Intergroup Contact, Social Dominance and Environmental Concern:

A Test of the Cognitive-Liberalization Hypothesis

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Abstract

Intergroup contact is among the most effective ways to improve intergroup attitudes. While it is now beyond any doubt that contact can reduce prejudice, in this paper we provide evidence that its benefits can extend beyond intergroup relations – a process referred to as cognitive liberalization (Hodson, Crisp, Meleady & Earle, 2018). We focus specifically on the impact of intergroup contact on environmentally-relevant attitudes and behavior. Recent studies suggest that support for an inequality-based ideology (Social Dominance Orientation) can predict both intergroup attitudes and broader environmental conduct. Individuals higher in SDO are more willing to exploit the environment in unsustainable ways because doing so aids the production and maintenance of hierarchical social structures. In four studies conducted with British adults we show that by promoting less hierarchical and more egalitarian viewpoints (reduced SDO), intergroup contact encourages more environmentally responsible attitudes and behavior. Both cross-sectional and longitudinal data support this model. Effects are more strongly explained by reductions in an anti-egalitarian motive (SDO-E) than a dominance motive (SDO-D). We discuss how these findings help define an expanded vision for intergroup contact theory that moves beyond traditional conflict-related outcomes.

Keywords: INTERGROUP CONTACT, ENVIRONMENTAL CONCERN, SOCIAL DOMINANCE ORIENTATION, PREJUDICE, COGNITIVE LIBERALIZATION

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Intergroup contact occurs when members of different social groups interact and come to know one another across group lines (Allport, 1954). This integration of different groups has been reliably shown to reduce prejudice. Multiple meta-analytic integrations, attest to the fundamental, robust, and positive impact of contact on intergroup attitudes (Beelman & Heinemann, 2014; Davies, Tropp, Aron, Pettigrew, & Wright, 2011; Miles & Crisp, 2014; Lemmer & Wagner, 2015; Pettigrew & Tropp, 2006). This effect replicates across different implementations, participant populations and bases for group membership. It is strengthened by certain 'optimal' conditions (e.g. equal status, cooperative norms, common goals and institutional support), but remains even in their absence, Pettigrew & Tropp, 2006). Key principles of contact have now been distilled into intergroup contact theory (Brown & Hewstone, 2005; Pettigrew, 1998) which provides a sophisticated theoretical account of how, when, and why intergroup interaction can contribute to the improvement of intergroup relations (for a collection of papers documenting recent advances, see Hodson & Hewstone, 2013; Pettigrew & Tropp, 2011).

Although it is now beyond any doubt that intergroup contact reduces prejudice, we know surprisingly little about the more *distal* consequences of intergroup contact. In recent years several prominent scholars have emphasized the need to enlarge the pool of outcomes assessed in intergroup contact research in order to more fully capture its influence beyond simply improving individuals' feelings towards others (e.g. Dixon, Levine, Reicher, Durrheim, 2012; Pettigrew & Tropp, 2011; McKeown & Dixon, 2017; Vezzali, Turner, Capozza, & Trifiletti, 2018; Wright & Lubensky, 2009). Responding to these calls, Hodson, Crisp, Meleady, and Earle (2018) recently argued that contact can serve as an *agent of cognitive liberalization,* improving not only intergroup attitudes and relations, but changing

the way people think about the world and solve problems more generally. Analogous to a liberal education, contact is said to promote mental expansion and growth in ways that are not rigid or specific to the experience. Consistent with this premise, research demonstrates that contact improves attitudes not only toward the contact group but toward other, uninvolved groups (e.g. Pettigrew, 2009; Tausch et al., 2010), makes respondents less inward looking and more open to experiences (e.g. Pettigrew, 1997; Sparkman, Eidelman, & Blanchar, 2016; Verkuyten, Thijis & Bekhuis, 2010; Vezzali et al., 2018), and reduces ideological views about hierarchy (e.g. Dhont, Van Hiel, & Hewstone, 2014; Shook, Hopkins, & Koech, 2016; Van Laar, Levin, Sinclair & Sidanius, 2005). In these ways, contact exerts a generalizing reaction not only shaping the content or valence of intergroup attitudes, but promoting openness to new ideas and ways of thinking. The benefits of this process should be observable even beyond the intergroup relations domain.

This paper sought to provide a test of the *cognitive-liberalization hypothesis*. Pushing the implications of intergroup contact even further beyond the intergroup relations domain we focused on the impact of intergroup contact on environmental attitudes and behavior. Research suggests that individuals' endorsement of an ideology of inequality (Social Dominance Orientation; Pratto, Sidanius, Stallworth, & Malle, 1994) not only predicts intergroup attitudes and behaviors, but also attitudes and behaviors directed towards the natural environment (e.g., Milfont & Duckitt, 2010; Milfont, Richter, Sibley, Wilson, & Fischer, 2013). Reflecting a basic motivation to achieve hierarchy and dominance, individuals high in social dominance orientation (SDO) are more supportive of the exploitation of natural resources, and are less likely to believe that humans should live harmoniously with nature. It follows that by liberalizing cognition and promoting less hierarchical and more egalitarian viewpoints, intergroup contact has the potential to impact a range of more expansive variables, including environmental decision-making.

A Social Dominance Perspective on Environmental Conduct.

Social dominance theory is a theory of social and intergroup relations that focuses on individuals' support for status hierarchy in society (Pratto et al., 1994; Sidanius & Pratto, 1999). Social dominance orientation (SDO) captures measurable differences in individuals' preference for hierarchically structured group relations and inequality among social groups. Whereas individuals low in SDO believe that all people should be treated equally, individuals high in SDO prefer hierarchical social systems where superior groups dominate over groups considered inferior (Pratto et al., 1994; Sidanius & Pratto, 1999). SDO is one of the most widely used variables in social and personality psychology (Kteily, Ho, & Sidanius, 2012; Lee, Pratto, & Johnson, 2011), and is a powerful predictor of prejudice towards a range of groups including racial/ethnic minorities, homosexuals and women (for a review see Sidanius, Levin, Lui & Pratto, 2000). Individuals high in SDO are said to endorse prejudice as a way of fulfilling their desire to achieve and maintain hierarchical social structures. Prejudiced attitudes function as a 'legitimising belief' that justify and entrench inequality.

Although the SDO scale was developed to understand prejudice, and items refer specifically to groups, a number of recent studies suggest that SDO not only predicts intergroup attitudes and behaviors, but also attitudes and behaviors directed towards the natural environment. The central premise of social dominance theory is that high-SDO individuals should support initiatives and social policies that promote and enforce social hierarchy (Sidanius & Pratto, 1999). Importantly, environmental exploitation may be one such strategy, sustaining and widening social inequality through the hierarchical distribution of natural resources. Individuals high in SDO may be more willing to exploit the environment in unsustainable ways because to do so aids the production and maintenance of hierarchical social structures (Milfont & Sibley, 2014; Stanley, Wilson, Sibley, & Milfont, 2017).

This perspective is consistent with cultural theory (Douglas & Wildavsky, 1982). It has been argued that environmental attitudes are embedded within individuals' broader sociocultural orientation. Individuals are said to construct their policy preferences so as to bolster their preferred pattern of social relations. Environmentalism, specifically, is said to arise from a bias in favor of equality and redistributive concern. Proponents of cultural theory argue that individuals engage in environmentally responsible behaviors not just because they are concerned about the environment, but also because of a desire to transform how individuals live together in an egalitarian direction. To accept that the world is fragile and liable to catastrophe helps justify regulation ensuring the balanced and equitable distribution of limited natural resources.

Empirical evidence supports this notion. Indeed, in one of the first publications on SDO, Pratto and colleagues (1994) examined the correlates of SDO and found a strong negative correlation between SDO and support for environmental protection policies. This association replicated across three studies and remained strong when controlling for political-economic conservatism. Subsequent research has gone on to corroborate these findings. Studies have shown that individuals high in SDO are more willing to exploit environmental resources (Milfont & Duckitt, 2010; Milfont et al., 2013), less convinced that climate change is real (Hakkinen & Akrami, 2014; Hoffarth & Hodson, 2016; Jylha & Akrami, 2015; Jylha, Cantal, Akrami, & Milfont, 2016), and less likely to see environmental protection as an important principle (Jackson, Bitacola, Janes, & Esses, 2013; Son Hing, Bobocel, Zanna, & McBride, 2007). Research has also shown SDO to predict other environmentally relevant variables such as meat consumption (Allen, Wilson, Ng, & Dunne, 2000) and exploitation of animals (Dhont & Hodson, 2014; Dhont, Hodson, & Leite, 2016). Perhaps the most extensive evidence, however, comes from a 25-nation study recently conducted by Milfont and colleagues (2017). SDO was found to be systematically and reliably associated with anti-

environmentalism across contexts. Individuals higher in SDO were less likely to engage in public environmental citizenship behavior, less likely to engage in private sphere environmental behaviors, and less likely to donate to an environmental organization.

Dimensions of Social Dominance and their Associations with Environmentalism

A recent advancement in social dominance theory is the separation of SDO into two subdimensions: SDO-Dominance (SDO-D), or a preference for group-based dominance, and SDO-Egalitarianism (SDO-E), or opposition to equality. While SDO-D indexes one's support for systems of group-based dominance that maintain the subordination of low status groups, SDO-E constitutes a preference for systems of group-based inequality that taps into a preference for intergroup inequalities and non-egalitarian intergroup relations (Ho et al., 2012; 2015). Although highly correlated, research has confirmed that SDO-D and SDO-E are theoretically distinct and dissociate in terms of the intergroup outcomes they best predict. SDO-D is associated with the active and forceful suppression of outgroups and is positively correlated with old-fashioned prejudice, perceptions of zero-sum intergroup competition, and overt hostility and aggression toward outgroups. In contrast, SDO-E is associated more with exclusively of resources to prevent outgroups from increasing their social status, and is positively correlated with more subtle legitimizing ideologies and opposition to redistributive social policies (Ho et al., 2012; 2015).

Both aspects of SDO could feasibly drive the association between SDO and environmentalism. Lower environmental concern may reflect a desire for group-based dominance indexed by SDO-D that extends to human dominance over the nature world. Milfont et al. (2013) argue that individuals high in SDO should be motivated to endorse a broad range of ideologies that help to justify inequality and support a desire for dominance in its many forms. Individuals high in SDO may be less concerned about environmental issues and more willing to exploit the environment in unsustainable ways because these behaviors

reinforce the dominating role of humans as the master of nature. This perspective is consistent with the Social Dominance Human-Animal Relations Model (SD-HARM) which argues that the desire for group-based dominance underpins bias towards both human outgroups and non-human animals (Dhont et al., 2016; see also Dhont, Hodson, Costello, & Macinnis, 2014). Evidence consistent with this dominance account is provided by Jackson and colleagues (2013, Study 3) who found that when given the choice of locations to site an environmentally hazardous manufacturing plant, people higher in SDO were more likely to select foreign locations, particularly those of lower socioeconomic standing, despite the resources from the plant benefitting their own social group. Consistent with a dominance view of SDO, hierarchy is achieved in this context through oppressing a group of lower power and status.

Alternatively, the association between SDO and environmentalism may primarily reflect a preference for the unequal distribution of resources. SDO-E has been shown to be a stronger predictor than SDO-D of a preference for unequal distribution of resources and opposition to policies that promote greater equality (Ho et al., 2015). This support for the unequal distribution of resources indexed by SDO-E has been observed in the context of environmental resources. Milfont and Sibley's (2014) Hierarchy Enforcement Hypothesis of Environmental Exploitation argues that SDO predicts willingness to exploit the environment to the extent that resources gained from exploiting the environment lead to a widening of the gap between high- and low-status social groups. In supporting evidence they found that SDO predicts support for human actions that are detrimental to the environment only when they are expected to generate further profits for high-status groups (i.e. hierarchy-enhancing), and not when profits are expected to equally benefit all community members (i.e. hierarchy-attenuating). The only study to date that explored the association the two distinct sub-dimensions of SDO and environmentalism, supports this perspective. Specifically, Stanley

and colleagues (2017) found that individuals high in SDO-E were less willing to make sacrifices for the environment, less concerned about environmental protection, and less likely to believe the climate change is real while SDO-D was either a weaker or non-significant predictor of all environmental outcomes. Although these findings warrant follow-up, they suggest that low concern for the environment may be most strongly driven by opposition to equality, and to a lesser extent by a dominance motive.

Intergroup Contact as an Agent of Cognitive Liberalization

If environmental exploitation is congruent with social dominance motives, it follows that strategies that attenuate SDO levels can have environmental implications. One such strategy may be intergroup contact. Recent theorizing suggests that intergroup contact is not a single-purpose phenomenon, but can work at a deep level to change the way people think about the world and solve problems more generally – a process referred to as cognitive liberalization (Hodson et al., 2018). An increasingly diverse body of research demonstrates that in addition to improving attitudes towards the contact group (much of the focus in the field), contact effects generalize (i.e. spread their influence). Research on secondary transfer effects, for instance, demonstrates that contact benefits are not specific to the group in question but reshape how people think about outgroups generally. There is now growing evidence of secondary transfer effects in a range of contexts and between a range of groups (e.g. Pettigrew, 2009; Tausch et al., 2010). Similarly, research suggests that contact "deprovincializes" the mind, removing the self and the ingroup as the focus of judgment, and rendering participants more open to experience (e.g. Pettigrew, 1997; Sparkman, Eidelman, & Blanchar, 2016; Verkuyten, Thijs & Bekhuis, 2010). These processes suggest that contact promote learning in ways that are not rigid or specific to the experience itself but rather reflect a more liberalized mind-set. Accompanying this process can be a shift in ideology and worldview. Ideologies link moral and political attitudes, organize our values and belief

systems and guide behavior (Jost, 2006). In this way, ideologies serve psychological functions, offering "a sense of certainty, predictability, and control: a sense of security, and reassurance; and a sense of identity, belongingness, and shared reality" (Jost, 2017, p. 168), reflecting epistemic, existential and relational motivations respectively. It is easy to appreciate, therefore, how contact with outgroups can draw into question one's own set of beliefs and provide impetus for mental change and integration of new ideas.

SDO has long been examined with regards to intergroup contact, though it has typically been considered as a moderator of the effect of intergroup contact on prejudice. This research tends to find that although individuals high in SDO are less interested in improving intergroup relations, they benefit more from contact experiences when they do arise than those low in SDO (Dhont & Van Hiel, 2009, Hodson, 2008, 2011; Kauff, Schmid, Lolliot, Al Ramiah, & Hewstone, 2016; Kteily, Hodson, Dhont, & Ho, 2019). For example, in two studies Hodson (2008) found that White inmates higher in SDO showed substantially less intergroup bias following positive intergroup contact with Black inmates than those low in SDO.

More important to our thesis, however, is whether contact may not only improve attitudes amongst those with right-leaning ideologies, but might actually influence the ideology itself. Although SDO was originally considered to be a relatively stable individual difference variable, findings suggest that SDO is sensitive to life and socialisation experiences (Duckitt, 2001; Haley & Sidanius, 2005; Sidanius & Pratto, 1999). In two studies Dhont colleagues (2014) provided evidence that positive intergroup contact can reduce SDO. Study 1 was a pretest-posttest intervention study. The authors followed a group of Belgian high school students as they travelled to Morocco on a 1-week trip where they interacted with Moroccan students in educational and sporting activities. Not only were levels of prejudice towards the outgroup reduced following the contact intervention, but so were levels of SDO.

A second study employed a longitudinal sample of Belgian adults over the span of three months. Self-reported intergroup contact with immigrants at Time 1 predicted lower SDO at Time 2 (whereas SDO at Time 1 did not predict contact at Time 2).

Further evidence comes from Van Laar et al. (2005) who report the results of a large field experiment where more than 2000 US college students were tracked annually across 5 waves. Results showed that having a roommate from an ethnic outgroup (e.g. Black) was associated with more positive attitudes not only towards the contact group but other, secondary outgroups (e.g. Latino, Asian), and also with reductions in SDO. Shook and colleagues (2016) similarly examined students in university housing who were randomly assigned to same- versus different-race roommates. Echoing the findings of Van Laar and colleagues (2005), results showed that not only were secondary outgroup attitudes more positive after the first term, but those with cross-race roommates also showed a significant decrease in SDO. Together these findings suggest that having meaningful contact with a outgroup members encourages the adaptation of a more liberalized and tolerant mindset. Intergroup contact not only leads to more positive attitudes towards outgroups, but makes participants less accepting of dominance and hierarchy as a general outlook on life.

Recent research has emphasized the need to also study the effects of negative intergroup contact. The emphasis on intergroup contact as a strategy to improve intergroup relations has understandably meant that research has focused on investigating the consequences of positive interactions across group lines (Pettigrew, 2008). Of course, in natural settings, intergroup contact is not always positive, but may be unpleasant or unfriendly. Findings suggest that while positive contact reduces prejudice, negative contact can increase prejudice, with some research suggesting the later effect is stronger than the former (Barlow et al., 2012; Graf, Paolini, & Rubin, 2014; Paolini, Harwood, & Rubin, 2010). It is also important to consider how the consequences of negative contact encounters

extend beyond intergroup attitudes. In two studies, Meleady and Vermue (in press) showed that while positive contact was associated with reductions in SDO, negative contact was associated with increased endorsement of SDO. To our knowledge, this is the only investigation to date that has explored the impact of negative intergroup contact on SDO, but it is an important finding because if negative contact encourages the adaptation of a more close-minded and intolerant mindset (in contrast to an open-minded, "liberalized" mindset) and makes individuals more accepting of dominance and hierarchy as a general outlook on life, it too may be expected to exert a generalizing reaction beyond intergroup relations. Whereas positive contact may be expected to encourage environmentally-protective attitudes and behavior by attenuating SDO levels, negative contact may be associated with environmentally-damaging attitudes and behavior through increases in SDO.

The Present Research

It has recently been argued that intergroup contact can serve as an agent of *cognitive liberalization* with largely unrecognized potential beyond prejudice reduction (Hodson et al., 2018). This paper provides an empirical test of this idea. Pushing the implications of intergroup contact far beyond traditional, conflict-related outcomes, we focused on the impact of intergroup contact on environmental decision-making. As we have seen, research has established a link between SDO, an ideology that supports group hierarchies and inequality, and environmentalism. If intergroup contact has a liberalizing effect on cognition reducing ideological views about hierarchy it follows that it may also impact a range of more expansive variables including environmental attitudes and behavior. In four studies we tested this hypothesis. Study 1 sought to provide the first empirical test of an association between intergroup contact and environmentalism, and examined the mediating role of SDO in this process. Study 2 provides a conceptual replication on Study 1 with alternative measures of key constructs and controlling for the role of political orientation. In Study 3 we adopt a bi-

dimensional approach to the measurement of SDO in order to explore whether the contact-environmentalism association is primarily driven by an egalitarian motive (SDO-E), or dominance motive (SDO-D). Moreover, Study 3 also explored the specific effects of both positive and negative intergroup contact experiences. Finally, Study 4 increases confidence in the hypothesized direction of causality by providing longitudinal evidence of the association between intergroup contact, SDO, and environmental outcomes.

Study 1

Study 1 aimed to provide initial evidence of an association between intergroup contact and environmental concern. We also examined the mechanism underlying this effect. As discussed above, intergroup contact can have a liberalizing effect on cognition fostering less hierarchical and more egalitarian ideologies (i.e. reduced SDO; Dhont et al., 2014; Shook et al., 2015; Van Laar et al., 2005). Findings suggest that ideological views about hierarchy are predictive not only of intergroup attitudes, but also attitudes towards the natural environment (e.g. Jackson et al., 2013; Milfont & Duckitt, 2010). We therefore predict and test a mediational model in which the effect of intergroup contact on environmental outcomes is explained by reductions in SDO.

Method

Participants. One hundred and sixty four participants were recruited from a UK University. The sample included 26 male and 138 females, aged between 18 and 58 ($M = 20.01$, $SD = 3.68$). Our recruitment aim was 150 participants to provide sufficient power (.80) for detecting small to medium mediated effects using bias-corrected bootstrapped estimates (Fritz & MacKinnon, 2007). Participants were all British students and the target outgroup was international students. Participants received partial course credit in exchange for their

participation. Collection of responses within all studies reported in this paper were obtained in the format of online questionnaires.

Procedure. Intergroup contact was assessed with an index based on the product of two scales assessing the frequency and quality of intergroup contact (Dhont & Van Hiel, 2011; Voci & Hewstone, 2003). The *quantity* of participants' prior contact with international students was measured with 4 items, including "In everyday life, how often do you encounter international students" and "In everyday life how frequently do you interact with international students?" on a 7 point scale (1= *Never* to 7 = *Very often*, α =.91). To measure *quality* of contact, participants were asked to describe their experience of contact with international students based on the following adjectives: *superficial-deep; natural-forced; unpleasant-pleasant; competitive-cooperative; intimate-distant* on a bipolar scale ranging from 1 to 7 (α =.85). Following the procedure of Voci and Hewstone (2003) the quality and quantity scales were combined into a single multiplicative index. Prior to multiplication, the scores of the quantity of intergroup contact were recoded so that 0 corresponded to no contact and 6 to very frequent contact, and the quality scores were recoded so that the scores ranged from -3 to +3. A higher score on the multiplicative index therefore reflects more frequent, high-quality contact. Possible scores ranged between -18 and +18.

Environmental attitudes were assessed with a measure of environmental concern adapted from Dutcher, Finley, Luloff, and Johnson (2007). Participants rated their agreement with 5 statements, including "If things continue on their present course, we will soon experience a major ecological catastrophe" and "We are fast using up the world's natural resources". Responses were provided on a 5 point scale from 1= *Strongly disagree* to 5 = *Strongly agree* (α = .77). We also measured participants' intentions to engage in pro-environmental behaviors on the same scale with three items adapted from Joireman, Lasane, Bennett, Richards, and Solaimani (2001), including "I would sign a petition in support of

tougher environmental laws", and "I would contribute money to environmental organisations". ($\alpha = .68$)

SDO was measured with the 16-item SDO_6 scale (Pratto et al., 1994). Sample items include, "Some people are just more worthy than others" and "This country would be better off if we cared less about how equal all people were". Participants indicated how positively they viewed each item of a scale from 1 (*Very negative*) to 7 (*Very positive*). Half of the items were recoded such that higher scores always indicated a higher social dominance orientation ($\alpha = .94$). The order of all scales was counterbalanced across participants.

Results

We first examined the correlations amongst all variables. These are presented in Table 1 along with means and standard deviations. As expected, intergroup contact was negatively associated with SDO, and positively associated with both environmental concern and environmental behavioral intentions. Both environmental outcomes were negatively associated with SDO.[1]

Next, we conducted path analysis using robust maximum likelihood estimation (MLR) in Mplus (version 8, Muthen & Muthen, 1998-2017) to test our mediation hypothesis stating that the association between intergroup contact and environmental outcomes can be explained by reductions in SDO. Hence, we tested a model that included paths from intergroup contact to SDO (i.e. the mediator) and to environmental concern and behavioral intentions (i.e. criterion variables) as well as the paths from SDO to the two environmental outcomes. This model estimated all associations between the constructs, resulting in a fully saturated model ($df = 0$). In line with the zero-order correlations, the results (Figure 1) confirmed the hypothesized negative associations between intergroup contact and SDO, $\beta = -.32, z = -4.21, p < .001$, which in turn, was negatively associated with environmental concern and environmental intentions $\beta = -.27, z = -3.17, p = .002$ and $\beta = -.28, z = -4.02, p < .001$,

respectively. The standardized total effects of intergroup contact on environmental concern and environmental intentions were .22, z = 2.99, *p* = .003 and .32, z = 4.43, *p* < .001, respectively.

Furthermore, estimating the indirect associations based on 10,000 bootstrap samples, showed that intergroup contact was indirectly associated with both environmental concern and environmental intentions via SDO, standardized indirect effect (IE) = .085, [95% bias-corrected bootstrap confidence interval (BCI)= .026, .173], z = 2.29, *p* = .022, and standardized IE = .089 (95%BCI = .038, .166), *z* = 2.76, *p* = .006, respectively.

The results of Study 1 provide the first evidence that the benefits of intergroup contact in the ostensibly unrelated domain of environmental decision-making. Intergroup contact was found to be positively associated with attitudinal environmental concern and intended pro-environmental behaviors. The effect of intergroup contact on both environmental outcomes was mediated by reductions in SDO. Supporting our theoretical model, we found that those having more frequent positive intergroup contact showed stronger support for social equality (i.e. reduced SDO), which in turn predicts more environmentally responsible attitudes and behavior. The results of Study 1 provide the first evidence that by shifting individuals' general beliefs about social (in)equality, intergroup contact has the potential to have a wider impact on a more expansive set of variables predicted by SDO, including environmental attitudes and behavior.

Study 2

Study 2 sought to provide a conceptual replication of the results of Study 1. We sought to demonstrate the robustness of effects by employing alternative, but conceptually consonant measures of key constructs. We also sought to rule out an alternative explanation for results by measuring and controlling for participants' political orientation. Political

conservatism is an important predictor of both intergroup negativity (Sibley & Duckitt, 2008; Hodson & Dhont, 2015), and environmental concern (Hornsey, Harris, Bain, & Fielding, 2016; Milfont, Milojev, Greaves, & Sibley, 2015). It could therefore be argued that intergroup contact is associated with environmental outcomes only because politically liberal people are more likely to be environmentally friendly and also more likely to engage in intergroup contact. Study 2 aimed to rule out this alternative explanation and confirm that intergroup contact explains a unique amount of variance in environmental outcomes, over and above political orientation.

Method

Participants. Data was collected from 152 undergraduate participants from a UK University. As in Study 1, the recruitment aim was 150. Participation was restricted to individuals who had not taken part in previous studies within this investigation. The target group for contact in Study 2 was 'ethnic minorities' and so only White British participants were recruited. The sample included 22 male and 130 female participants, aged between 18 and 45 ($M = 19.76$, $SD = 3.16$). Participants received partial course credit in exchange for their participation.

Procedure. Intergroup contact was measured with the same items as used in Study 1. Participants reported on both the quantity ($\alpha = .90$) and quality ($\alpha = .75$) of their contact with ethnic minorities which were then combined into a multiplicative index of intergroup contact. Rather than environmental attitudes or intentions, we measured participants' self-reported engagement in pro-environmental behaviors as the outcome variable in Study 2. Participants indicated how often they had performed ten pro-environmental behaviors in the last year on a 5-point scale (1=*never*, 2=*rarely*, 3=*sometimes*, 4=*often*, 5=*very often,* $\alpha = .84$). Behaviors included recycling behaviors, conservation behaviors, consumer behaviors, and transportation

behaviors, e.g. "Looking for ways to reuse things", "Composting food scraps", "Conserved fuel by walking or cycling" (Schultz & Zelezny, 1998).

The hypothesized mediating mechanism, egalitarian attitudes, was measured with Katz and Hass's (1988) Humanitarianism-Egalitarianism scale which measures peoples' endorsement of equality of opportunity, social justice, and concern for the well-being of other individuals regardless of their respective group membership. Participants rated their agreement with 10 statements including "There should be equality for everyone – because we are all human beings" and "Everyone should have an equal chance and an equal say in most things" (1= *Strongly disagree* 7=*Strongly agree, α* = .90). Finally, Study 1 did not directly measure the effect of intergroup contact on outgroup evaluation. To confirm this effect in Study 2, participants were asked to indicate how they felt towards people from ethnic minorities, in general, on six, seven-point semantic-differential scales (*cold-warm, suspicious-trusting, positive-negative, friendly-hostile, respect-contempt and admiration-disgust α* = .88; Wright, Aron, McLaughlin-Vope, & Ropp, 1997). Finally, participants were asked to indicate their overall political orientation by placing themselves on a political spectrum from 1 = *Very liberal* to 7 = *Very conservative.*

Results

We first examined the zero-order correlations amongst variables (see Table 2). Replicating the traditional contact effect, intergroup contact was positively correlated with outgroup evaluation. Intergroup contact was also positively correlated with egalitarianism and self-reported environmental behavior. There was also a significant positive association between egalitarianism and environmental behavior.[2]

Path analysis using MLR in Mplus was then conducted to examine whether the association between intergroup contact and environmental behavior could be explained by higher levels of egalitarianism, while controlling for political orientation. As in Study 1, we

estimated all associations between the constructs, resulting in a fully saturated model (df = 0). The results, presented in Figure 2, confirmed that those reporting more positive contact experiences, more strongly endorsed egalitarian values, $\beta = .33, z = 5.85, p < .001$, and in turn, also reported more pro-environmental behavior, $\beta = .18, z = 2.12, p = .034$. The standardized total effect of intergroup contact on environmental behavior was .22, $z = 2.94, p = .003$. Moreover, as hypothesized, intergroup contact was indirectly positively related to environmental behavior through egalitarianism, standardized IE = .06 (95% BCI = 005, .125), $z = 1.99, p = .047$ (based on 10,000 bootstrap samples).

Discussion

The results of Study 2 provide a conceptual replication of the results of Study 1. The impact of intergroup contact on environmental outcomes was replicated when we measured contact with a different target outgroup and self-reports of past pro-environmental behaviors rather than environmental attitudes or intentions. The mediational role of an alternative, but conceptually consonant, egalitarianism construct was also established. Importantly, effects held after controlling for political orientation. Findings therefore increase confidence that intergroup contact is not associated with environmental outcomes merely because more politically liberal people are more likely to engage in intergroup contact and also more likely to be concerned with environmental issues, but instead intergroup contact explains a unique amount of variance in environmental conduct over and above political ideology.

Study 3

In Study 3 we sought to provide a stricter test of the proposed model by employing the new measurement and conceptualization of SDO that distinguishes between two subdimensions – intergroup dominance (SDO-D) and intergroup anti-egalitarianism (SDO-E) (Ho et al., 2015). While it could be argued that the SDO-environmental association is reflective of a dominance motive (SDO-D) that transfers from human-human relations to

human-nature relations, previous findings and theoretical argumentation suggest that an anti-egalitarian motive (SDO-E) is a stronger predictor of environmental conduct (Milfont & Sibley, 2014; Stanley et al., 2017). We therefore expect the association between intergroup contact and environmental outcomes to be explained by reductions in SDO-E, and to a lesser extent SDO-D.

We also considered the valence of intergroup contact more focally in Study 3. Recent advancements in intergroup contact theory have highlighted the importance of recognizing positive and negative contact experiences as distinct dimensions of intergroup contact. While the former may reduce prejudice, the latter can increase it (e.g. Barlow et al., 2012; Dhont & Van Hiel, 2009; Graf, Paolini, & Rubin, 2014). In this study we considered how the consequences of both positive and negative contact encounters may generalize beyond focal intergroup outcomes. Specifically, whereas positive contact may increase concern for environmental issues by attenuating SDO levels, negative contact may be associated with the denial of environmental problems through increases in SDO.

Method

Participants.   In order to obtain a more heterogeneous sample in Study 3 data was collected from a commercial platform, Prolific Academic. Sample size was increased to allow us to test the hypothesized mediation model using structural equation modeling (SEM) with latent variables rather manifest variables. The final sample included 501 participants. It consisted of 149 males and 352 females, aged between 18 and 69 ($M = 36.56, SD = 13.12$). The target outgroup in Study 3 was again 'ethnic minorities' and so only White British participants were eligible to participate.

Procedure. Participants indicated the frequency of their positive contact with people from ethnic minority backgrounds with three items concerning how often they have had pleasant, positive, and friendly interactions with people from ethnic minorities on a scale

from 1 (*Never*) to 7 (*Very often*) (α = .88). Similarly participants indicated the frequency of their negative contact with people from ethnic minorities by responding to three items concerning how often they have had unpleasant, negative, and hostile interactions with people from ethnic minorities on the same scale (α = .91, Dhont & Van Hiel, 2009; Meleady & Vermue, in press).

SDO was measured with the new SDO$_7$ scale developed by Ho and colleagues (2015). In contrast to previous measures of SDO which were designed to be unidimensional, the new measure embeds the dominance and anti-egalitarianism subdimensions. Eight items measured SDO-D (e.g. pro-trait: "Some groups of people must be kept in their place", con trait: "No one group should dominant in society") (α = .85), and eight items measured SDO-E (pro-trait: "We should not push for group equality", con-trait: "We should do what we can to try and equality conditions for different groups"), (α = .91). Participants indicated how much they favored or opposed each statement on a scale from 1 (*Strongly oppose*) to 7 (*Strongly favor*).

Environmentalism was measured with a measure of climate change denial (Hakkinen & Akrami, 2014). The measure consisted of sixteen items that were constructed to capture different forms of denial, such as denial of human effect (e.g. "Climate change is natural and not due to human influence"), and denial of seriousness (e.g. "Climate change will not affect life on Earth in any significant way", e.g. McCright & Dunlap, 2011). Participants responded to all items on a Likert-like scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Items were coded so that higher scores always indicated greater climate change denial (α = .94). Political orientation was again measured as per Study 2.

Results

Descriptive statistics and correlations between all variables are shown in Table 3. Positive contact was negatively associated with climate change denial, SDO-E and SDO-D.

Negative contact, meanwhile, was positively associated with climate change denial, SDO-E and SDO-D. All associations held when controlling for political orientation.

We tested the hypothesized mediational model using SEM analysis with latent variables. We used the robust maximum likelihood estimator in Mplus (version 8). To smooth measurement error and to maintain an adequate ratio of cases to parameters (Little, Cunningham, Shahar, & Widaman, 2002), we created three indicator parcels for the latent factors of each of the two SDO dimensions and three indicator parcels for the latent factor of climate change denial. The latent factors of positive and negative contact were indicated by the observed items (i.e. three items for each contact measure). The Chi-square test statistic (χ^2), the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the Standardized Root-Mean-Square residual (SRMR) were used to evaluate the goodness-of-fit of the tested model. A satisfactory fit is indicated by a CFI value greater than .95, an RMSEA value close to or lower than .06, an SRMR close to or lower than .08 (Hu & Bentler, 1999), and a χ^2/df ratio smaller than three (Kline, 2010). The measurement model showed a good model fit, $\chi^2(80) = 124.96$, $p = .001$; $RMSEA = .034$ (90%CI = 0.22, 0.045); $SRMR = .023$; $CFI = .990$.

We tested a model in which we included the paths from positive and negative intergroup contact (i.e. the predictors), to SDO-E and SDO-D (i.e. the mediators), and the paths from SDO-E and SDO-D to climate change denial (i.e. the criterion variable). Also the direct paths from positive and negative contact to climate change denial were included and the disturbance terms of SDO-E and SDO-D were allowed to be correlated. Furthermore, we controlled for political orientation (indicated by the manifest scores on the item) by including paths from political orientation to the mediators and criterion variable.

Figure 3 and Table 4 report the results of this model test, which resulted in a good model fit, $\chi^2(90) = 136.74$, $p = .001$; RMSEA = .032 (90%CI = .021, .043); SRMR = .022;

CFI = .990. The results demonstrated that positive contact was negatively associated with both SDO-E and SDO-D, while negative contact was positively associated with both SDO sub-dimensions. Furthermore, both SDO-E and SDO-D were in turn, significantly positively associated with climate change denial. The direct paths from positive and negative contact to climate change denial were not significant (see Table 4).

Estimating the indirect associations based on 10,000 bootstrap samples, confirmed that positive contact was indirectly negatively associated with climate change denial, through both SDO-E and SDO-D, standardized IE = -.09 (95% BCI= -.153, -.049], z = -3.51, p < .001 and standardized IE = -.05 (95% BCI= -.11, -.011), z = -2.14, p = .032, respectively. Furthermore, negative contact was indirectly positively with climate change denial, through both SDO-E and SDO-D, standardized IE = .10 (95% BCI= .054, .166), z = 3.60, p < .001 and standardized IE = .05 (95% BCI = .010, .098), z = 2.17, p = .030, respectively.

Discussion

The results of Study 3 provide evidence that both positive and negative intergroup contact are independently associated with environmental outcomes. While positive contact was associated with lower climate change denial, negative contact was associated with higher climate change denial. Moreover, whereas previous examinations of the effect of intergroup contact on SDO have employed a uni-dimensional measurement approach, we adopted a bi-dimensional measurement approach in Study 3. Both SDO subdimensions served as significant mediators of the effect of positive and negative intergroup contact on environmental outcomes, however, in both cases, the indirect effects of SDO-E was larger than SDO-D. Although these findings warrant follow up, they provide initial evidence that the effect of intergroup contact on environmental outcomes is more strongly driven by an egalitarian motive than a dominance motive.

Study 4

Three studies have now provided evidence of an association between intergroup contact and environmentally relevant attitudes and behavior. The principle aim of Study 4 was to provide a longitudinal replication of this effect. All previous studies have been cross-sectional and thus cannot speak to causality. We can be more confident that intergroup contact (positive and negative) has a causal impact on environmental outcomes if contact at Time 1 is predictive of environmental attitudes at Time 2, while environmental outcomes at Time 1 are controlled for. Findings will also help clarify the role of SDO-E and SDO-D in this association, as well as whether the association between intergroup contact and environmental outcomes is unidirectional or bidirectional.

Method

Participants. Data was collected from a mixture of undergraduate participants from a university panel, and from Prolific Academic. Participants recruited from the university panel received partial course credit, whereas those recruited via Prolific Academic received a small payment in exchange for their participation. Sample size was increased relative to Study 3 given the longitudinal design and uncertain attrition rates. We recruited a total of 654 participants at Wave 1. This included 212 male and 442 female participants, aged between 18 and 84 ($M =32.24$, $SD = 13.05$). Only White British participants were eligible to participate. All respondents from Time 1 were contacted again approximately 100 days later (Time 2) with a request to complete a second questionnaire. This inter-survey interval is consistent with other recent longitudinal studies of intergroup contact (Reimer et al., 2017). A total of 74% of the initial sample ($N_{Time2} = 487$) participated at Time 2 ($Ns = 206$ and 128 from undergraduate panel at T1 and T2 respectively, $Ns = 448$ and 359 from Prolific Academic panel at T1 and T2 respectively).

Procedure. Participants in each wave were asked to complete an identical questionnaire. Participants indicated the frequency of their positive contact with ethnic minorities (αs = .88 and .90 at T1 and T2 respectively) and the frequency of their negative contact with ethnic minorities (αs = .90 and .92 at T1 and T2 respectively) on the same scales used in Study 3. SDO was again measured with the same SDO_7 scale. Eight items measured SDO-D (αs = .87 and .87 at T1 and T2 respectively), and eight items measured SDO-E (αs = .90 and .92 at T1 and T2 respectively).

Three measures of environmentalism were included in Study 4 mirroring those used throughout the three preceding studies. All items were answered on a seven point scale from 1 = *Strongly disagree*, to 7 = *Strongly agree*. *Environmental concern* was assessed with six items including "People have been giving far too light attention to how human progress has been damaging the environment" and "The benefits of modern consumer products are more important than the pollution that results from their production and use" (adapted from Milfont & Duckitt, 2010, αs = .80 and .81 at T1 and T2 respectively). *Self-reported environmental behavior* was also measured with two items, "In my daily life, I try to find ways to conserve water and/or power" and "In my daily life, I'm just not interested in trying to conserve water and/or power" (αs = .82 and .85 at T1 and T2 respectively). *Climate change denial* was measured with two items (reverse coded), "Climate change is real" and "Climate change is caused by humans" (Stanley et al., 2017, αs = .85 and .83 at T1 and T2 respectively).

Results

Cross-sectional analyses. Means and standard deviations for all manifest variables at T1 and T2 and their correlations are reported in Table 5. Before conducting the longitudinal analyses, we first cross-sectionally tested the mediation hypothesis using Time 1 data. We followed the same statistical procedures as in Study 3 by conducting SEM analyses with latent variables in Mplus (with MLR). We created three indicator parcels for each of the two

SDO dimensions. The pro-environmentalism factor was indicated by the scores on environmental concern, environmental behavior, and climate change denial. The latent factors of positive and negative contact were indicated by the observed items (i.e. three items for each contact measure). The measurement model showed satisfactory model fit, $\chi^2(80) = 141.29$, $p < .001$; CFI = .987; RMSEA = .038 (90%CI = .025, 0.043); SRMR = .044.

Similar to Study 3, we tested a model including the paths from positive and negative intergroup contact (i.e. the predictors), to SDO-E and SDO-D (i.e. the mediators), and the paths from SDO-E and SDO-D to pro-environmentalism (i.e. the criterion variable). Also the direct paths from positive and negative contact to pro-environmentalism were included and the disturbance terms of SDO-E and SDO-D were allowed to be correlated.

The results, reported in Figure 4 and Table 6, demonstrated that positive contact was negatively associated with both SDO-E and SDO-D, while negative contact was positively associated with SDO-E and SDO-D. Furthermore, in this sample, SDO-E was significantly positively associated with pro-environmentalism, while the effect of SDO-D on pro-environmentalism was weaker and not significant. Also the direct paths from positive and negative contact to pro-environmentalism were not significant (see Table 6).

Moreover, estimating the indirect associations (10,000 bootstrap samples), demonstrated that positive contact was indirectly positively related to pro-environmentalism, through SDO-E, standardized IE = .11 (95% BCI= .021, .226), $z = 2.18$, $p = .030$, but not through SDO-D, standardized IE = .06 (95% BCI= -.017, .139), $z = 1.47$, $p = .142$. Furthermore, negative contact was indirectly negatively related to pro-environmentalism, through SDO-E, standardized IE = -.08 (95% BCI = -.171, -.014), $z = -2.02$, $p = .044$, but not through SDO-D, standardized IE = -.05 (95% BCI = -.137, .057), $z = -1.46$, $p = .144$, respectively.

Longitudinal analyses. Before testing the longitudinal models between the latent constructs of positive and negative contact, SDO-E, SDO-D, and pro-environmentalism, we determined whether the respondents who participated at both time points differed significantly from the respondents who dropped out after Time 1 along any of these variable indicators. The results of Little's Missing Completely At Random test was non-significant, $\chi^2(15) = 23.90$, $p = .067$, indicating no significant multivariate differences between both groups. Hence, it is unlikely that selective attrition played a significant role in subsequent findings and we used full information maximum likelihood estimates to deal with missing values. Furthermore, also tests of the cross-sectional measurement model at Time 2, which included all the Time 2 latent factors yielded a satisfactory model fit, $\chi^2(80) = 141.35$, $p < .001$; CFI = .983; RMSEA = .040 (90%CI= .029, .050); SRMR = .032.

In the longitudinal models, the residual errors of parallel indicators were allowed to correlate, reflecting stability in systematic error over time. To establish longitudinal measurement invariance (MI) (Byrne, Shavelon, & Muthén, 1989; Little, Preacher, Selig, & Card, 2007), we compared a model including the latent factors from each time point with freely estimated parameters with a second model in which factor loadings of corresponding indicators across time were constrained to be invariant (Brown, 2006; Christ & Wagner, 2013; see also Dhont et al., 2014; Swart, Hewstone, Christ, & Voci, 2011). Both models showed good model fit, $\chi^2(345) = 445.13$, $p < .001$; CFI = .991; RMSEA = .021 (90%CI = .015, .027); SRMR = .044 and $\chi^2(355) = 452.25$, $p < .001$; CFI = .991; RMSEA = .020 (90%CI= .014, .026); SRMR = .044, respectively and were not significantly different from each other, scaled $\Delta\chi^2(10) = 7.38$, $p = .69$, confirming metric MI over time. We then tested whether the constructs showed relatively equivalent stability over time, by gradually constraining the autoregressive associations between constructs over time. The model fit did not significantly worsen when imposing these additional equality constrains, all scaled

$\Delta\chi^2$s(1) $<$ 3.30, $ps >$ .068. Furthermore, the model fit of the more parsimonious model with all autoregressive paths constrained to be equal between constructs was satisfactory, χ^2(359) = 462.67, $p <$ .001; $CFI =$ .990; RMSEA = .021 (90%CI = .015, .026); SRMR = .046, indicating that the constructs were of equivalent stability over time (see also Swart et al., 2011). Hence, also in the following longitudinal models, the stability of the constructs over time was assumed to be equivalent.

Longitudinal associations between intergroup contact and SDO. In a first longitudinal model, we investigated the effects of the contact factors (positive and negative contact) and SDO factors (SDO-E and SDO-D) at Time 1 on the contact and SDO factors at Time 2. This model thus included all autoregressive and cross-lagged paths from these Time 1 factors to the Time 2 factors (i.e. full cross-lagged model). The latent variables at Time 1 were allowed to be correlated and the latent variable residuals (the disturbance terms) at Time 2 were allowed to be correlated. Figure 5 depicts the results (i.e., standardized estimates) of this analysis, χ^2(223) = 256.92, $p =$ .059; CFI = .996; RMSEA = .015 (90%CI= .000, .023) ; SRMR = .025 (for full results, see Table 7). As expected, positive contact had a significant negative longitudinal effect on SDO-E, $\beta =$ -.08, $z =$ -2.51, $p =$ .012, but not on SDO-D, $\beta =$ .03, $z =$ 0.82, $p =$ .410. Consistent with previous findings (e.g. Dhont et al., 2014), neither SDO-E, nor SDO-D showed a significant longitudinal effect on positive contact, $\beta =$ -.05, z = -0.58, $p =$ .564, and $\beta =$ -.02, z = -0.28, $p =$ .780, respectively. Furthermore, the longitudinal effects of negative contact on SDO-E and SDO-D, and from SDO-E and SDO-D to negative contact were not significant (see Table 7). In sum, these results replicated the cross-sectional findings indicating that those having more positive contact Time 1 scored lower on anti-egalitarianism at Time 2.

Longitudinal associations between intergroup contact and environmentalism. In the second full cross-lagged model, we investigated the longitudinal associations between

positive and negative contact and environmentalism. Again, the latent variables at Time 1, and the latent variable residuals (the disturbance terms) at Time 2 were allowed to be correlated. Figure 6 depicts the model results (i.e., standardized estimates), $\chi^2(119) = 176.55$, $p < .001$; CFI = .989; RMSEA = .027 (90%CI = .018, .035) ; SRMR = .052, only showing the estimates for significant paths (for full results, see Table 8). As predicted, positive contact had a significant positive longitudinal effect on pro-environmentalism, $\beta = .10$, z = 2.99, $p = .003$, whereas negative contact did not predict environmentalism over time (Table 8). Also the longitudinal associations from environmentalism to positive and negative contact were not significant. These results are consistent with the cross-sectional results, demonstrating an effect of positive contact on pro-environmentalism, such that those reporting more positive contact at Time 1 expressed more pro-environmental attitudes at Time 2. No support was found for the idea that those higher in environmentalism would seek out more positive contact.

Longitudinal associations between intergroup contact, SDO-E, and environmentalism. Having established that positive contact predicted heightened egalitarianism (i.e. lower SDO-E) and environmentalism over time, we tested a third and final model including all possible cross-lagged paths between the contact variables, SDO-E, and pro-environmentalism at Times 1 and 2. The model fit was satisfactory, $\chi^2(223) = 304.28$, $p < .001$; CFI = .990; RMSEA = .024 (90%CI = .016, .030); SRMR = .049. Figure 7 illustrates the results of this model, only showing the significant standardized estimates, with full results reported in Table 9. In line with our main hypotheses, positive contact at Time 1 was significantly negatively related to SDO-E at Time 2, $\beta = -.12$, z = -3.69, $p < .001$. Moreover, SDO-E at Time 1 was significantly negatively related to pro-environmentalism at Time 2, $\beta = -.17$, z = -3.35, $p = .001$, indicating that participants who had lower SDO-E scores at Time 1 endorsed greater environmentalism at Time 2. Furthermore, the results also revealed that

environmentalism at Time 1 was negatively related to SDO-E at Time 2 and that positive contact at Time 1 was negatively related to negative contact at Time 2 (see Table 9).

Finally, we estimated the longitudinal indirect effect of positive contact on pro-environmentalism via the mediating role of SDO-E. Given the two-wave panel design, the longitudinal indirect effect can be estimated by calculating the product term of the path from positive contact at Time 1 to SDO-E at Time 2, and the path from SDO-E at Time 1 to pro-environmentalism at Time 2 (Cole & Maxwell, 2003; Little, Preacher, Card, & Selig, 2007; for another example from the contact literature, see Wölfer et al, 2019). The results showed that positive contact had a significant positive indirect effect on pro-environmentalism via SDO-E, $b = .009$, $SE = .004$, $z = 2.24$, $p = .025$. A bootstrap analysis with 10,000 samples confirmed the mediation effect with a 95% BCI =[.003, .020].

Discussion

The results of Study 4 provide longitudinal evidence that positive intergroup contact predicts greater pro-environmentalism over time. There was no support for the reverse pattern of causation where those higher in environmental concern seek out more outgroup contact - the longitudinal association from environmentalism to positive and negative contact were not significant. Notably, there was also no longitudinal effect of negative intergroup contact on environmental outcomes. If we look at the cross-sectional results using just the Time 1 data we see that both positive and negative contact had a significant indirect effect on environmentalism, as per Study 3. However, in the longitudinal model, only positive contact had an effect on environmentalism and SDO over time. There was no longitudinal effect of negative contact on either environmental outcomes or SDO. Although these findings warrant follow up, they suggest that the effect of positive contact may be more longitudinally robust than that of negative contact, at least in terms of the more distal outcomes of intergroup contact.

Critically, also in line with our hypotheses, the longitudinal effect of positive contact on pro-environmentalism was mediated by greater endorsement of egalitarianism (i.e. lower SDO-E). In Study 3 we found that the association between intergroup contact and environmental outcomes were mediated by SDO-E, and to a lesser extent SDO-D. The cross-sectional model tested in Study 4 we find that positive and negative contact had significant indirect effects on environmentalism through SDO-E, but the indirect effect through SDO-D was non-significant. In the longitudinal model positive contact had a significant longitudinal effect on SDO-E, but not on SDO-D. Together with the result of Study 3, these findings therefore support the conclusion that the association between intergroup contact and environmental outcomes is largely driven by the (negative) effect of intergroup contact on opposition to social equality rather than on support for group dominance.

General Discussion

A host of studies have previously examined the relationships between intergroup contact and a range of focal intergroup variables (e.g. outgroup attitudes, intergroup anxiety, stereotyping). But critics have urged the field to think *beyond prejudice* (e.g. Dixon, et al., 2012; Pettigrew & Tropp, 2011; McKeown & Dixon, 2017; Vezzali et al., 2018; Wright & Lubensky, 2009). In this paper, we embrace this critique, and adopt an admittedly broader approach by exploring the implications of intergroup contact on environmental attitudes and behavior. Recent theoretical models suggest that intergroup contact has the potential not only to increase tolerance, but to shape ideologies and liberalize thinking (Hodson et al., 2018). It is argued that contact with outgroup members is relevant not only for shaping the content or valence of intergroup attitudes, but for promoting individuals' to question their own set of beliefs and provide impetus for mental change and integration of new ideas. This paper provides a test of this *cognitive-liberalization* hypothesis by exploring the impact of

intergroup contact on environmentally relevant attitudes and behaviors. Previous research suggests that ideological views about hierarchy have important implications for environmental conduct with individuals higher in SDO being more willing to exploit the environment in unsustainable ways because doing so aids the production and maintenance of hierarchical social structures (e.g. Pratto et al., 1994; Milfont et al., 2017; Milfont & Sibley; 2014). It follows that if intergroup contact promotes less hierarchical viewpoints, it may also encourage more environmentally responsible attitudes and behavior. Across four studies we provide both cross-sectional and longitudinal evidence that intergroup contact not only reduces prejudice, but also encourages greater environmentalism.

Repeated testing of this effect across different populations, in different intergroup contexts, and with different measures of key constructs provides converging evidence to support this conclusion. Study 1 provided support for a positive association between intergroup contact and environmental concern, and support for the proposed mediational model in which intergroup contact predicts a reduction in SDO, which in turn is positively associated with environmental outcomes. Study 2 replicated this model and confirmed the robustness of this effect by using alternative measures of key constructs and controlling for the role of political orientation. In Study 3 both positive and negative intergroup contact were separately cross-sectionally associated with environmentalism, and the effects of both types of contact were more strongly explained by an egalitarianism motive (SDO-E), rather than a dominance motive (SDO-D). Finally, Study 4 increased confidence in the hypothesised direction of causality by providing evidence of a longitudinal association between intergroup contact and environmentalism. Only positive and not negative contact was longitudinally associated with environmentalism. The longitudinal effect of positive contact on pro-environmentalism was mediated by reductions in SDO-E, but not SDO-D.

By exploring the impact of intergroup contact on environmental outcomes this research provides a (perhaps unconventional) response to calls to harness psychological knowledge to tackle environmental issues (e.g., Oskamp, 2001; Swim et al., 2011). A clear and repeated message from previous research is that attempts to improve individuals' understanding and appreciation of environmental issues rarely influence actions (e.g. Weber & Stern, 2011). The present findings suggest it may be possible to *indirectly* shift opinion on environmental issues by targeting individuals' broader perspectives on society. Specifically, by reducing support for an ideology of inequality, intergroup contact may also promote more socially responsible use of natural resources. Climate change is increasingly recognized by scientists and policymakers as a social issue requiring social solutions (Pearson, Schuldt, & Romero-Canyas, 2016). The present research adds to our understanding of the social drivers of climate change, and how psychological research on cultural ideologies and group hierarchies can help inform strategies to redress environmental injustice.

There are some limitations to the present research that should be acknowledged. Firstly, whilst we measured and controlled for participants' political orientation in two studies (Study 2 and 3) the role of political conservatism in the contact-environmental association cannot be fully ruled out by statistically controlling for it. A stronger test would be to only recruit people who identify as politically conservative and to explore whether the effects observed here still hold. There may also be other, third variables that exist. For instance, it may be the case that the effect of intergroup contact on environmental concern is more distal than found here with contact acting on the general value systems of the individual (e.g. self-transcendence, universalism) and these general values, more than SDO, are responsible for the effect on environmental outcomes. It should also be noted that although confidence in the causal impact of intergroup contact on environmentalism is increased by the inclusion of longitudinal data in Study 4, a full test of longitudinal mediation should

ideally include at least three waves of data collection in which intergroup contact at Time 1 predicts SDO at Time 2, which, in turn, predicts environmentalism at Time 3 enabling the generalization of intergroup contact effects to environmental outcomes.

Future research should go on to explore the benefits of intergroup contact within other domains ostensibly unrelated to intercultural relations, as well as providing more valuable information about the mechanisms underlying these generalized effects. In the present studies reduced support for an ideology of inequality (i.e. reduced SDO) represented the core mechanism under investigation. Future research should consider how intergroup contact may influence a range of other variables also predicted by SDO, as well as effects enabled by other ideological, affective, and cognitive consequences of intergroup contact. The accumulated evidence shows that contact is not a single-purpose phenomenon, but in its capacity to promote openness and divergent thinking the benefits of intergroup contact should be observable across multiple domains (Hodson et al., 2018). Rather than the benefits of contact being overstated (see Dixon, Durrheim & Tredoux, 2005), we argue that the benefits of contact are under-recognized. Contact can be about more than mere attitudes or evaluations of the other; rather, contact can meaningfully and substantially shape one's worldview and thinking style.

Conclusion

The present findings demonstrate that the promise of intergroup contact may be much broader than originally conceived by Allport in 1954. In four studies we provide evidence consistent with the idea intergroup contact can serve as an agent of *cognitive-liberalization* with implications that extend beyond the realm of intergroup relations. Four studies show that by promoting less hierarchical and more egalitarian viewpoints, intergroup contact has the potential not only to improve tolerance, but to encourage more environmentally responsible attitudes and behavior. Effects emerge more consistently for positive contact compared to

negative contact, and are more strongly explained reductions in an anti-egalitarian motive (SDO-E) than a dominance motive (SDO-D). We hope these findings will help re-frame discussions of the value of contact, not only as a means of increasing social harmony, but playing a fundamental role in changing the way people think about the world and solve social problems more generally.

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Notes

[1] If analysed separately, the items assessing the quality of intergroup contact in Study 1 ($M =$ 5.02, $SD = 1.05$) were significantly associated with environmental concern $r(164) = .23$ $p = .003$, 95% CI [.075, .369], environmental intentions $r(164) = .32$ $p < .001$, 95% CI [.167, .447], and SDO $r(164) = -.19$ $p < .001$, 95% CI [-.474, -.143]. Quantity of contact ($M = 4.38$, $SD = 1.52$) was significantly associated with environmental intentions $r(164) = .30$ $p < .001$, 95% CI [.142, .433], and SDO $r(164) = -.19$ $p = .014$, 95% CI [-.334, -.034], but not environmental concern $r(164) = .10$ $p = .185$, 95% CI [-.064, .264].

[2] If analysed separately, the items assessing the quality of intergroup contact in Study 2 ($M =$ 5.10, $SD = 0.83$) were significantly associated with pro-environmental behavior $r(152) = .28$ $p =.001$, 95% CI [.117, .418], egalitarianism $r(152) = .39$ $p < .001$, 95% CI [.259, .519], and outgroup evaluation $r(152) = .65$ $p < .001$, 95% CI [.553, .749]. Quantity of contact ($M = 4.36$, $SD = 1.43$) was also significantly associated with pro-environmental behavior $r(152) = .18$ $p =.026$, 95% CI [.033, .337], egalitarianism $r(152) = .31$ $p < .001$, 95% CI [.150, .457], and outgroup evaluation $r(152) = .34$ $p < .001$, 95% CI [.175, .500].

Table 1

Means, standard deviations and correlations for all variables in Study 1.

	M (*SD*)	1	2	3	4
1) Intergroup contact	4.19 (4.94)	-			
2) Environmental concern	4.06 (0.63)	.22** [.073, .377]	-		
3) Environmental intentions	3.63 (0.68)	.32*** [.157, .448]	.59*** [.466, .693]	-	
4) SDO	2.21 (0.99)	-.32*** [-.454, -.173]	-.31*** [-.473, -.153]	-.35*** [-.476, -.220]	-

Notes. Values in square brackets are 95% bias correlated and accelerated confidence intervals for each correlation based on bootstrapping of 1000 iterations.
*$p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Means, standard deviations and correlations for all variables in Study 2.

	M (*SD*)	1	2	3	4
1) Intergroup contact	4.27 (4.19)	-	.22** [.063, .366]	.34*** [.219, .454]	.57*** [.463 .664]
2) Environmental behavior	3.32 (0.58)	.26** [.102, .407]	-	.23** [.084, .362]	.27** [.131, .391]
3) Egalitarianism	5.77 (0.81)	.39*** [.264, .514]	.29*** [.142, .420]	-	.38*** [.166, .564]
4) Outgroup evaluation	5.65 (0.84)	.59*** [.479, .682]	.31*** [.163, .435]	.42*** [.213, .601]	-

Notes. Simple correlations are presented below the diagonal, and partial correlations controlling for political orientation as shown above the diagonal. Values in square brackets are 95% bias correlated and accelerated confidence intervals for each correlation based on bootstrapping of 1000 iterations.
*p < .05, ** p < .01, *** p < .001

Table 3

Means, standard deviations and correlations for all variables in Study 3.

	M (SD)	1	2	3	4	5
1) Positive contact	4.66 (1.50)	-	-.02 [-.072, .117]	-.12** [-.217, -.022]	-.27*** [-.352 -.180]	-.29*** [-.370 -.199]
2) Negative contact	2.20 (1.05)	-.01 [-.102, .092]	-	.11* [.018, .198]	.30*** [.224, .384]	.25*** [.168, .333]
3) Climate change denial	2.33 (1.80)	-.18*** [-.272, -.091]	.18*** [.089, .273]	-	.42*** [.329, .510]	.37*** [.284, .456]
4) SDO-E	2.32 (1.16)	-.31*** [-.391, -.223]	.35*** [.263, .427]	.55*** [.482, .612]	-	.63*** [.569, .688]
5) SDO-D	2.38 (1.07)	-.32*** [-.410, -.230]	.30*** [.218, .375]	.50*** [.428, .573]	.70*** [.653, .753]	-

Notes. Simple correlations are presented below the diagonal, and partial correlations controlling for political orientation as shown above the diagonal. Values in square brackets are 95% bias correlated and accelerated confidence intervals for each correlation based on bootstrapping of 1000 iterations.
‡$p < .10$, *$p < .05$, ** $p < .01$, *** $p < .001$

Table 4.

Results (standardised estimates) of model testing the associations between positive and negative intergroup contact, SDO-E, SDO-D and climate change denial in Study 3.

	SDO-E			SDO-D			Climate change denial		
	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p
Positive contact	-26. [-.335, -.177]	-6.34	< .001	-.28 [-.367, -.196]	-6.47	< .001	.02 [-.064, .106]	0.49	.626
Negative contact	.29 [.20., .370]	6.74	< .001	.25 [.159, .340]	5.41	<.001	-.06 [-.145, .016]	-1.58	.114
Political Orientation	.38 [.298, .455]	9.37	< .001	.38 [.301, .460]	9.39	<.001	.23 [.149, .317]	5.44	< .001
SDO-E	/	/	/	/	/	/	.36 [.201, .513]	4.48	< .001
SDO-D	/	/	/	/	/	/	.19 [.041, .344]	2.49	.013

Table 5

Means, standard deviations and correlations for all variables in Study 4

		M (SD)	Positive contact		Negative contact		SDO-E		SDO-D		Environmental concern		Environmental behavior		Climate change denial	
			T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Positive contact	T1	4.64 (1.43)	.75*** [.700,.798]		-.04 [-.125, .047]	-.14** [-.232, -.029]	-.36*** [-.437, -300]	-.39*** [-.460, -.310]	-.32***[-.400, -.264]	-.28*** [-.355, -.193]	.14*** [.068, .212]	.15** [.061,.250]	.07 ‡[-.011, .145]	.10** [.000, .184]	-.27*** [-.354, -.184]	-.28*** [-.372,-.183]
	T2	4.53 (1.41)			.008 [-.122,.097]	-.05 [-.148, .054]	-.31*** [-.402,-.237]	-.39*** [-.476,-.320]	-.29***[-.370,-.202]	-.27*** [-.357,-.192]	.14** [.053,.230]	.18*** [.088,.272]	.03 [-.055,.108]	.10* [.005,.182]	-.23*** [-.316, -.132]	-.24*** [-.327,-.146]
Negative contact	T1	2.14 (1.05)			.60*** [.517,.679]		.27*** [.186,.358]	..20*** [.093,.313]	.30*** [.218,.383]	.20*** [.117,.297]	-.15*** [-.219, -.082]	-.09* [-.176,-.006]	-.10* [-.179,-.005]	-.10* [-.212,-.005]	.13** [.014, .256]	.13** [.038,.223]
	T2	2.22 (1.09)					.25*** [.164,.334]	.28*** [.184,.373]	.24*** [.153,.323]	.25*** [.161,.346]	-.17*** [-.249,-.084]	-.14** [-.235,-.052]	-.10* [-.196,-.006]	-.15**[-.267,-.024]	.17*** [.049,.238]	.19*** [.087,.280]
SDO-E	T1	2.28 (1.16)					.79*** [.746,.826]	.74*** [.699,.782]	.68*** [.623,.722]	-.36*** [-.430,-.270]	-.37*** [-.458,-.280]	-.11** [-.197,.030]	-.15** [-.245,-.049]	.41*** [.325, .496]	.46*** [.375,.533]
	T2	2.41 (1.22)						.70*** [.644,.756]	.74*** [.693,.778]	-.38*** [-.470,-.288]	-.42*** [-.501,-.335]	-.10* [-.190,-.022]	-.21*** [-.309,-.110]	.38*** [.298, 459]	.44*** [.351,.519]
SDO-D	T1	2.47 (1.17)							.80*** [.755,.833]	-.35***[-.420,-.272}	-.36*** [-.436,-.282]	-.10* [-.176,-.005]	-.14* [-.231,-.049]	.35*** [.266, 4.35]	.37*** [.270,.451]
	T2	2.57 (1.16)								-.41*** [-.473,-.341]	-.41*** [-.483,-.337]	-.15* [-.240,-.064]	-.17*** [-.262,-.079]	.35*** [.266, .435]	.38*** [.285,.463]
Environmental concern	T1	5.54 (1.00)									.79*** [.749,.827]	.46*** [.388, .525]	.35*** [.275,.428]	-.45*** [-.526,-.364]	-.45*** [-.525,-.361]
	T2	5.47 (1.00)										.41*** [.323,.478]	.43*** [.349,.510]	-.40*** [-.483,-.313]	-.48*** [-.560,-.385]
Environmental behavior	T1	5.18 (1.36)											.61*** [.533, .681]	-.23*** [-.323,-.123]	-.21*** [-.300,-.126]
	T2	5.20 (1.41)												-.22*** [-.320,-.126,]	-.25*** [-.341,-.161]
Climate change denial	T1	1.95 (1.15)													.82*** [.762, .861]
	T2	2.01 (1.13)													

Notes. Values in square brackets are 95% bias correlated and accelerated confidence intervals for each correlation based on bootstrapping of

1000 iterations. ‡ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 6

Results (standardised estimates) of the cross-sectional model testing the associations between positive and negative intergroup contact, SDO-E, SDO-D and environmentalism at time 1 (T1) in Study 4.

	SDO-E			SDO-D			Environmentalism		
	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p
Positive contact	-38. [-.456, -.304]	-9.82	< .001	-.34 [-.417, -.263]	-8.68	< .001	.03 [-.083, .133]	0.46	.649
Negative contact	.27 [.194, .347]	6.91	< .001	.31 [.233, .395]	7.62	< .001	-.04 [-.132, .055]	-0.81	.420
SDO-E	/	/	/	/	/	/	-.30 [-.551, -.041]	-2.28	.023
SDO-D	/	/	/	/	/	/	-.17 [-.384, .043]	-1.57	.117

Table 7

Results (standardised estimates) of longitudinal model testing the associations between positive and negative intergroup contact, SDO-E, and SDO-D from time 1 (T1) to time 2 (T2) in Study 4.

	Positive contact T2			Negative contact T2			SDO-E T2			SDO-D T2		
	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p
Positive contact T1	.74 [.688, .785]	29.92	<.001	-.09 [-.175, -.011]	-2.21	.027	-.08 [-.143, -.018]	-2.51	.012	.03 [-.042, .103]	0.82	.410
Negative contact T1	.01 [-.063, .085]	0.30	.766	.66 [.600, .724]	20.82	<.001	.01 [-.065, .085]	0.25	.800	-.01 [-.042, .077]	-0.07	.943
SDO-E T1	-.05 [-.201, .110]	-0.58	.564	.07 [-.097, .232]	0.80	.422	.67 [.613, .719]	24.48	<.001	.18 [.112, .256]	5.02	<.001
SDO-D T1	-.02 [-.182, .137]	-0.58	.793	.01 [-.182, .137]	-0.28	.780	.19 [.112, .267]	4.82	<.001	.73 [.671, .785]	25.01	<.001

Table 8

Results (standardised estimates) of longitudinal model testing the associations between positive and negative intergroup contact and environmentalism from time 1 (T1) to time 2 (T2) in Study 4

	Positive contact T2			Negative contact T2			Environmentalism T2		
	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p
Positive contact T1	.77 [.729, .816]	35.01	<.001	-.10 [-.172, -.026]	-2.65	.008	.10 [.036, .173]	2.99	.003
Negative contact T1	.01 [-.067, .081]	0.26	.792	.69 [.637, .751]	23.74	<.001	.01 [-.067, .095]	0.34	.735
Environmentalism T2	.05 [-.016, .113]	1.52	.129	-.02 [-.100, .068]	-0.37	.710	.83 [.776, .891]	28.31	< .001

Table 9

Results (standardised estimates) of longitudinal model testing the associations between positive and negative intergroup contact, SDO-E, and environmentalism from time 1 (T1) to time 2 (T2) in Study 4

	Positive contact T2			Negative contact T2			SDO-E T2			Environmentalism T2		
	β [CI$_{95}$]	z	p	β [CI$_{95}$]	z	p	β [CI$_{95}$]	Z	P	β [CI$_{95}$]	z	p
Positive contact T1	.77 [.727, .811]	36.01	<.001	-.09 [-.172, -.013]	-2.27	.023	-.12 [-.179, -.055]	-3.69	<.001	.04 [-.036, .120]	1.05	.293
Negative contact T1	.01 [-.058, .081]	0.26	.745	.69 [.631, .749]	22.83	<.001	.03 [-.051, .110]	0.73	.792	.05 [-.032, .137]	1.21	.226
SDO-E T1	-.01 [-.084, .073]	-0.14	.892	.02 [-.078, .111]	0.35	.729	.73 [.688, .780]	31.48	< .001	-.17 [-.276, -072]	-3.35	.001
Environmentalism T1	.06 [-.027, .137]	1.32	.186	-.02 [-.123, .084]	-0.37	.712	-.11 [-.191, -.038]	-2.93	.003	.80 [.728, .864]	23.06	<.001
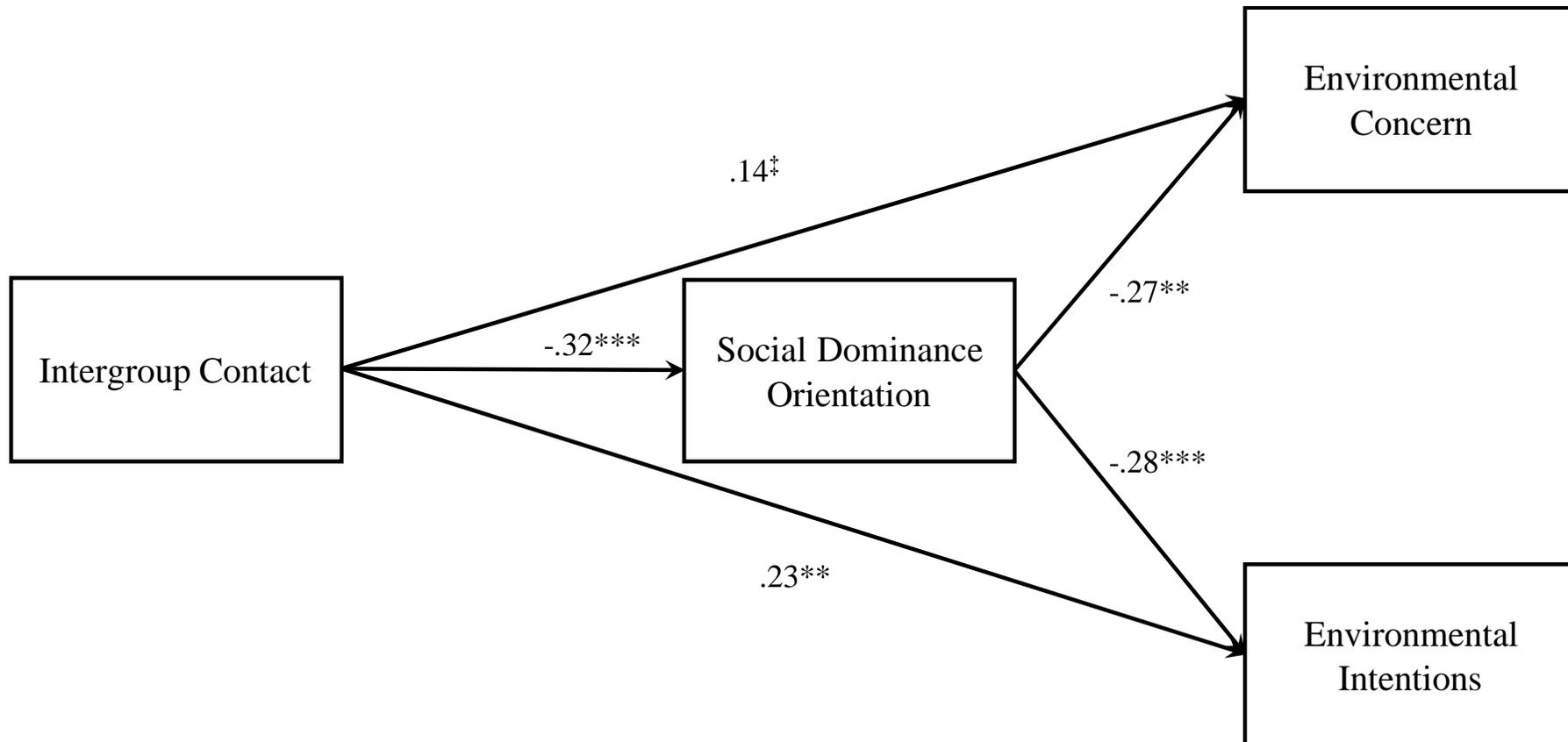
Figure 1. Mediation model results of the relationships between intergroup contact and environmental concern and environmental

intentions through reductions in SDO (Study 1)

Note: Path estimates represent standardized coefficients. $^{\ddagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$
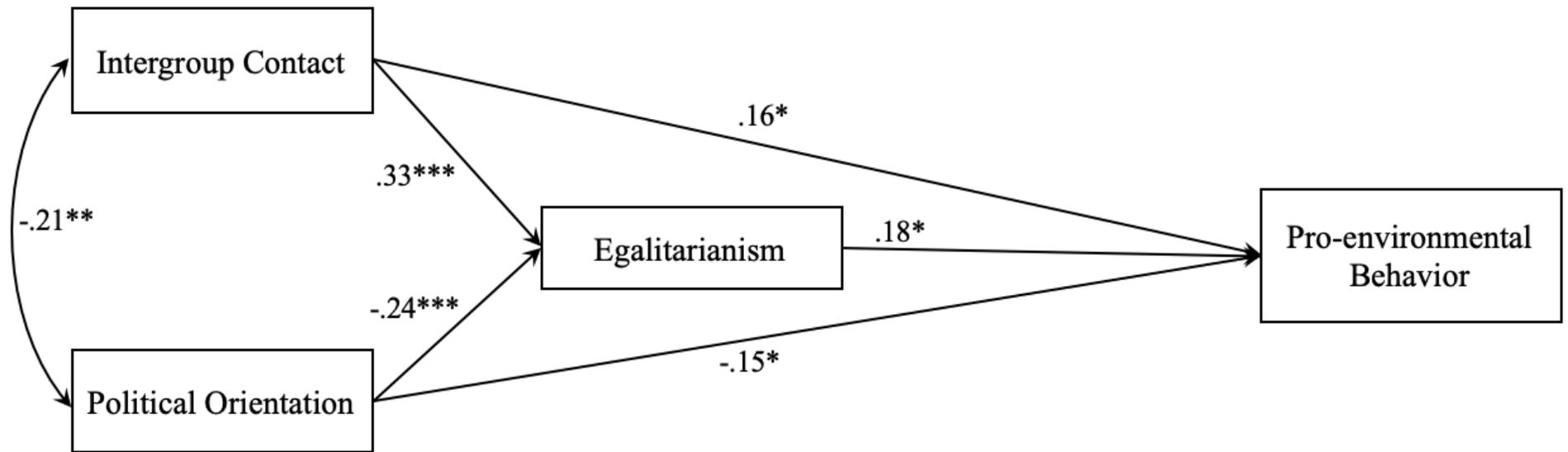
Figure 2. Mediation model results of the relationships between intergroup contact and pro-environmental behavior through egalitarianism, controlling for political orientation (Study 2).

Note: Path estimates represent standardized coefficients. *p < .05, ** p < .01, *** p < .001
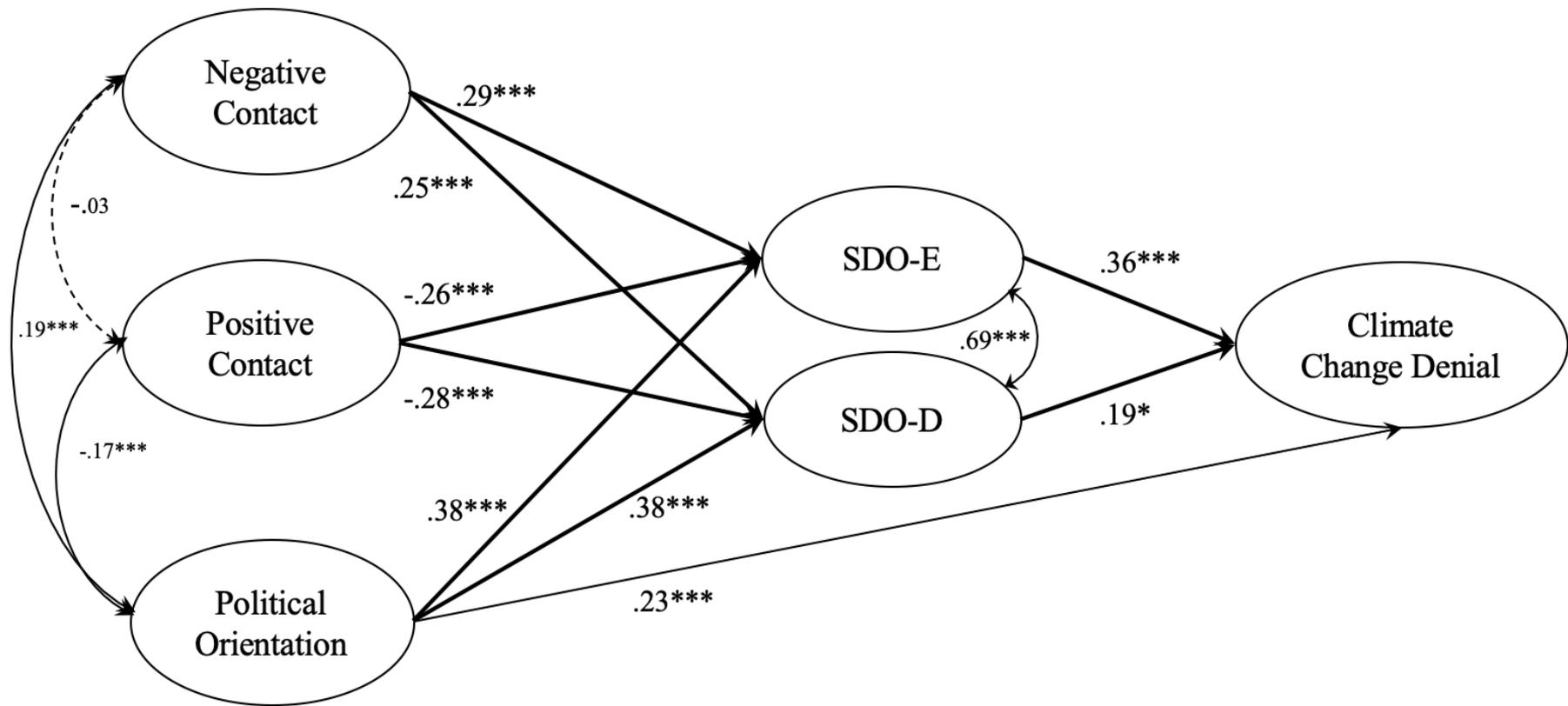
Figure 3. Model results of the relationships between intergroup contact and climate change denial through SDO-E and SDO-D, controlling for political orientation (Study 3).

Note: Path estimates represent standardized coefficients. *$p < .05$, ** $p < .01$, *** $p < .001$
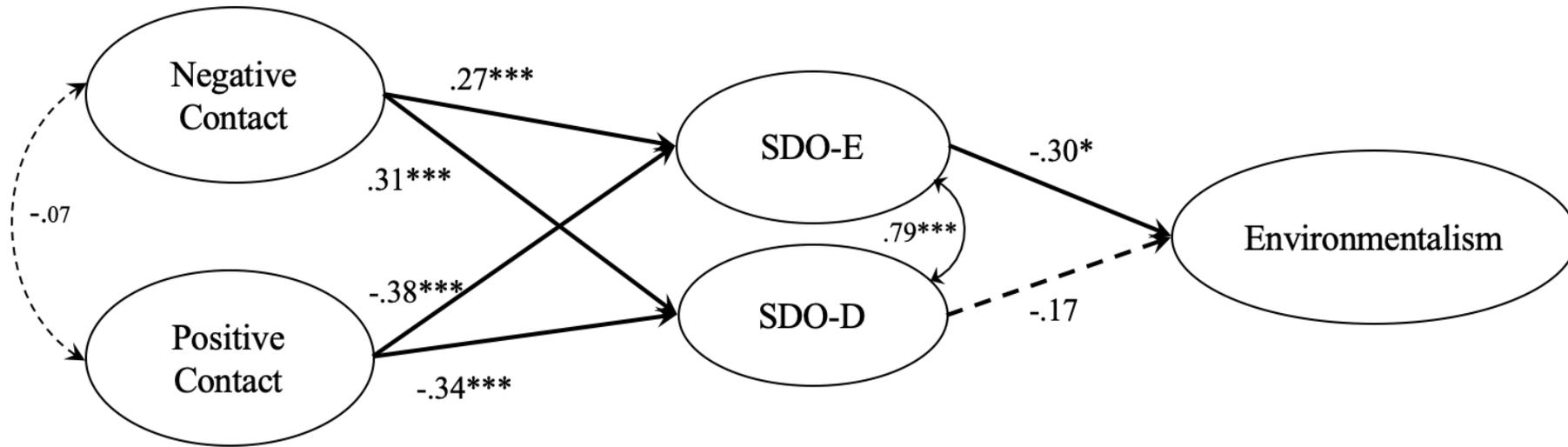
Figure 4. Model results of the cross-sectional relationships between intergroup contact and climate change denial through SDO-E and SDO-D at

Time 1 (Study 4)

Note: Path estimates represent standardized coefficients. *$p < .05$, ** $p < .01$, *** $p < .001$
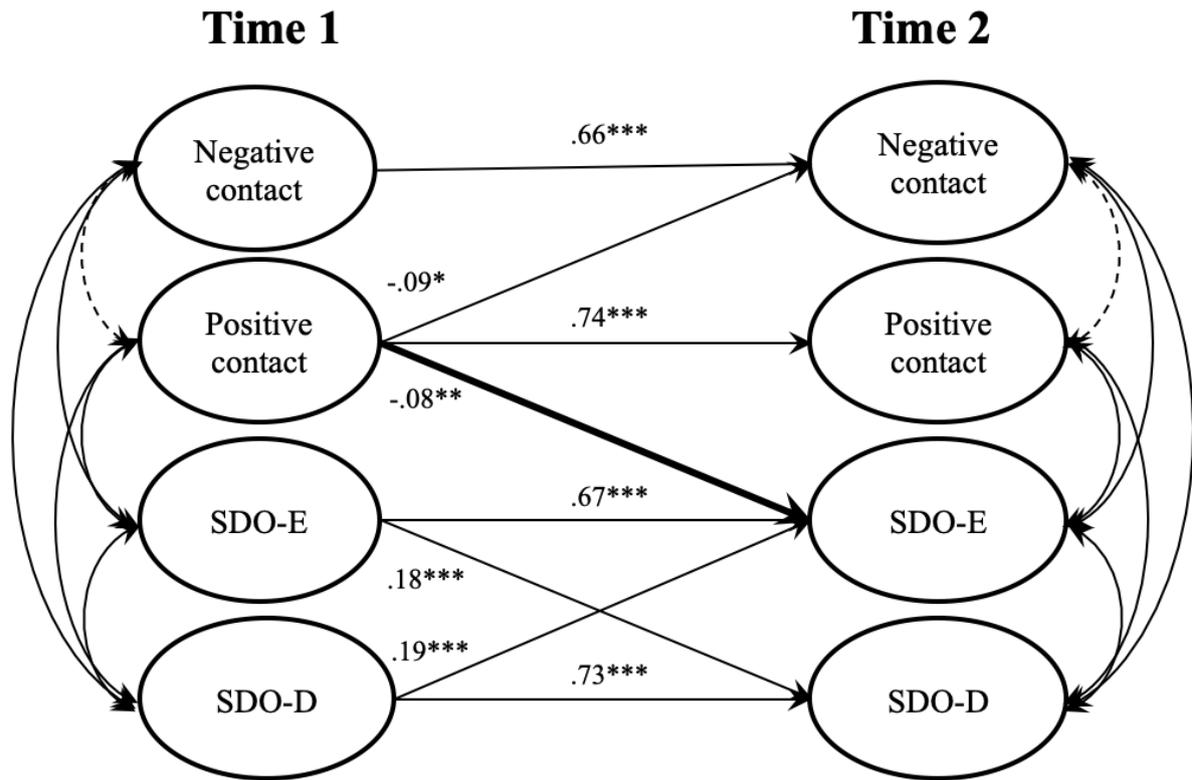
Figure 5. Longitudinal associations between positive and negative intergroup, SDO-E, and SDO-D (Study 4).

Note: All paths between Time 1 and Time 2 were tested but only significant longitudinal paths are presented (for full model specification see Supplemental Materials). Path estimates represent standardized coefficients. *p < .05, ** p < .01, *** p < .001
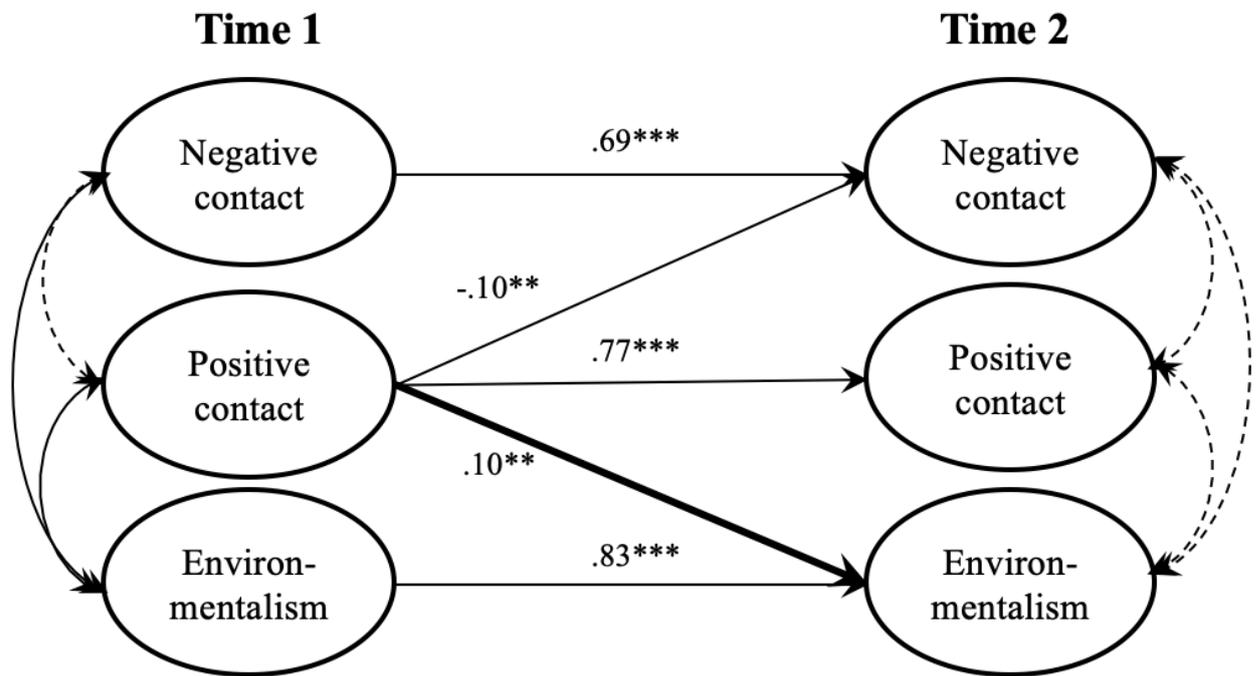
Figure 6. Longitudinal associations between positive and negative intergroup and

environmentalism (Study 4).

Note: All paths between Time 1 and Time 2 were tested but only significant longitudinal paths

are presented (for full model specification see Supplemental Materials) Path estimates represent

standardized coefficients. *$p < .05$, ** $p < .01$, *** $p < .001$
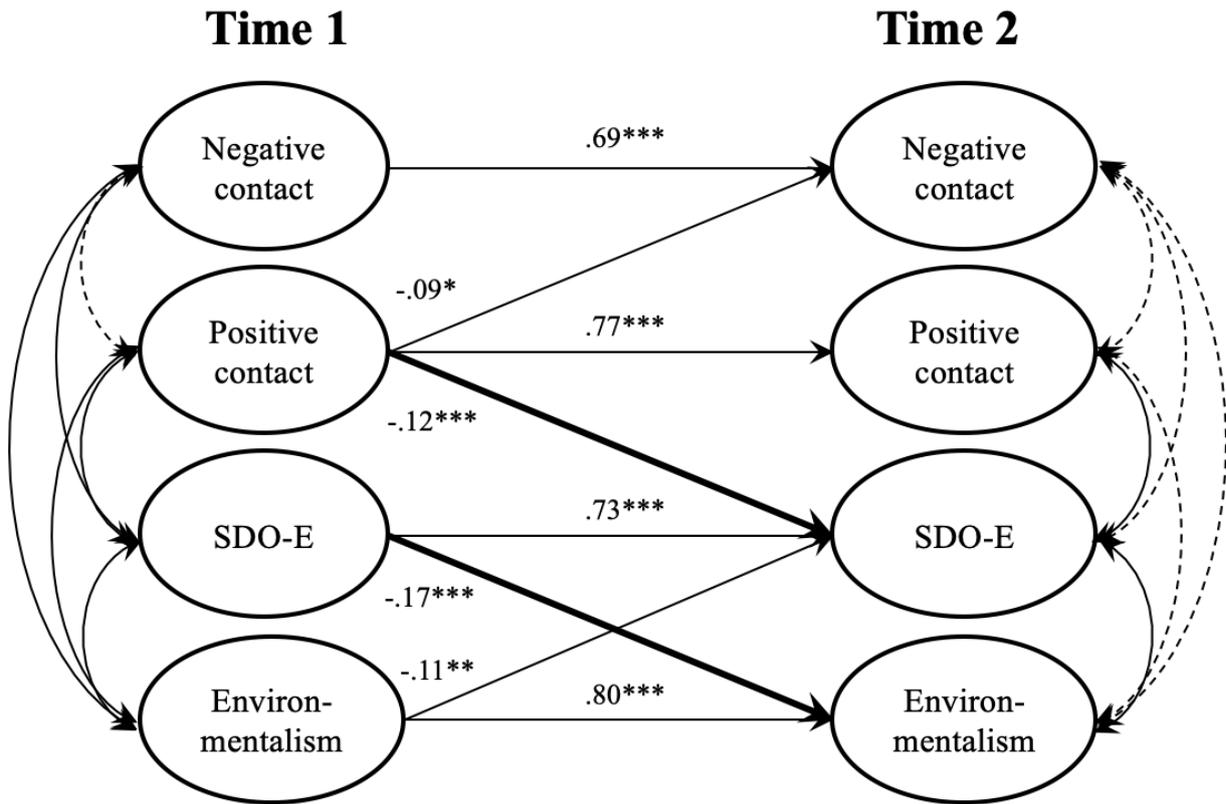
Figure 7. Longitudinal associations between positive and negative intergroup, SDO-E, and

environmentalism (Study 4).

Note: All paths between Time 1 and Time 2 were tested but only significant longitudinal paths

are presented (for full model specification see Supplemental Materials). Path estimates

represent standardized coefficients. *p < .05, ** p < .01, *** p < .001