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Bliuc, Ana-Maria; McGarty, Craig Austin; Thomas, Emma F; Lala, Girish; Berndsen, Mariette; Misajon, RoseAnne

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Ana-Maria Bliuc*, School of Social Sciences, Monash University
Address: GPO Box 197, Caulfield East, VIC, Australia 3145
Email: ana-maria.bliuc@monash.edu

Craig McGarty, School of Social Sciences and Psychology, University of Western Sydney
Address: Locked Bag 1797, Penrith, NSW, Australia 2751
Email: c.mcgarty@uws.edu.au

Emma F. Thomas, School of Psychology and Exercise Science, Murdoch University
Address: 90 South Street, Murdoch, WA, Australia 6150
Email: emma.thomas@murdoch.edu.au

Girish Lala, School of Psychology and Exercise Science, Murdoch University
Address: 90 South Street, Murdoch, WA, Australia 6150
Email: g.lala@murdoch.edu.au

Mariette Berndsen, School of Psychology, Flinders University
Address: GPO Box 2100, Adelaide, SA, Australia 5001
Email: mariette.berndsen@flinders.edu.au

RoseAnne Misajon, School of Social Sciences, Monash University
Address: GPO Box 197, Caulfield East, VIC, Australia 3145
Email: roseanne.misajon@monash.edu

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Of the climate science papers that take a position on the issue 97% agree that climate change is caused by humans[1], but less than half of the U.S. population shares this belief[2]. This misalignment between scientific and public views has been attributed to a range of factors including political attitudes, socio-economic status, moral values, levels of scientific understanding, and failure of scientific communication. The public is divided between climate change 'believers' (whose views align with those of the scientific community) and 'skeptics' (whose views are in disagreement with those of the scientific community). We propose that this division is best explained as a socio-political conflict between these opposing groups. Here we demonstrate that U.S. believers and skeptics have distinct social identities, beliefs, and emotional reactions that systematically predict their support for action to advance their respective positions. The key implication is that the divisions between skeptics and believers are unlikely to be overcome solely through communication and education strategies, and that interventions that increase angry opposition to action on climate change are especially problematic. Thus, strategies for building support for mitigation policies should go beyond attempts to improve the public's understanding of science to include approaches that transform intergroup relations.

While there is a growing belief in the general public that climate change is real (with over 80% agreement in some U.S. states[3, 4]), there is a sharp division in beliefs about its causes. Yet, if there is to be effective and timely action on climate change, widespread public agreement that human activity causes climate change is crucial for building political will. The roots of the public divide on climate change (and in particular the persistence of skeptic beliefs) have been explained in terms of individual factors such as socio-economic aspects[5],

moral values[6], socio-political orientations and ideologies[7, 8], level of knowledge[9] and scientific understanding of the public[10], and personal experiences of climate change[11, 12]. Going beyond individual factors, support for skeptic beliefs has also been attributed to the use of lobby groups by vested economic and political factions[13, 14] to discredit the scientific consensus on climate change[15, 16], and to a failure of communication from the scientific community to the broader public[17].

While all these factors are important in understanding the persistence of climate change skepticism, previous research has not fully considered the possibility that the climate change divide is itself an intergroup conflict. We propose that the climate change debate can be understood as an intergroup conflict that exists primarily between two groups with conflicting views, that is, climate change believers and skeptics (rather than between scientists and sections of the public). As such, the public division in opinions about climate change can be understood in similar terms to other social conflicts such as that over abortion, the campaign for equality of the sexes, the U.S. civil rights movement, and campaigns for marriage equality. Although positions in these conflicts are related to, and can emerge from, membership of political parties, gender, and religion they are not reducible to any of these categories. In relation to abortion, for example, a Republican, male Catholic is more likely to be pro-Life than pro-Choice, but the conflict between pro-Life and pro-Choice supporters is not a conflict between Republicans and Democrats, men and women, or between Catholics and persons with other religious beliefs. Rather, the key defining feature of the pro-Life (or pro-Choice) position is a shared opinion, and such opinions provide the psychological basis for the intergroup conflict. Although it is very plausible that the climate change divide reflects and draws upon partisan and ideological conflicts [8, 14], we consider the possibility that it is a conflict that can be understood in opinion-based terms. While believers may tend to be

Democrats and skeptics may tend to be Republicans, we ask: can believers and skeptics be treated as real groups with distinct identities?

Although there are multiple shades of opinion about climate change[18], we argue that there is value in seeing climate change believers and skeptics as conflicting *opinion-based groups*. Opinion-based groups are psychological groups formed around contrasting views about what needs to be done about an issue, in this case, climate change[19]. We propose that the contrasting opinions of believers and skeptics about the causes of climate change provide the basis of social identities that inform what they, and other people, should do about climate change. In particular, these identities drive the forms of social and political action that believers and skeptics should take to ensure that their views are supported by policy makers. Therefore, we argue that people come to see climate change beliefs and skepticism not just as an opinion on an issue, but as an aspect of self that defines who they are, what they stand for, and who they stand with (and against). In doing so, opinion-based identities provide a basis for collective action as coordinated, collective attempts to bring about, or thwart social change[19].

Contemporary models of collective action that integrate psychological (subjective) and social (structural) perspectives[20, 21] agree that collective action flows from a specific set of predictors. Foremost among these are social identification with (or commitment to) a relevant group, a sense of grievance or perceived injustice that is expressed as anger at opponents, and beliefs that the group can achieve its goals (group efficacy beliefs). There is correlational and experimental evidence that group identification predicts environmental behaviour and that heightened group-based emotions and perceptions of group efficacy lead to an increase in such behavior[22, 23, 24], but our interest here is in the role of these variables in motivating support for action to advance competing policy positions.

Given that there are different causal orders proposed by existing models [20, 21] we

conceptualize the antecedents of action as an integrated cluster of variables that represent a distinct group consciousness[24] for believers and for skeptics, each of which predicts commitment to action to support the cause they each support. In other words, if identification with activists, anger directed at the target of activism, and efficacy of action are measured, a factor capturing all these aspects is likely to be a good predictor of collective action participation.

To capture group consciousness we constructed a latent variable with three indicators: social identification, anger at the opposing group, and group efficacy beliefs. Group consciousness as a skeptic or a believer could be expected to have different political and moral foundations such that U.S. believers would tend to have political preferences for the Democratic Party and endorse liberal moral values (acting with fairness and avoiding harm) and U.S. skeptics would tend to have Republican political preferences and endorse conservative moral values of purity, ingroup loyalty and respect for authority[25]. Specific moral foundations have been shown to underpin individuals' positions towards a range of issues including immigration, abortion, and same-sex marriage[26] as well as religious orientations[27].

In the current study we measured social identification as a skeptic or believer as self-investment (i.e., positive feelings for and bonds with other group members), group efficacy beliefs, anger at the opposing group, party identification (with Republicans versus Democrats), moral values (avoiding harm, achieving fairness, loyalty to the ingroup, respecting authority and ensuring purity/sanctity), intentions to participate in socio-political action in support of the group's cause, and actual behaviour in support of the cause (a donation to an aligned action group as opposed to a neutral charity).

Using Amazon Mechanical Turk we collected volunteer samples of U.S. citizens who were self-declared believers and skeptics. The first step was to determine the validity of

categorizing our participants into believers and skeptics by examining the socio-demographic and psychological characteristics of the two groups. The descriptive statistics show that the two samples were similar in age, education, employment and income (see Table 1). In order to characterize our sample in terms of climate change ideology we used the six Americas audience segmentation instrument[18]. Not surprisingly, members of the two groups occupy different segments. Specifically, believers were alarmed, concerned and cautious about climate change while skeptics were cautious, doubtful and dismissive (tellingly, there were no disengaged participants in our samples). Consistent with previous research[7, 14] believers and skeptics had different political views, with believers more likely to be Democrats or uncommitted Republicans, and skeptics more likely to be Republicans or uncommitted Democrats. Believers were also more likely to commit to environmental behaviours and to express more fear and guilt and less hope about the future of the planet whereas skeptics tended to have higher levels of national identification, lower levels of identification with all of humanity, and to endorse moral values that were more typical of conservative positions. Believers appear to be more invested in their group identity than skeptics, as they were higher on opinion-based group identification, group efficacy beliefs, and especially anger towards the opposing group and commitment to socio-political action. Research suggesting skeptics are less certain[28] about their attitudes may explain these differences and presents an important line of future research. Given the differences in the psychological characteristics of the two groups, we concluded that the participants' own categorization of themselves as believers and skeptics was valid.

To test a model that included pathways between group consciousness (indicated by social identification with the relevant opinion-based group, anger at the opposing group, and group efficacy beliefs), socio-political action for skeptics, and also considering moral foundations and political party identification as antecedents of group consciousness we

conducted structural equation modelling (SEM) using the software AMOS. As expected on the basis of the integration of contemporary models of collective action[20, 21, 24] we found that group consciousness predicted commitment to socio-political action and donations for both believers (Figure 1) and skeptics (Figure 2). Despite some small zero order correlations with the indicator variables of group consciousness the links between the group consciousness factor and moral foundations (avoiding harm and endorsing fairness for believers, and purity, authority and ingroup loyalty for skeptics) were not statistically significant in the models. However, political party identification was a relevant predictor of group consciousness for the believer group but not for skeptics.

These findings demonstrate that it is plausible to consider the debate between climate skeptics and believers as an intergroup conflict. Put another way, believers and skeptics are not just people who support different political parties or who hold different positions in a scientific debate but are members of opposing sides in a conflict about climate change. Moreover, their intended actions, beliefs and hostility to people on the other side of the divide could be understood as integrated expressions underpinning specific social identities. An integrated cluster of group consciousness factors comprising of identification with these groups, anger at the opposing group and beliefs that the group can achieve its goal through collective action predicted political action intentions and actual politically relevant behaviour. While these results would be expected for activist members of believer and skeptic groups, the fact that our sample comprised members of the U.S. general public who were not drawn from climate action groups supports the broader applicability of these models and points to the depth of social conflict on this issue.

More generally, the results support the contention that cultural polarization and political mobilization[16] are at the core of the climate change divide. Further research would fruitfully explore the processes by which these competing groups have formed and by which

they grow and are sustained by lobby groups, political messaging and other processes, and to clarify the causal order. Our results go further, however, to provide guidance for advocates of action on climate change. We note in particular that part of the skeptic group consciousness is anger at climate change believers. Antagonizing skeptics and increasing their anger towards their opponents (e.g., by suggesting that their beliefs are risible) is likely to rebound by making them more committed to take contrary action. On the other hand, efforts to undermine group efficacy, for example, by convincing skeptics that their actions are unlikely to prevent action on climate change, represent a more plausible path. Similarly, believers' commitment to take action to support mitigation policies can be boosted by strengthening their identity and beliefs in the group efficacy of their cause.

We note that our findings are based exclusively on U.S. data, so they reflect a set of specific circumstances and relations that characterize the context in an industrialized, high emission nation. There is evidence to suggest that the U.S. context is also different from many other countries' in the strategies that conservative movements use to undermine pro-environmental attitudes and policies (through aligning themselves with high profile skeptics[14, 290]). Thus, a replication of our study in European countries where many conservative parties do not dispute the scientific consensus on climate change is likely to highlight other relevant ideological antecedents to group consciousness (rather than political party identification). Our model provides a way of considering antecedent factors that are known to be associated with climate change positions (political ideology, moral values) with the more proximal predictors of intergroup conflict (identity, anger at the outgroup, and group efficacy beliefs). As such, it provides a basis for testing structural relations within and across different sub-groups, cultures and populations as well as for further exploring the differences between believers and skeptics. For example, past research has established that believers and skeptics differ in their focus on the climate change debate with believers

tending to focus on solutions (e.g., behaviors) whereas skeptics are more likely to focus on the definition of the problem (e.g., the debate)[8]. Despite the stark differences between the groups the underlying message of the results is that believers and skeptics are united, but only insofar as they are united in opposition to each other.

Methods

We conducted an online survey of U.S.-based participants that yielded a sample of 120 climate change skeptics and 328 believers (using Amazon's Mechanical Turk). We examined (a) differences between groups both in terms of environmental behaviors, emotional responses, national and global identification, moral foundations, and political party identification and, (b) the structural relationships between group identification, anger towards the opposing group, political party-identification, moral values, group efficacy beliefs and willingness to take socio-political action in support of their group's cause.

After a short introduction about the climate debate that included an explanation of what the categories skeptics and believers refer to, participants classified themselves as either skeptics or believers depending on whether their views were closer to one position or the other. The main variables that we measured were social identification (using self-investment as a skeptic or a believer, 10 items, α = .932 for skeptics, α = .923 for believers), perceptions of injustice (as anger at the opposing group, 3 items, α = .933 for skeptics, α = .905 for believers), group efficacy beliefs (3 items, α = .913 for skeptics, α = .914 for believers), moral values (15 items, harm, fairness, ingroup loyalty, respect for authority, and purity/sanctity), political party-identification and affiliation (2 items, strength of affiliation with Republicans versus Democrats), and intentions to participate in socio-political action in support of the group's cause (using the same items for both groups, 13 items, α = .946 for the whole sample). Actual behaviour was measured through giving the participants the option to decide on a donation amount of up to one U.S. dollar to be made by the researchers to the Climate Reality project for believers, or the Heartland Institute for skeptics. The Climate Reality Project was described to participants as a group headed by former Vice President Al Gore that aims to challenge climate change skepticism, while the Heartland Institute was described as a group that has been referred to as 'the world's most prominent think tank promoting skepticism about man-made climate change'. The balance of the $1 would be donated to a non-climate charity (the American Society for the Prevention of Cruelty to Animals).

Other variables include American national identification (10 items, α = .950), global identification (identification with all humanity scale, 9 items, α =.899), emotions towards the future of the Earth[27] (hope,

optimism, despair, fear, worry, remorse, and guilt), and environmental behaviour (support companies that reduce emissions, punish companies that do not reduce emissions, use less energy for heating in winter, use public transport or car pool, walk or bike instead of driving). Underpinning beliefs about climate change were captured through the use of the 6 Americas screening instrument that identifies 6 audience segments (Alarmed, Concerned, Cautious, Disengaged, Doubtful, and Dismissive). All measures used in the study are presented in detail in the Supplementary Materials.

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Corresponding author

Correspondence and requests for materials should be addressed to Ana-Maria Bliuc.

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Author Contributions

A.M.B and C.M. contributed to study design, statistical analyses and writing. E.T. contributed to study design and writing. G.L. contributed to study design, data management and writing. M.B. and R.M. contributed to interpreting the findings and writing. All authors commented on the paper and participated in the process of refinement of the paper in response to the peer-reviews.

Competing Financial Interests statement

The authors declare no competing financial interests.

Figures

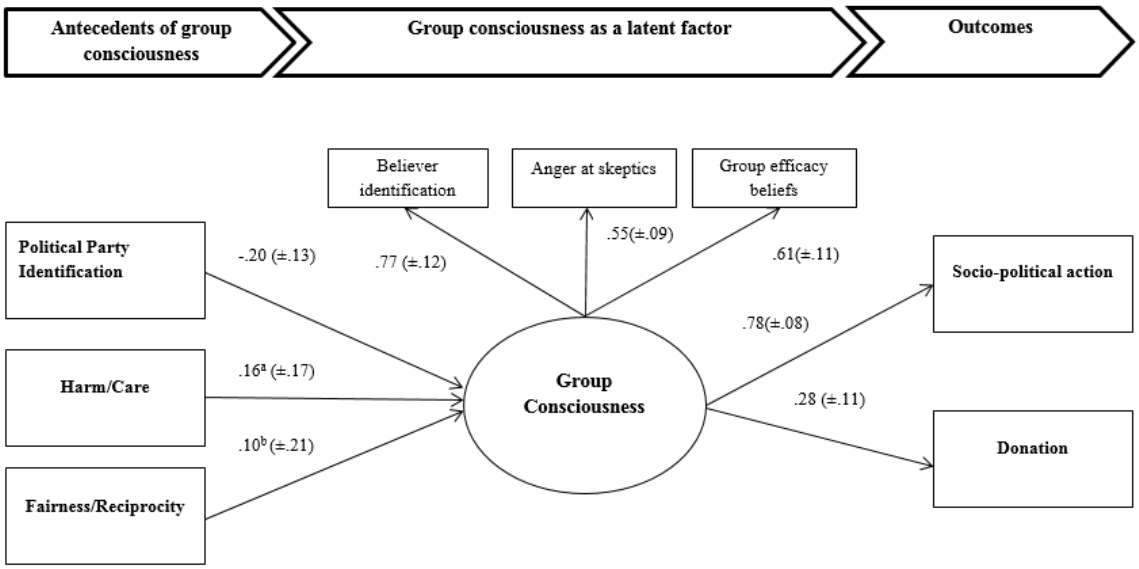

Figure1. Structural model for believers ($p < .05$ except where marked 'a' when $p = .099$, and 'b' when $p = .324$). $N = 328$, Comparative Fit Index (CFI) = .973, RMSEA = .054, χ^2 (17) = 33.109, $p = .011$. Coefficients show the 95% confidence interval around the estimate.

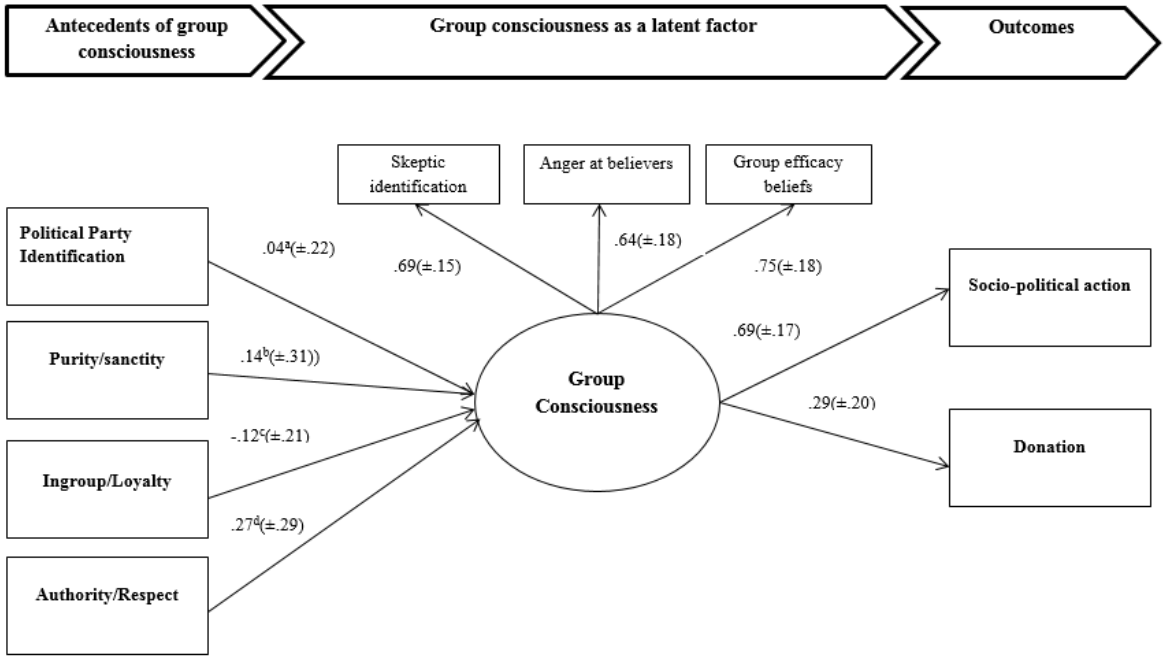

Figure2. Structural model for skeptics ($p < .05$ except where marked 'a' when $p = .622$, 'b' when $p = .349$, 'c' when $p = .381$, and 'd' when $p = .125$). $N = 120$, CFI = 1.00, RMSEA = .000, χ^2 (21) = 16.400, $p = .747$. Coefficients show the 95% confidence interval around the estimate.

Table 1. Descriptive statistics for the study sample

	Skeptics (N = 120)	**Believers (N = 328)**
Demographic information		
Age (years)	34.2 (10.96)	33.2 (11.22)
Gender (women %)	41.2	51.4
Education (tertiary %)	73.3	71
Income – average or above (%)	65.8	56.7
Political preference (%)		
Republicans	68.4	17.6
Democrats	26.6	80.2
6 Americas segments (%)		

Alarmed	1	25.6
Concerned	4	45.9
Cautious	24.2	25.6
Disengaged	0	0
Doubtful	33.3	1.9
Dismissive	37.4	0.9
Measured variables (*M (SD*))		
Identification		
Identification with all humanity (1-5)	2.78 (0.82)	3.20 (0.78)
National identification (1-7)	5.33 (1.13)	4.70 (1.32)
Emotional responses about the future of the Earth's climate (1-7)		
Hope	4.58 (1.50)	3.80 (1.65)
Optimism	4.77 (1.54)	3.81 (1.69)
Despair	2.81 (1.44)	4.06 (1.70)
Fear	2.77(1.65)	4.43 (1.80)
Worry	2.93 (1.66)	4.78 (1.70)
Remorse	2.29 (1.47)	3.55 (1.82)
Guilt	2.02 (1.25)	3.25 (1.77)
Group consciousness (1-7)		
Opinion-based group identification	3.80 (1.16)	4.12 (1.24)
Collective efficacy beliefs	4.28 (1.36)	4.93 (1.25)
Anger at the opposing group	2.84 (1.58)	4.10 (1.70)
Political party identification* (1-6)	4.17 (1.32)	2.55 (1.27)
Moral foundation scales (0-5)		
Harm/Care	3.12 (0.93)	3.64 (0.82)
Fairness/Reciprocity	3.07 (0.80)	3.62 (0.79)
Ingroup/Loyalty	2.69 (0.97)	2.48 (1.04)
Authority/Respect	2.80 (0.83)	2.49 (1.06)
Purity/Sanctity	2.62 (1.07)	2.09 (1.35)
Environmental behaviours (1-7)		
Support companies that reduce emissions	4.40 (1.67)	5.69 (1.24)
Punish companies that do not reduce emissions	3.62 (1.71)	5.45 (1.50)
Use less energy for heating in winter	4.84 (1.71)	5.62 (1.39)
Use public transport or car pool	3.06 (1.88)	4.24 (2.01)
Walk or bike instead of driving	3.06 (1.82)	4.33 (1.99)
Socio-political action		
Socio-political action intentions (1-7)	3.13 (1.33)	3.69 (1.36)
Donation to climate group ($US)	0.46 (0.38)	0.59 (0.33)

Note. *Political party identification was computed on a scale from 1 Strong Democrat to 6 Strong Republican.