for (a) participants (children aged 7–12 years) in the Republic of Georgia and (b) participants (adults aged 7–20 years during the civil war) in Sierra Leone. The plots in the bottom row show the mean proportion of egalitarian choices made in the Envy Game as a function of war exposure and condition; results are shown separately for (c) participants in the Republic of Georgia and (d) participants in Sierra Leone. The children in Georgia were divided into three treatment groups: nonaffected children, children who were exposed to warfare but were not internally displaced persons (IDPs) 6 months later (affected non-IDP), and children who were exposed to warfare and IDPs (affected IDP). The adults in Sierra Leone were also divided into three groups: those least affected by war, those moderately affected (midaffected; i.e., participants from households in which somebody had been either killed or injured), and those most affected by war (i.e., participants from households in which somebody was killed and somebody was injured). Error bars show exact 95% confidence intervals.

framework also revealed a positive interaction effect of being in the affected-IDP group and the in-group condition ($n = 341$) on sharing (In-Group Dummy × Affected IDP, $p = .03$), which indicates that the difference in sharing between the in-group and out-group conditions increased with warfare experience. In Sierra Leone, the frequency of

egalitarian sharing in the in-group condition ($n = 58$) increased from 32% among the least-affected group to 57% among the most-affected group ($p = .097$), but we found no statistically discernible effect on sharing in the out-group condition. As shown in Panel A of Table S2 (columns 7–12) in Supplemental Design and Results, these

patterns held in a regression framework after controlling for gender, age, number and gender of siblings, education, religion, and ethnicity.

For the Envy Game, Figure 1 (c and d) shows that those participants who were more affected by the war made more egalitarian choices when interacting with in-group members, and they showed a larger in-group–out-group gap. In Georgia, the percentage of egalitarian choices in the in-group condition ($n = 107$) increased from 25% among nonaffected participants to 58% in the affected-IDP group ($p = .001$), and in Sierra Leone ($n = 58$), it increased from 16% among least-affected to 43% in the most-affected group ($p = .03$). The gap between the in-group and out-group treatments in the percentage of egalitarian choices increased from −18% in the nonaffected group ($n = 118$; $p = .05$) to 26% in the affected-IDP group ($n = 75$; $p = .04$) in Georgia and from −20% in the least-affected group ($n = 76$; $p = .07$) to 25% in the most-affected group ($n = 38$; $p = .16$) in Sierra Leone. Confirming this, results from a probit regression analyses (see Panel A of Table S2 in Supplemental Design and Results) showed that the difference in the in-group–out-group gap changed as a function of war exposure at both sites, as indicated by the positive and highly significant interaction effect of war exposure and in-group condition on egalitarian choices in the Envy Game (Georgian sample, In-Group Dummy × Affected IDP, $p < .001$, $n = 341$; Sierra Leone sample, In-Group Dummy × Most Affected, $p = .01$, $n = 158$).
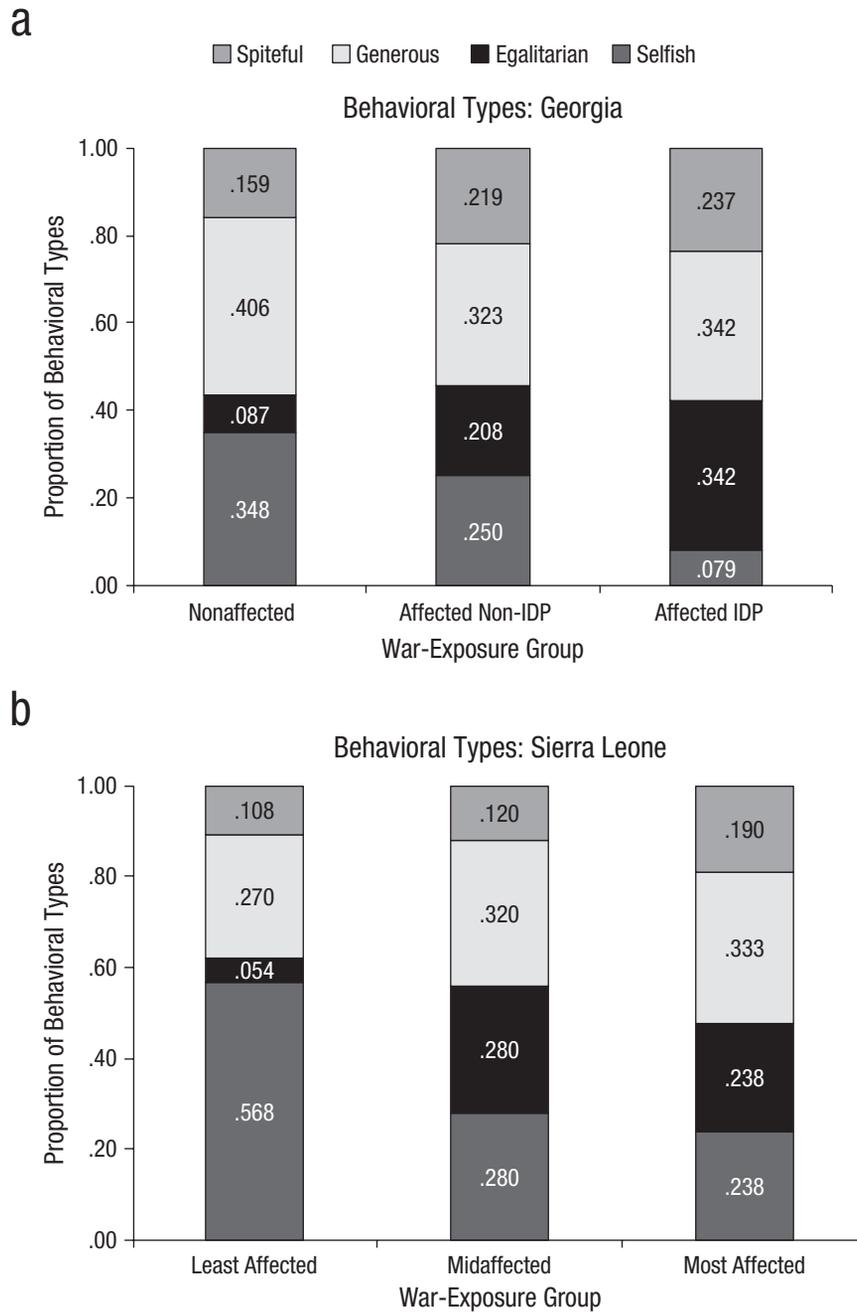
In another approach to analyzing our findings (shown in Fig. 2), we combined the in-group data from the two games to distinguish four behavioral types: (a) selfish, (b) egalitarian, (c) spiteful, and (d) generous. Selfish types were characterized by maximizing their own payoffs by picking the (2, 0) and (2, 3) allocations in the Sharing and Envy Games in Georgia, respectively, or by picking the (15, 5) and (13, 16) allocations in Sierra Leone. The percentage of selfish types diminished with war exposure, dropping from 35% in the nonaffected group to 8% in the affected-IDP group among Georgian children ($p = .002$) and from 57% among the least-affected group to 24% among the most-affected group among Sierra Leoneans ($p = .03$). By contrast, the percentage of egalitarian types, who were characterized by minimizing differences in payoffs between themselves and their partners (i.e., always picking the evenly split allocations) rose from 9% in the nonaffected group to 34% in the affected-IDP group in Georgia ($p = .002$) and from 5% in the least-affected group to 24% in the most-affected group in Sierra Leone ($p = .09$). The percentage of spiteful types—those who aimed to minimize the payoffs of other in-group members by selecting the (2, 0) and (15, 5) allocations in the Sharing Game in Georgia and Sierra Leone, respectively, and the (1, 1) and (10, 10) allocations

in the Envy Game in Georgia and Sierra Leone, respectively)—also increased with conflict exposure in Georgia, although to a lesser degree than egalitarian and selfish types. The effects of war exposure on the prevalence of purely generous types—those who picked the (1, 1) and (10, 10) allocations in the Sharing Game in Georgia and Sierra Leone, respectively, and the (2, 3) and (13, 16) allocations in the Envy Game in Georgia and Sierra Leone, respectively—were not significant, with the percentage of generous types slightly declining in Georgia and slightly increasing in Sierra Leone. Supporting this are results of regression analyses, provided in Supplemental Design and Results (see Table S3), linking conflict experience and type, as well as results from additional analyses that incorporated our two costless games (see Figs. S2 and S3).

Whereas we observed both short- and long-term impacts on social motivations among those who experienced conflicts between the ages of 7 and roughly 20, we do not find any conflict-related effects on sociality for children between the ages of 3 and 6 in Georgia (see Panel A of Table S4 in Supplemental Design and Results), and there were only muted effects for Sierra Leoneans who were over 20 years of age during the conflict (see Panel B of Table S4 in Supplemental Design and Results). In Sierra Leone, in the in-group condition, the difference between the most-affected and the least-affected groups in the percentages of children and adolescents who picked the egalitarian choice was 26 percentage points in the Sharing Game and 31 percentage points in the Envy Game, whereas for adults, it was 17 and 4 percentage points, respectively.

Nevertheless, it bears emphasis that our calculation of a large change in the impact of war experience at 20 years of age is (a) based only on the Sierra Leone data and (b) an approximation, because expanding the window to include 21 years of age, for example, fits almost as well. As noted, previous experimental evidence has shown that prosocial behavior increases with age during childhood and does not plateau until the mid-20s (Eisenberg et al., 2006; Harbaugh & Krause, 2000), probably because children and adolescents are gradually acquiring and internalizing the norms of their society. Consistent with this idea, results showed that sharing behavior in Georgian children increased with age—their likelihood of sharing increased by 4 percentage points with each year between the ages of 3 and 12.

Of course, our selection of natural experiments creating quasirandom assignment to war treatments may not have been entirely effective. For instance, some of the regions covered in our samples were more affected than others, and, it could be argued, social norms governing prosocial behavior could vary across regions independently from warfare. To address this, we controlled for

## a

Behavioral Types: Georgia

Legend: Spiteful, Generous, Egalitarian, Selfish



## b

Behavioral Types: Sierra Leone



**Fig. 2.** Results: proportion of behavioral types in the in-group condition as a function of war exposure. Results are shown separately for participants in (a) the Republic of Georgia (children aged 7–12 years) and (b) Sierra Leone (adults aged 7–20 years during the country's civil war). IDP = internally displaced person.

location differences using dummy variables for each region (Georgia) or village (Sierra Leone; see Panel B of Table S2 in Supplemental Design and Results). This approach eliminated any variation in warfare experience across the regions so that the remaining variation distinguished only children from the same school (Georgia) and neighbors within the same village (Sierra Leone).

The results reflect the same pattern of results, linking war experience to egalitarian motivations.

Another remaining concern is that our results may have been due to a selection into victimization based on observable and unobservable characteristics that may correlate with prosocial motivations. We addressed this with a series of analyses. In Georgia, children's

observable characteristics (age, gender, family size, and height) did not predict their likelihood of being affected IDPs. Our results also were not driven by a subsample of children who lived close to the Russian borders, where, arguably, there could have been more scope for selective targeting because of some knowledge of the local population. In Sierra Leone, we found that observable characteristics (gender, age, education, family size, religion, and ethnicity) did not predict individuals' exposure to warfare. It is also noteworthy that we found stronger results for younger participants (less than 20 years of age during the civil war)—a subsample toward which it would be reasonable to expect less targeted violence than adults, who could potentially be singled out on the basis of their leadership roles or other characteristics. All these results are presented in detail in Tables S7 through S9 in Supplemental Design and Results. Together, they indicate that selective targeting is unlikely to explain the link between war experience and in-group egalitarian motivations.

## Discussion

Using decision tasks run with children and adults from the Caucasus and Africa, we found that exposure to conflict-related violence between middle childhood and early adulthood shifted people's motivations toward greater equality for in-group members. Affected participants were more willing to sacrifice both their own payoffs and those of the group to reduce inequality—whether such inequality was advantageous or disadvantageous to the participants themselves—within their in-group. These findings support evolutionary approaches that emphasize how intergroup competition intensifies selective pressures for reducing within-group differences in fitness to solidify internal cohesion and galvanize in-group cooperation (Bowles, 2006; Dawes et al., 2007). Combined with other evidence, our results suggest that psychological reactions triggered by war during a particular developmental window generate either (a) greater attention to or internalization of egalitarian social norms or (b) simply more in-group oriented egalitarian motivations, independent of local norms. These are separate evolutionary hypotheses, which we cannot distinguish here.

Some of our findings suggest a need for an enrichment of the concept of group benefits in current theorizing regarding how intergroup competition creates selection pressures for social motivations. Note that when focusing purely on direct payoffs in the Envy Game, choosing the equal allocation is immediately costly for the individual, the pair, and the larger group, so the central trade-off between individual and group benefits in current multilevel selection models is not immediately present within this game. Therefore, intergroup competition will not favor the egalitarian choice if it maximizes

average payoffs in the short term. However, such a choice could still be favored by either cultural or genetic evolution, driven by intergroup competition, if there are extra benefits from equal allocations for the group that follow later after the immediate allocation task—for example, if sustaining equality preserves internal harmony (e.g., by reducing theft and exploitation) and thereby prevents groups from fissioning, as communities do when their populations grow (Forge, 1972).[3] Such indirect group benefits may compensate for the loss of immediate payoffs by making groups larger and more stable in the long run. Among small-scale societies, group size is often the largest determinate of success in intergroup conflicts (Tuzin, 2001), so long-term group stability is crucial. The reasoning here parallels arguments that have been made for costly punishment, which reduces both individual and group payoffs in the short run but favors success in the longer run (Gächter, Renner, & Sefton, 2008).

Thus, the outcomes from our Envy Game suggest a need for evolutionary models that explicitly examine the trade-off between fitness-leveling motivations that promote group solidarity in the long run and those that favor higher, but unequal, short-term payoffs. Consistent with this, much evidence has suggested that greater inequality is associated with greater social disharmony (Wilkinson & Pickett, 2010) and slower economic growth in the modern world (Sokoloff & Engerman, 2000) and was associated with societal collapse in the ancient world (Turchin, 2005).

Nevertheless, there may be other explanations for our results. First, the experience of war may have induced a concern with maximizing relative payoff, which could be favored by natural selection when fitness is regulated locally. Severe resource depletions after conflicts might mean that only a fraction of the population will survive to reproduce. This could explain the Envy Game results but would be inconsistent with those from our Sharing Game. Second, it is possible that ancestral humans rarely faced choices between options that reduced inequality and those that increased both inequality and group payoffs (Boehm, 1999). This selective process may have used equality as the driving cue in group-beneficial choices, potentially resulting in undue emphasis on equality when individuals face trade-offs as participants did in the Envy Game. Or, finally, it could be argued that the observed effects of war were due to a trauma-related psychological malfunction rather than an adaptive response, although if this were the case, it is not clear why behavioral changes would be in the predicted directions or be restricted to this particular developmental window.

Our findings converge with those of two other recent studies in which war and social motivations were linked using behavioral games. Results from ultimatum games conducted before, during, and after the Israel-Hezbollah conflict have shown that living in a society under an active

and ongoing external threat temporarily increases the willingness of senior citizens to punish noncooperators and reward cooperation (Gneezy & Fessler, 2012). In Burundi, Voors et al. (2012) revealed that the experience of war-related violence increased sharing with neighbors.

Our work advances these findings in four ways. First, by using simple games suitable to both children and unschooled adults, we were able to isolate a developmental window in which the experience of warfare leaves an enduring psychological mark on social motivations. This contrasts with the time-limited effects revealed by Gneezy and Fessler (2012) among senior Israeli citizens, although our findings are consistent with those of Gneezy and Fessler in that we observed only weak enduring effects in people exposed to conflict during adulthood. Second, in our tasks, we more directly identified the social motivations instilled by intergroup conflicts using multiple interlocking games with an in-group versus out-group manipulation. This is crucial because the theoretical prediction was specifically for an increase in in-group egalitarian motivation—not merely for generalized prosociality or equality. Third, because we assessed the nature of individuals' conflict experiences, we were able to examine how more and less direct exposure to violent conflict differentially impacted social motivation: More direct exposure to conflict yields greater in-group egalitarian motivations. Fourth, we ran our experiments across more than 1,000 participants, ranging from 3 to 84 years of age, drawn from multiple communities in both the Caucasus and Sierra Leone. Establishing the broad generalizability of experimental findings is crucial to testing theories of human behavior (Henrich, Heine, & Norenzayan, 2010). Nevertheless, our work is only a starting point and calls for more research linking life-history trade-offs to models of cooperation and intergroup competition.

Our hypotheses were based on the idea that intergroup conflict may have specifically impacted both genetic and cultural evolution in domain-specific ways. However, it is plausible that intergroup conflict instead represents but one type of personal insecurity—a broader domain that includes other events or threats, such as those created by floods, pathogens, earthquakes, and famines, as well as war. The idea underlying our hypotheses was that people have evolved to respond to insecurity by shifting their investment from building a broader sphere of positive-sum interactions to managing risk by investing more heavily in their kin, their close personal relationships, and their in-group. Future research will sort this out.

Establishing the enduring effects of war on human sociality and delimiting them to a particular developmental window may illuminate a range of phenomena, including (a) the rapid recoveries observed in numerous postconflict societies (Blattman & Miguel, 2010), (b) the historical importance of war in building new nations and larger political structures (Tilly & Ardant, 1975), (c) the persistent parochialism of cyclical conflicts, and (d) the existence of generational differences in sociality and patriotism between those who experienced war during a developmental window and those who did not. This last point may contribute to explaining generational differences, such as those between America's "Greatest Generation" (who experienced World War II in the window) and subsequent generations. Such findings also remind us that the potentially positive effects on cooperation created by conflict may come at the expense of regard for those outside of one's own group.

## Author Contributions

M. Bauer, A. Cassar, and J. Chytilová contributed equally to the research design, data analysis, and writing of the manuscript. M. Bauer and J. Chytilová conceived the original idea for the experiments. J. Henrich contributed to the interpretation and writing of the manuscript. All authors approved the final version of the article for submission.

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## Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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## Supplemental Material

Additional supporting information may be found at http://pss .sagepub.com/content/by/supplemental-data

## Notes

1. Because of the particular questions we asked (following Bellows & Miguel, 2009) and because of our desire to create a coding scheme paralleling that used for the Georgia sample, it is possible that some of the Sierra Leoneans coded as most affected might have been better classified as midaffected and vice versa. We do not have additional information for further assessing the intensity of victimization. However, the results did not significantly change when we pooled members of both categories into one and compared the least-affected group with the resulting "affected" group. These results are available in Table S6 and Figure S4 in the Supplemental Design and Results.

2. All *p* values reported here were calculated using Fisher's exact test.

3. The link between equality and conflict is perhaps best illustrated by one of the participant's comments. When asked, after the experiments, why she had chosen the equal allocation in the Envy Game, a Georgian girl responded, "You know, sometimes people fight if one has more and other less. If all have equal amounts, they probably won't fight." Notably, ultimatum-game experiments in small-scale societies have also revealed preferences for equality over higher payoffs to the individual and group in the short term (Henrich et al., 2006).

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