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RESEARCH INSIGHT



Climate Change Consensus Messages Cause Reactance

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ABSTRACT

Several recent studies have debated whether climate change consensus messages cause reactance, although they sometimes employ different procedures and measurement. This study uses procedures and measures from competing studies to allow for a comparison of the respective approaches. We find that climate change consensus messages cause reactance, particularly among Republicans and those who do not believe in anthropogenic climate change. These findings highlight concerns that consensus messaging strategies may be ineffective or backfire among audiences that science communicators are most keen to target.

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KEYWORDS

Scientific consensus;
reactance; climate change;
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There are inconsistent findings on whether scientific consensus messages can persuade conservatives to be more amenable to climate action. Initial work reached optimistic conclusions about the efficacy of these messages (van der Linden, Leiserowitz, et al., 2015, 2019). Consensus messages increase scientific agreement estimates (Chinn et al., 2018), which are positively associated with belief in anthropogenic climate change and support for action (Lewandowsky et al., 2012; van der Linden, Leiserowitz, et al., 2015). For this reason, estimates of scientific agreement have been called an influential “gateway belief” for shifting attitudes on climate change. Researchers argue that because consensus messages target second-order normative beliefs (i.e. beliefs about what others believe), indirect effects on personal climate attitudes are less susceptible to moderation by factors promoting skepticism, including political ideology (van der Linden, Leiserowitz, et al., 2019). Indeed, some work finds that partisans shift their agreement estimates by similar amounts in response to a consensus message (Deryugina & Shurchkov, 2016; van der Linden, Clarke, et al., 2015), or that climate change consensus messages are more impactful on conservatives’ agreement estimates than liberals’ (van der Linden, Leiserowitz, et al., 2015). For these reasons, consensus messaging has been advocated as a means of reducing political polarization on climate change.

However, other work finds that climate change consensus messages not only fail to persuade conservatives of scientifically supported positions (Bolsen & Druckman, 2018; Deryugina & Shurchkov, 2016) but also may backfire (Bolsen & Druckman, 2018; Cook & Lewandowsky, 2016; Dixon & Hubner, 2018). Despite shifting agreement estimates, prior beliefs (Dixon, 2016), political ideology (Bolsen & Druckman, 2018), and free market beliefs (among Americans) (Cook & Lewandowsky, 2016) can dampen the direct and indirect effects that consensus messages may have on personal beliefs and policy support. In addition, there is evidence that consensus messages may *increase* political polarization by backfiring among partisans disinclined to agree with the consensus position (Bolsen & Druckman, 2018; Cook & Lewandowsky, 2016; Dixon & Hubner,

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2018). Thus, a growing body of evidence suggests that consensus messages may only be effective among those predisposed to accept scientists' positions.

Researchers have recently investigated whether consensus messages produce psychological reactance. Reactance is an oppositional response to a perceived threat to agency or freedom, often characterized by anger or counter-arguing (Rains & Turner, 2007). Reactance can be triggered if messages are perceived to be overtly persuasive (Dillard & Shen, 2005), to threaten existing attitudes (Meirick & Nisbett, 2011), or to threaten political identities (Nisbet et al., 2015). Consensus messages about climate change may arouse reactance for all of these reasons; they are intended as persuasive communications (van der Linden, Leiserowitz, et al., 2019) that may be seen as manipulative or threatening by those who hold attitudes out of line with consensus positions (McCright & Dunlap, 2011). Further, consensus messages may challenge political identities and values because climate opposition is associated with partisanship in the U.S. (McCright & Dunlap, 2011). If consensus messages cause reactance, individuals may counter-argue such messages and express anger (Rains & Turner, 2007), or may strengthen their initial attitude, leading to a backfire effect (Hart & Nisbet, 2012; Meirick & Nisbett, 2011). Thus, it is important to determine whether consensus messages produce reactance, especially among those who are skeptical about climate change.

Whether consensus messages cause reactance is debated. Ma et al. (2019) found that climate change consensus messages produce reactance among those who question anthropogenic climate change. Reactance, in turn, was associated with less support for mitigative action (Ma et al., 2019). In response, van der Linden, Maibach, et al. (2019) examined whether individuals considered a consensus message to be more manipulative when they viewed it twice compared to only viewing it once; seeing no difference the researchers claimed consensus messages do not cause reactance. In a commentary, Dixon et al. (2019) offer several criticisms of the van der Linden, Maibach, et al. (2019) study: (1) van der Linden, Maibach, et al. (2019) measure how manipulative participants evaluate the message to be, rather than their experienced feeling of being manipulated, which means that van der Linden, Maibach, et al. (2019) cannot comment directly on reactance; (2) the fact that there is not a difference in perceived manipulation when an individual is exposed to a message once or twice does not mean that they do not see the message as manipulative; and (3) the response of Republicans, who saw the consensus message as manipulative, is consistent with the reactance response found by Ma et al. (2019).

The present study addresses this debate by investigating whether consensus messages about climate change cause reactance among liberals and conservatives using the reactance measures from Ma et al. (2019) and the perceived message manipulation measure from van der Linden, Maibach, et al. (2019). Given the conflicting findings of previous studies, we investigate the following research question: Do consensus messages about climate change cause (a) reactance or (b) perceptions of manipulation among Democrats and Republicans? (RQ1). In addition, we include both pre-/post-test and post-test only conditions to better understand how individuals' prior beliefs may affect reactance (RQ2) and whether the decision to measure beliefs prior to message exposure affects responses (RQ3). This is important for understanding whether consensus messages may elicit different levels of reactance in interactive settings (e.g. classrooms, Instagram stories) or one-way communication contexts (e.g. news articles, mass advertising) (Myers et al., 2015). We find evidence that consensus messages cause reactance, particularly among Republicans and those who disbelieve anthropogenic climate change, which are critical audiences for climate change communicators.

Methods

Data

The data were collected from Lucid Theorem, a nonprobability nationally diverse online panel, between March 27 and March 30, 2020.¹ The sample consisted of 1,998 respondents. Two

respondents who did not respond to outcomes were excluded from the analysis, leaving 1996 usable respondents. Full sample and ethics approval information is provided in Supplemental Information.

Design

This study sought to replicate two studies with competing claims regarding whether or not climate consensus messages cause reactance. To do so, it adopted the design of van der Linden, Maibach, et al.'s (2019) study, which claimed such messages *do not* cause reactance. However, as outlined above, there were two major defects with this study's design: (1) both the treatment and control groups were exposed to consensus messages and (2) the authors did not directly measure reactance. To make this study as comparable as possible, we constrained the design to follow van der Linden, Maibach, et al.'s (2019) procedure, but remedied these two flaws while additionally testing whether the decision to pretest climate attitudes affected reactance.

The study has a two (exposure to a consensus message (treatment) or not (control)) by two (answered climate change questions pre/post-stimuli or post-stimuli only) design. Participants in the treatment conditions saw the statement: *"Did you know? 97% of climate scientists have concluded that human-caused climate change is happening."* Participants in the control conditions did not see any message. Participants in the pre-/post-test conditions responded to the same battery of questions about their climate beliefs twice during the survey, once before and once after exposure to the stimulus, while those in post-test only conditions only responded to the battery of climate measures after exposure to the stimulus. We use a 3-letter acronym to refer to the conditions, such that the first letter is either a T (treatment) or C (control) and the last two letters are either PP (pre-/post-test) or PO (post-test only). For example, TPP would refer to the treatment pre/post-test condition, which responded to climate belief questions before and after seeing a consensus message. In contrast, TPO refers to the treatment post-test only condition, whose participants only responded to climate belief questions after exposure to the consensus message. The number of participants in each condition was: TPP, $n = 485$; CPP, $n = 497$; TPO, $n = 551$; CPO, $n = 465$.

Procedure

The procedure reflects that of van der Linden, Leiserowitz, et al. (2015), van der Linden, Maibach, et al. (2019), and van der Linden, Leiserowitz, et al. (2019) with respect to question ordering and use of distractor tasks (See figure S1 in Supplemental Information). First, participants in pre-/post-test conditions (TPP and CPP) responded to questions about climate change beliefs. These questions were presented alongside distractor batteries that participants in the post-test only conditions (TPO and CPO) also completed. Next, participants in the treatment conditions (TPO and TPP) saw the consensus message before all participants completed a distractor task about popular tourist attractions (additional information about distractor tasks is in Supplemental Information). Finally, all participants responded to climate belief measures from van der Linden, Leiserowitz, et al. (2015, 2019) work.

Following this, and most pertinent to the results presented here, participants then responded to reactance and perceived manipulation measures (Ma et al., 2019; van der Linden, Maibach, et al., 2019). Those in the treatment groups (TPP and TPO) saw the consensus message for a second time immediately prior to responding to reactance measures. This is similar to the approach taken by van der Linden, Maibach, et al. (2019), but unlike the van der Linden, Maibach, et al. (2019) study, those in our control groups never viewed the consensus message. Participants then responded to demographic measures, including partisan identity, and reported their COVID-19 concern. A flow chart of the study procedure is in the Supplemental Information.

Measures

Reactance

Participants' *reactance* was captured with three items from Moyer-Gusé and Nabi (2010) that were used in Ma et al.'s (2019) study. Participants reported their agreement with three statements describing feeling pressured, manipulated, and forced into beliefs about climate change on a scale from "Strongly disagree" (1) to "Strongly agree" (7). These three items were averaged to form our measure of *reactance* ($M = 3.25$, $SD = 1.72$, Cronbach's alpha = .86, $n = 1996$).

Perceived manipulation

Our measure of *perceived manipulation* asked participants to evaluate how manipulative the message is, rather than how manipulated they felt (as they did for *reactance*). We asked, "In your opinion, how manipulative is the media statement you read?" (van der Linden, Maibach, et al., 2019). Participants responded on a scale from "Not manipulative at all" (1) to "Extremely manipulative" (5). In contrast to our measure of *reactance*, only those participants who saw the consensus message responded to our item of *perceived manipulation* ($M = 2.49$, $SD = 1.38$, $n = 1036$).

Partisan identity

Partisan identity was measured on a 7-point scale from "Strong Democrat" (1) to "Strong Republican" (7) ($Mean (M) = 3.74$, $Standard Deviation (SD) = 2.26$, $n = 1996$).

Prior belief

In pre-stimuli measures of climate beliefs (seen by CPP and TPP conditions only), after asking participants whether they believed anthropogenic global warming was happening, *prior belief* in anthropogenic climate change was measured by asking, "Assuming climate change *IS* happening, to what extent do you think that climate change is *human-induced* or the result of *Earth's natural changes*?" (van der Linden, Leiserowitz, et al., 2015, 2019). Respondents answered on a scale from "Climate change is completely caused by natural changes" (1) to "Climate change is completely caused by human activity" (5). ($M = 3.35$, $SD = 1.13$, $n = 982$).

Results

Random assignment

While conditions did not differ with respect to income or race, gender (chi-squared = 9.22, $p = .03$), age $F(3, 1993) = 2.65$, $p = .048$, and education $F(3, 1994) = 2.33$, $p = .072$ differed across experimental conditions and are controlled for in the analyses that follow.²

Effects of consensus messages

OLS regressions (Table 1) revealed a main effect of the TPO condition on reactance. Those in the TPO condition reported higher levels of reactance compared to those in the CPO condition (Table 1; unstandardized $B = .36$, $p < .01$) or the CPP condition ($B = .33$, $p < .01$). No other condition differences were significant (see Table S1 in Supplemental Information for results using CPP as a reference group).

Looking at perceived message manipulation, we did not observe a difference between the TPP and TPO conditions (Table 2).

Effects of partisanship

Republicans were more likely to experience reactance than Democrats ($B = .24$, $p < .01$; Table 1). Additionally, we observed an interaction between partisanship and experimental condition on

Table 1. OLS Regression Predicting Reactance.

	Reactance			
	B	s.e.	B	s.e.
CPP (v. CPO)	.03	(.10)	-.31	(.20)
TPO (v. CPO)	.36**	(.10)	-.02	(.19)
TPP (v. CPO)	.17	(.10)	-.27	(.20)
Partisan Identity	.24**	(.02)	.16**	(.03)
Gender	-.39**	(.07)	-.38**	(.07)
Age	-.04#	(.02)	-.04#	(.02)
Education	.11**	(.02)	.11**	(.02)
CPP (v. CPO) * Partisan Identity			.09*	(.05)
TPO (v. CPO) * Partisan Identity			.10*	(.05)
TPP (v. CPO) * Partisan Identity			.12*	(.05)
Constant	2.54**	(.18)	2.82**	(.21)
Observations		1,993		1,993
Adjusted R ²		0.133		0.135
Residual Standard Error		1.599 (df = 1985)		1.597 (df = 1982)
F Statistic		44.523** (df = 7; 1985)		32.040** (df = 10; 1982)

Note: # $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

Table 2. OLS Regression Predicting Perceived Manipulation.

	Perceived Manipulation			
	B	s.e.	B	s.e.
TPP (v. TPO)	-.11	(.08)	-.10	(.16)
Partisan Identity	.20**	(.02)	.20**	(.02)
Gender	-.33**	(.08)	-.33**	(.08)
Age	.01	(.02)	.01	(.02)
Education	.12**	(.03)	.12**	(.03)
TPP (v. TPO) * Partisan Identity			-.001	(.04)
Constant	1.81**	(.20)	1.81**	(.21)
Observations		1,033		1,033
Adjusted R ²		0.155		0.154
Residual Standard Error		1.273 (df = 1027)		1.273 (df = 1026)
F Statistic		38.895** (df = 5; 1027)		32.381** (df = 6; 1026)

Note: # $p < 0.1$; * $p < 0.05$; ** $p < 0.01$.

reactance (Table 1). There was a significant interaction between partisanship and condition for the CPP (v. CPO) ($B = .09$, $p < .05$), TPO (v. CPO) ($B = .10$, $p < .05$) and TPP (v. CPO) ($B = .12$, $p < .01$) conditions. Results using the CPP condition as a reference follow the same pattern, revealing a significant interaction between CPO (v. CPP) and partisanship ($B = -.09$, $p < .05$) (Table S1 in Supplemental Information). Figure 1 visually demonstrates that the interaction is driven by a greater difference in reactance between conditions among Republicans, compared to a minimal or no difference between conditions among Democrats.

Republicans were also more likely than Democrats to report that consensus messages are manipulative ($B = .20$, $p < .01$, Table 2). Democrats (partisan identity scale points 1 and 2) found the consensus message to be “slightly manipulative” (*Descriptive Mean* (M) = 2.07, *Standard Deviation* (SD) = 1.21), while Republicans (scale points 6 and 7) found it “moderately manipulative” ($M = 3.10$, $SD = 1.43$). There was no interaction between partisan identity and condition on perceived message manipulation (Table 2).

Effects of prior beliefs

Previous research also investigated how prior belief in anthropogenic global warming moderates the effects of consensus messages on reactance (Ma et al., 2019). We investigated this by limiting our analyses to participants in experimental conditions that responded to climate belief measures pre- and post-exposure to the consensus message (TPP and CPP conditions, Table 3).

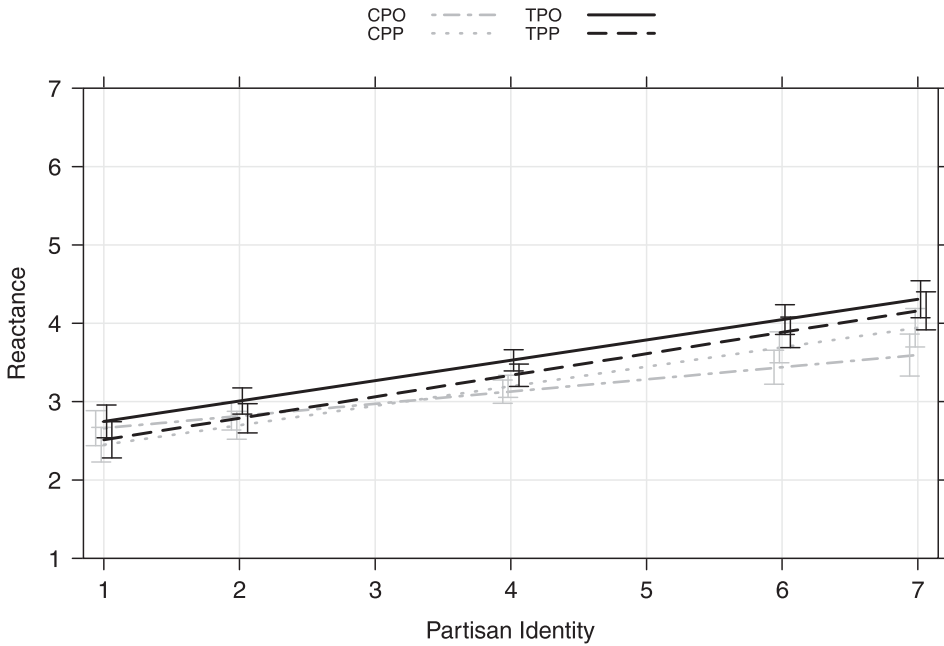


Figure 1. Interactive Effects of Partisan Identity and Condition on Reactance.

Table 3. Effects of Prior Belief in Anthropogenic Global Warming.

	Reactance					
	B	s.e.	B	s.e.	B	s.e.
TPP (v. CPP)	.18#	(.10)	.86**	(.30)	1.30*	(.66)
Partisan Identity	.19**	(.02)	.19**	(.02)	.26**	(.09)
Prior Belief in AGW	-.51**	(.05)	-.41**	(.06)	-.32**	(.12)
Gender	-.42**	(.10)	-.42**	(.10)	-.41**	(.10)
Age	-.09**	(.03)	-.09**	(.03)	-.09**	(.03)
Education	.15**	(.03)	.14**	(.03)	.14**	(.03)
TPP (v. CPP) * Prior Belief in AGW			-.20*	(.09)	-.31#	(.18)
TPP (v. CPP) * Partisan Identity					-.10	(.13)
Prior Belief in AGW * Partisan Identity					-.02	(.03)
TPP (v. CPP) * Prior Belief in AGW * Partisan Identity					.03	(.04)
Constant	4.52**	(.30)	4.19**	(.33)	3.86**	(.49)
Observations		981		981		981
Adjusted R ²		0.253		0.256		0.255
Residual Standard Error		1.512 (df = 974)		1.509 (df = 973)		1.510 (df = 970)
F Statistic		56.236** (df = 6; 974)		49.215** (df = 7; 973)		34.484** (df = 10; 970)

Note: # < 0.1; *p < 0.05; **p < 0.01. Betas are unstandardized.

Prior belief in anthropogenic global warming has a significant negative main effect on reactance ($B = -.51, p < .01$).

We also see a significant interactive effect between prior belief in anthropogenic climate change and exposure to a consensus message on reactance ($B = -.20, p < .05$). A consensus message produced reactance for individuals who did not believe in anthropogenic climate change, but there was no effect for individuals with a high belief in anthropogenic climate change (see Figure 2).

However, we do not observe a significant three-way interaction effect between prior beliefs, partisan identity, and exposure to a consensus message on reactance that Ma et al. (2019) report.

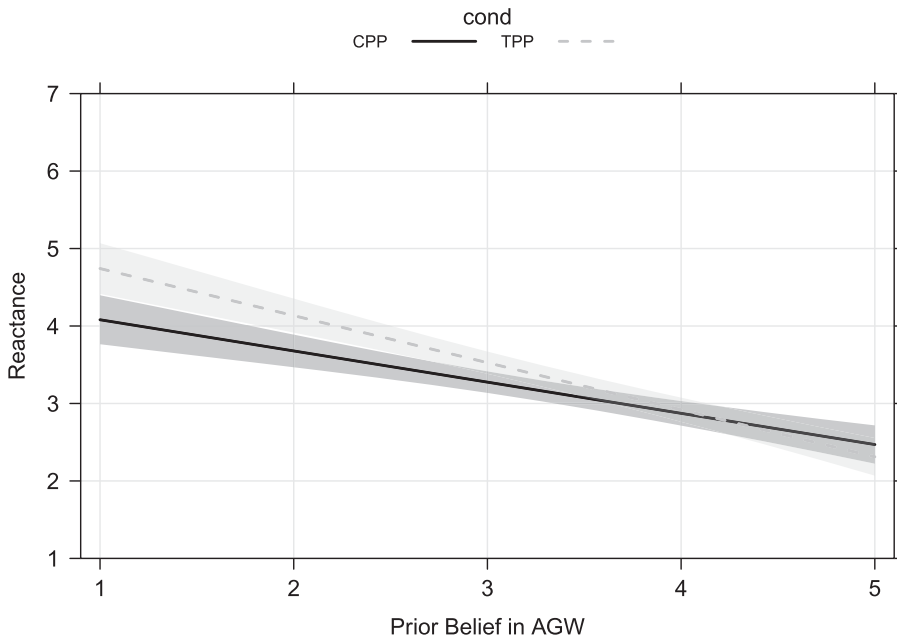


Figure 2. Interactive Effect of Prior Beliefs and Experimental Condition on Reactance.

Discussion

Our analysis finds that consensus messages can produce reactance. Participants report greater reactance after seeing a consensus message in the TPO condition compared to both control conditions. We do not see a significant main effect on reactance in the TPP condition. There was no difference in perceived message manipulation between the TPO and TPP conditions. We also find that consensus messages cause greater reactance among Republicans in both treatment conditions, as well as those who do not believe in anthropogenic climate change.

This study builds on previous work in several ways. First, we examine effects of consensus messages on both reactance (Ma et al., 2019) and perceived manipulation (van der Linden, Maibach, et al., 2019). We find that (1) in the absence of a pretest, consensus messages cause reactance among all respondents (TPO); (2) those with opposing prior beliefs experience reactance even when a pretest is present (TPP); and (3) that climate change consensus messages cause reactance among Republicans, regardless of pretest condition. Though some have suggested that interactive consensus messaging, asking participants to estimate agreement before seeing a consensus message, is more effective than one-way messaging (Myers et al., 2015), our findings suggest consensus messages deployed in this way will nevertheless produce reactance among those inclined to be skeptical.

There are also limitations worth noting. van der Linden, Maibach, et al. (2019) expressed concern about Ma et al.'s sample size and diversity. Our sample was larger than that of Ma et al. (2019) and reasonably diverse, but not nationally representative. Concerning the finding that consensus messages directly affect reactance in the TPO but not TPP condition, we cannot determine whether respondents in the TPP condition were more accepting of the consensus message or whether the pretest attuned them to the intentions of the survey. Though participants' open-text responses about the topic of the survey suggest that TPP participants were not significantly more primed about study intentions than TPO participants (see Supplemental Information), potential artefacts of pretests are an important concern for consensus messaging research. Further, while counter-arguing is often component to measures of reactance (Rains & Turner, 2007), it was not present in measures used by Ma et al. (2019) or van der Linden, Maibach, et al. (2019) and was therefore

not included in this study. In future, observed measures of reactance via counter-arguing would inform researchers about the behaviors likely to result from felt reactance. Finally, while the experimental design allows for the comparison of consensus messages to no message, it does not compare consensus messages to other types of strategic climate change messages. Future research will benefit from comparing consensus messages to other types of climate messages, as alternative message strategies may elicit more or less reactance than consensus climate messages.

This study demonstrates that climate change consensus messages can cause reactance and be perceived as manipulative, particularly among Republicans and those who disbelieve anthropogenic climate change. Though van der Linden, Maibach, et al. (2019) argued that consensus messages target beliefs about what others believe, and thus are less psychologically threatening than messages targeting personal beliefs, we nevertheless see consistent evidence of reactance to consensus messages. This is in line with work suggesting that conservatives' perceptions of scientists' views on climate change are informed by motivated reasoning, as opposed to systematic knowledge differences between partisans (Chinn & Pasek, 2020). Given Ma et al.'s (2019) finding that reactance leads to less belief in climate change and support for mitigative actions, these findings suggest that well-intentioned actors spreading consensus messages may inadvertently calcify positions against climate action.

Notes

1. As with the data informing the van der Linden, Maibach, et al. (2019) study, these data also inform a separate study examining what role the decision to pretest climate belief measures has on reactions to a consensus message.
2. These data were collected while many U.S. states were under stay at home orders due to COVID-19. We therefore measured concern about COVID-19 with two items. Measurement is available in the supplemental information. COVID-19 concern did not vary by condition, so it was not included as a covariate in the results presented.

Data availability statement

The data that support these findings are available from the corresponding author, upon reasonable request.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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