ATLANTIC JOURNAL OF COMMUNICATION
2017, VOL. 25, NO. 3, 166–180
https://doi.org/10.1080/15456870.2017.1324453

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"A Statistically Representative Climate Change Debate": Satirical Television News, Scientific Consensus, and Public Perceptions of Global Warming

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ABSTRACT

Satirical television news programs provide the public with potential sources of information about climate change. This study uses a segment from *Last Week Tonight with John Oliver* as a test case for exploring how coverage from such programs that features consensus messaging may influence viewers' perceptions of global warming. The segment presents a "statistically representative climate change debate" to affirm the scientific consensus on anthropogenic climate change and satirize television news coverage "balancing" this consensus with skeptics' arguments. Results from a randomized experiment demonstrate that watching the segment increased viewers' own belief in global warming, as well as viewers' perceptions that most scientists believe in global warming. The latter effect was stronger among participants with low interest in the environment and global warming than among those with high interest. The segment's impact on perceptions of scientists' views may have mediated its effects on viewers' own beliefs about global warming.

Two weeks after its April 27, 2014, launch on the U.S. cable television network HBO, *Last Week Tonight with John Oliver* featured a segment on the topic of climate change. Oliver, the host of the satirical news program, begins the segment by describing a White House report on global warming. He then discusses—and mocks—public doubts about global warming. Next, he criticizes U.S. television news coverage for creating the false perception of an equal debate between climate change believers and skeptics instead of accurately reflecting the scientific consensus on the topic. He concludes by staging his own "statistically representative climate change debate" between three climate change skeptics and 97 scientists affirming the existence of global warming. Although Oliver's tone is humorous, his message is clear: There is an overwhelming consensus among scientists that the earth is warming because of human activity.

This May 11, 2014, segment of *Last Week Tonight* illustrates the broader rise of satirical television news programs as potential sources of public information about climate change. In recent years, a number of such programs, including *The Daily Show with Jon Stewart* and *The Colbert Report with Stephen Colbert*, have used humor to address a wide range of political, environmental, and scientific topics (Baym, 2005; Brewer & Marquardt, 2007; Feldman, Leiserowitz, & Maibach, 2011; Fox, Koloen, & Sahin, 2007), including global warming (Brewer, 2013; Feldman, 2013). In doing so, they have tended to affirm the scientific consensus surrounding anthropogenic climate change (Brewer, 2013; Feldman, 2013)—thereby potentially countering skeptical messages presented by some U.S. economic interests (particularly fossil fuel industries; McCright & Dunlap, 2003), political leaders (particularly Republican and conservative ones; McCright & Dunlap, 2011), and news outlets

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(particularly conservative-leaning ones such as Fox News Channel; Feldman, Maibach, Roser-Renouf, & Leiserowitz, 2012). Satirical television news programs can reach sizable audiences; for example, *Last Week Tonight* averaged 4.1 million weekly viewers in its first season across TV airings, DVR, on-demand viewing, and HBO Go (O'Connell, 2014). The potential for viewers to watch videos from satirical news programs online expands their reach even further. As a case in point, the aforementioned *Last Week Tonight* segment on climate change had been viewed 6.3 million times on YouTube as of June 6, 2016. Furthermore, a substantial proportion of audience members for satirical television news programs consume them primarily to be entertained rather than informed (Young, 2013). Thus, these programs can reach not only viewers already engaged with public affairs—including environmental issues—but also viewers who may otherwise pay little attention to information about the environment in general or global warming in particular.

As such, satirical television news programs provide one potential solution to a double challenge confronting efforts to promote public acceptance that human-caused climate change is occurring. The first challenge involves reaching members of the public who possess no strong motivation to seek out information about global warming through traditional news outlets. Here, the present study builds on the "gateway hypothesis" that entertainment-oriented "soft news" programs (Baum, 2003), including satirical television news programs (Feldman et al., 2011), can foster learning and belief change among audience members, particularly those who are not predisposed to follow public affairs. One contribution of the following account is to extend this hypothesis to address both a new satirical outlet, *Last Week Tonight*, and a new belief topic, perceptions of scientific consensus. The second challenge involves selecting a message that will successfully promote greater belief in global warming. As Oliver himself noted, a substantial proportion of the U.S. public remains skeptical that the earth is warming (see also Pew Research Center, 2015; Saad, 2014). Such skepticism may carry important implications for citizens' willingness to undertake individual actions and support government action to address climate change (Bord, O'Connor, & Fisher, 2000; van der Linden, Leiserowitz, Feinberg, & Maibach, 2015). Here, the present study builds on the "gateway belief model," which posits that messages highlighting the scientific consensus surrounding climate change can promote belief in human-caused climate change by fostering perceptions of scientific agreement on the topic (van der Linden et al., 2015). Thus, another contribution of the following account is to extend research on the impact of consensus messaging to address potential effects of such messaging through satirical television news programs.

To these ends, the present study examines whether watching *Last Week Tonight*'s coverage of climate change can influence audience members' own beliefs about global warming, as well as their perceptions of scientists' views on the topic. After reviewing previous research regarding the nature and effects of traditional and satirical news coverage of climate change, it examines *Last Week Tonight*'s coverage of climate change in more depth to consider how it uses satirical humor to present the scientific consensus on climate change. In light of this discussion, it draws from previous research on the gateway hypothesis and the gateway belief model to hypothesize about the potential effects of the program's coverage. It then uses original data from a randomized experiment to test the effects of exposure to *Last Week Tonight*'s coverage.

Climate change and satirical television news

Initial research on U.S. news coverage of climate change, including television news coverage, found that it tended to balance the scientific consensus surrounding anthropogenic climate change with the views of climate change skeptics (Antilla, 2005; Boykoff, 2011; Boykoff & Boykoff, 2004)—in contrast to coverage in other nations, which tended to reflect the scientific consensus to a greater degree (e.g., Boykoff, 2007). For example, Boykoff (2008) found that most U.S. broadcast network television news segments provided balanced coverage regarding human contributions to climate change. This pattern of coverage, which reflects journalistic norms of objectivity, provides audience members with a "he said, she said" version of the debate (Boykoff, 2007) and thus may have contributed to

public skepticism about climate change (along with a host of other factors; McCright & Dunlap, 2011). In keeping with this, research has shown that the impact of exposure to traditional news coverage of climate change on public perceptions can depend on whether such coverage emphasizes context versus controversy (Corbett & Durfee, 2004) or includes the views of skeptics (Malka, Krosnick, Debell, Pasek, & Schneider, 2009).

More recent research has found differences in U.S. news coverage of climate change across both time and media outlets. In terms of the former, some evidence suggests that the extent of balancing in such coverage has declined over time (Boykoff, 2007; Nisbet, 2011). Looking at differences across outlets, Feldman et al. (2012) found that one of the three leading cable television news networks, Fox News Channel, presented dismissive coverage of climate change much more often than did the other two, CNN and MSNBC. Such variations in coverage may help shape public perceptions. As a case in point, Feldman et al. (2012) found that viewing Fox News was negatively related to acceptance of climate change, whereas viewing CNN and MSNBC was positively related to such acceptance (they found no relationship between broadcast network news viewing and acceptance). Another recent study found that consumption of conservative media (Fox News and *The Rush Limbaugh Show*) was negatively related to global warming certainty, whereas consumption of nonconservative media (CNN, MSNBC, National Public Radio, and broadcast network news) was positively related to global warming certainty (Hmielowski, Feldman, Myers, Leiserowitz, & Maibach, 2014).[1] These variations also raise the prospect that individuals who engage in selective exposure to like-minded outlets in a fragmented media environment will tend to encounter messages about climate change that reinforce their existing views (see Stroud, 2011).

Satirical television news programs can also cover climate change—and, thus, may shape public perceptions about the topic. In regard to the first point, one 2008 study showed that *The Daily Show* devoted twice as high a proportion of coverage to science and technology in general, and global warming in particular, than did the traditional press (Project for Excellence in Journalism, 2008). More recently, Feldman (2013; see also Brewer, 2013) found that both *The Daily Show* and *The Colbert Report* presented substantial coverage of climate change. The same study showed that most of the segments on the programs that discussed climate change affirmed its existence. In addition, it found that the programs overwhelmingly affirmed that human activity is causing global warming when they specifically addressed the topic of anthropogenic climate change. Thus, *Last Week Tonight*'s May 11, 2014, segment on climate change reflects a broader tendency of satirical television news programs to endorse the scientific consensus that the earth is warming and that human activity has caused this warming.

As for the potential effects of such coverage, a growing body of research indicates that exposure to satirical television news can influence audience members' knowledge (Brewer & Cao, 2006; Hollander, 2005; Xenos & Becker, 2009; Young & Hoffman, 2012) and opinions (Baumgartner & Morris, 2006; Becker, 2011; LaMarre, 2013; Morris, 2009) about a range of public affairs topics. Of particular importance for the purposes at hand, Feldman et al. (2011) found that viewing *The Daily Show* and *The Colbert Report* was associated with greater attention to news about science and technology, news about the environment, and information about global warming. Interpreting this pattern in light of Baum's (2003) gateway hypothesis that "soft news" can produce incidental learning by "piggy-backing" information "on entertainment fare," the authors argued that satirical television news programs can promote greater engagement with scientific issues such as climate change (Feldman et al., 2011, p. 31). In keeping with the gateway hypothesis, the authors found that the link between viewing satirical television news programs and attention was strongest among the least educated viewers. Thus, they argued that such viewing can help close engagement gaps between those who are already likely to follow scientific and environmental issues through traditional means and those otherwise less inclined to do so.

[1]Neither Feldman et al. (2012) nor Hmielowski et al. (2014) examined how Public Broadcasting Service (PBS) covered climate change or how viewing PBS was related to climate perceptions.

Following in the same vein, Brewer and McKnight (2015) used an experiment to test the effects of viewing clips from *The Daily Show* or *The Colbert Report* on viewers' climate change perceptions. The authors found that exposure to a clip from either program affirming the existence of climate change led viewers to report greater belief in global warming.

The present study extends this line of research by examining the potential impact of satirical television news on viewers' own perceptions not only of climate change but also regarding scientists' views on the topic. In doing so, it goes beyond Brewer and McKnight's (2015) study to consider the potential effects of satirical television news coverage that includes consensus messaging (see Cook & Jacobs, 2014) on perceptions of the scientific consensus. Such perceptions are important given that they can serve as gateway beliefs for other climate perceptions and can ultimately lead to support for public action (van der Linden et al., 2015). In addition, the present study extends research on the effects of satirical television news by focusing on *Last Week Tonight*. *The Daily Show* and *The Colbert Report* have both received extensive attention from media effects scholars; however, the latter is now defunct and the former recently lost the long-serving host, Jon Stewart, who raised it to prominence as an influential voice in public affairs. As a relatively new outlet for satirical humor that draws a substantial viewership (see the preceding) and has shaped both public discourse about (Faris, Roberts, Etling, Othman, & Benkler, 2015) and public familiarity with (University of Delaware Center for Political Communication, 2014) other policy issues, *Last Week Tonight* warrants closer investigation.

Climate change coverage on *Last Week Tonight*

Last Week Tonight episodes are a half-hour long and are typically split into two segments, with the first including brief commentary about events from the past week and the second featuring a longer treatment of a single topic. The host of the program, John Oliver, is a comedian and previously served as a "correspondent" on Comedy Central's *The Daily Show with Jon Stewart*. *Last Week Tonight* is similar to both *The Daily Show* and *The Colbert Report* in that it presents satirical looks at politics, news, and current events, with a comedian playing the anchor-like role of host. However, *Last Week Tonight* airs on HBO, a premium cable network, allowing Oliver greater freedom to explore topics in longer segments. In terms of Nielsen ratings, *Last Week Tonight* ranked seventh among all late-night TV programs in the first quarter of 2015 and earned a rating of 0.62 in the 18–49 demographic (Maglio, 2015).

One segment of the May 11, 2014, episode of *Last Week Tonight* focuses on climate change. This segment, which runs for 4 min 27 s, starts with the host using humor to introduce the topic in a manner that might engage the attention of both those already interested in it and those simply seeking to be entertained (see Feldman et al., 2011):

> The earth: You may know it as that blue thing that Bruce Willis is always trying to save, or from its famous collaboration with wind and fire, or just simply as that place where George Clooney lives. Anyway, the earth had some genuinely bad news this week.

With that, Oliver transitions to a recent White House report concluding that global warming threatens every part of the United States and is "affecting us now." The host says, "Smart move, Obama. That is a key shift in how to talk about climate change because we've all proven that we cannot be trusted with the future tense." Oliver then highlights public skepticism about global warming, observing that "incredibly, this latest damning scientific report may still face an uphill climb with some of us" given a Gallup poll finding that "one in four Americans is skeptical about climate change and thinks this issue has been exaggerated." In response, he argues,

> That doesn't matter. You don't need people's opinions on a fact. You might as well have a poll asking, "Which number is bigger: 15 or 5?" or "Do owls exist?" or "Are there hats?" The debate on climate change should not be about whether or not it exists, it's what we should do about it.

He then provides an overview of some of the extensive scientific research on climate change:

> There is a mountain of research on this topic. Global temperatures are rising, heat waves are becoming more common, sea surface temperatures are also rising, glaciers are melting, and, of course, no climate report is complete without the obligatory photo of a polar bear balancing on a piece of ice. … A survey of thousands of scientific papers that took a position on climate change found that 97% endorsed the position that humans are causing global warming.

From there, Oliver turns to criticizing television news coverage of climate change, echoing the same points about "balancing as bias" made by scholarly studies of such coverage (e.g., Boykoff, 2008). He says, "I think I know why people still think this issue is open to debate, because on TV it is, and it's always one person for and one person against, and it's usually the same person for." Here, the segment cuts to a montage of video clips from cable television news programs, each of which features a debate between a climate change skeptic and Bill Nye, the Science Guy (the former host of a popular children's science television program). Oliver comments, "Yeah, that's right, more often than not it's Bill Nye the Science Guy versus some dude, and when you look at the screen, it's 50-50, which is inherently misleading."

At this point, the host introduces his concept of a "statistically representative climate change debate" to satirize balanced media coverage and affirm the scientific consensus, stating that "if there has to be a debate about the reality of climate change—and there doesn't—then there is only one mathematically fair way to do it." The segment cuts to Oliver seated at a table, flanked by Bill Nye and another person playing the role of a climate change skeptic:

> OLIVER: Good evening. Joining me tonight, a climate change denier, and, naturally, Bill Nye [the] Science Guy.
> NYE: John, humans are causing climate change, no question …
> OLIVER: Wait, wait, before we begin, in the interest of mathematical balance I'm going to bring out two people who agree with you, climate skeptic, and Bill Nye, I'm also going to bring out 96 other scientists. It's a little unwieldy, but it's the only way to actually have a representative discussion.

As Oliver speaks, the stage fills with scientists wearing lab coats. The host then addresses the skeptic, now seated with two other people:

> OLIVER: Representationally, climate change skeptic, please make a case against climate change.
> SKEPTIC: Well, I just don't think all of the science is in yet.
> OLIVER: And what is the overwhelming view of the entire scientific community?

All of the scientists begin to speak at once. Oliver asks the skeptic, "Any response to that?" The skeptic attempts to reply, but the host shouts, "I can't hear you over the weight of scientific evidence!" As the segment concludes, he continues to shout, saying, "This whole debate should not have happened. I apologize to everyone at home. My thanks to Bill Nye and the overwhelming scientific consensus."

The potential effects of consensus messaging in satirical coverage

In sum, the May 11, 2014, segment of *Last Week Tonight* uses its "statistically representative climate change debate" to affirm the scientific consensus surrounding anthropogenic climate change. Thus, the segment incorporates the approach of consensus messaging, which recent research indicates can be an effective technique in shaping public perceptions of climate change (e.g., Bolsen, Leeper, & Shapiro, 2014; Cook & Jacobs, 2014; Myers, Maibach, Peters, & Leiserowitz, 2015; van der Linden et al., 2015). For example, one study found that the message, "97% of climate scientists have concluded that human-caused climate change is happening"—the same central message illustrated by Oliver's staged debate—influenced public perceptions of the scientific consensus when presented in the form of text, metaphors, or a pie chart (van der Linden, Leiserowitz, Feinberg, & Maibach, 2014). Given this, along with previous findings that viewing other satirical television news programs can influence public engagement with science, the environment, and global warming (Feldman et al.,

2011) and belief in climate change (Brewer & McKnight, 2015), the present study hypothesizes that watching the segment will influence viewers' own beliefs about climate change, as well as their perceptions of scientists' views on the topic:

H1a: Compared to those not exposed to any coverage of climate change, viewers exposed to *Last Week Tonight* coverage affirming the scientific consensus on anthropogenic climate change will report greater belief that global warming is occurring and that this is happening due to human activity.

H1b: Compared to those not exposed to any coverage of climate change, viewers exposed to *Last Week Tonight* coverage affirming the scientific consensus on anthropogenic climate change will report greater belief that scientists think global warming is occurring and that scientists think this is happening due to human activity.

Note that the present study does not seek to compare the effects of satirical consensus messaging to nonsatirical consensus messaging; it merely seeks to test whether a satirical television news segment that features consensus messaging can produce effects along the same lines as those produced by previously examined nonsatirical consensus messaging. Given that satirical television news can reach viewers who may not be particularly interested in the topics of the environment and global warming, this is a potentially important question in and of itself.

Indeed, such low-interest viewers may be especially responsive to the program's message. Extending research on the gateway hypothesis (Feldman et al., 2011), the present study posits that interest in the environment and global warming will moderate the relationships between exposure to the *Last Week Tonight* segment and viewers' beliefs about climate change:

H2a: The effects of *Last Week Tonight* coverage on audience members' own beliefs about global warming will be greater among those with low interest in the environment and global warming than among those with high interest.

H2b: The effects of *Last Week Tonight* coverage on audience members' perceptions of scientists' views about global warming will be greater among those with low interest in the environment and global warming than among those with high interest.

Put another way, watching *Last Week Tonight*'s climate change segment should narrow any "belief gaps" on global warming between those with high and low levels of interest.

Viewers' partisanship could also moderate the impact of the program's climate change coverage. One line of previous research suggests that the politicization of scientific issues may lead partisans among the public to engage in motivated reasoning when exposed to messages about these issues (Bolsen & Druckman, 2015), including consensus messaging about climate change (Kahan, 2014, 2015). However, previous studies have produced mixed findings on whether political beliefs can drive "boomerang effects" for media messages about climate change in ways consistent with motivated reasoning (Feldman et al., 2012; Hart & Nisbet, 2012). Furthermore, some tests of consensus messaging effects have failed to yield evidence of motivated reasoning depending on the receiver's political views (Myers et al., 2015; van der Linden et al., 2014, 2015). Looking at how audience members responded to climate change messages on *The Daily Show* and *The Colbert Report*, Brewer and McKnight (2015) found evidence that viewers' political beliefs shaped their interpretations of Colbert's messages but no evidence that these beliefs moderated the effects of either program's messages on climate beliefs. Given this conflicting set of findings, the present study poses a pair of research questions here:

RQ1a: Will audience members' party identification moderate the effects of *Last Week Tonight* coverage on their own beliefs about global warming?

RQ1b: Will audience members' party identification moderate the effects of *Last Week Tonight* coverage on their perceptions of scientists' views about global warming?

The present study also extends research on the gateway belief model (van der Linden et al., 2015) by exploring whether perceptions of scientists' views on climate change *mediate* the impact of *Last Week Tonight*'s climate change segment on viewers' own beliefs about climate change. The central point of the segment is that scientists overwhelmingly agree that the earth is warming due to human activity. To the extent that exposure to the segment shapes viewers' beliefs about climate change, then such influence may flow through its impact on perceptions of the scientific consensus:

H3: Audience members' perceptions of scientists' views about global warming will mediate the effects of *Last Week Tonight* coverage on audience members' own views about global warming.

Methods

The data for this study came from a posttest-only experiment conducted online from November 21 to December 2, 2014. Following Brewer and McKnight's (2015) approach, students in a course at a mid-Atlantic public university were each responsible for recruiting at least 20 participants. In all, 288 participants completed the study.[2] In regard to gender, 53% identified as women, 46% as men, and 1% as other. The median age was 21 years, though 19% of the participants were 25 years of age or older. In terms of race and ethnicity, 77% self-identified as White, 7% as African American, 5% as Hispanic, 3% as Asian/Pacific Islander, and 3% as other (participants were allowed to select multiple categories; some did not self-identify). Of the participants, 45% were students at the researchers' university, 26% were students at another university, and 29% were not students. The recruitment method and the nature of the sample raise the issue of how generalizable the results may be; the discussion revisits this point.

Treatments

Participants were told that they would be asked to view a video from *Last Week Tonight with John Oliver*. To minimize demand characteristics, the instructions stated that they would be asked "some questions about the video"; moreover, in the posttest (see next), the measures of the key dependent variables were described as "background questions." Each participant was then randomly assigned to one of two conditions. Those in the first condition, which served as the control condition (and, thus, the baseline for comparison), viewed a video from *Last Week Tonight* about a topic (net neutrality) unrelated to the true focus of the study.[3] Participants in the second condition, which served as the treatment condition, viewed the May 11, 2014, video from *Last Week Tonight* presenting a "statistically representative climate change debate." To check for technical issues, participants in each condition were asked to indicate whether they were able to view the video. Of the 319 participants who began the study, 31 indicated that they were unable to view the video; for these participants, the study was terminated. Of the remaining 288 participants, 150 viewed the control video and 138 viewed the treatment video.

[2]The study design was approved by the Institutional Review Board of the authors' institution. Participation was voluntary, and participants were not offered any compensation.
[3]The video was from June 15, 2014 (Pennolino, 2014).

Posttest

The posttest included questions on a variety of topics, some of which were intended to misdirect participants from the study's purpose (including questions related to the topic of the control video, net neutrality). Measures for the variables of interest were as follows.

Attention check

Participants assigned to view the treatment video were asked to indicate on 7-point scales "what John Oliver thinks about whether global warming is happening" (where 1 was labeled "John Oliver thinks global warming is not happening" and 7 was labeled "John Oliver thinks global warming is happening"; $M = 6.03$, $SD = 1.62$) and "what John Oliver thinks about whether the earth is getting warmer because of human activity" (where 1 was labeled "John Oliver thinks the earth is not getting warmer because of human activity" and 7 was labeled "John Oliver thinks the earth is getting warmer because of human activity"; $M = 6.00$, $SD = 1.53$).[4] Given that Oliver clearly states his views on these topics in the treatment video, the 15 respondents who selected a number below 4 for one or both scales were considered to have failed the attention check and were excluded from subsequent analyses. Thus, the analyses included 123 participants from this condition.[5]

Participants' views on climate change. All participants were asked to indicate on 7-point scales "your views on whether global warming is happening" (where 1 was labeled "I am very sure global warming is not happening" and 7 was labeled "I am very sure global warming is happening"; $M = 5.83$, $SD = 1.45$) and "your views about whether the earth is getting warmer because of human activity" (where 1 was labeled "I am very sure the earth is not getting warmer because of human activity" and 7 was labeled "I am very sure the earth is getting warmer because of human activity"; $M = 5.74$, $SD = 1.46$). Given that responses to the two items were strongly correlated with one another ($r = .73$, $p < .01$), they were averaged to create an index for participants' views on climate change ($M = 5.79$, $SD = 1.35$).

Participants' perceptions of scientists' views on climate change. All participants were also asked to indicate on 7-point scales "what most scientists think about whether global warming is happening " (where 1 was labeled "Most scientists think global warming is not happening" and 7 was labeled "Most scientists think global warming is happening"; $M = 5.97$, $SD = 1.41$) and "what most scientists think about whether the earth is getting warmer because of human activity" (where 1 was labeled "Most scientists think the earth is not getting warmer because of human activity" and 7 was labeled "Most scientists think the earth is getting warmer because of human activity"; $M = 5.82$, $SD = 1.41$). Responses to the two items were strongly correlated with one another ($r = .78$, $p < .01$); thus, they were averaged to create an index for participants' perceptions of scientists' views on climate change ($M = 5.89$, $SD = 1.32$).

Interest in the environment and global warming. All participants were asked to rate on 5-point scales, from 1 (*not at all*) to 5 (*a great deal*), how interested they were in information about the environment ($M = 3.54$, $SD = .99$) and information about global warming ($M = 3.39$, $SD = 1.06$). Given that responses to the two items were strongly correlated with one another ($r = .84$, $p < .01$), they were averaged to create an index for interest in the environment and global warming ($M = 3.46$, $SD = .98$).

[4]The attention check questions were asked after the questions on participants' climate change views to avoid influencing the latter by priming Oliver's views on the issue.

[5]When the participants who failed the attention check were included in the analyses, the results were substantively similar to the ones reported next for all analyses except the comparison of means for respondents' own beliefs about climate change; here, the difference across conditions fell short of statistical significance. Respondents who failed the manipulation check scored significantly lower on this variable than did other treatment condition participants, a pattern that could reflect a general lack of motivation to attend to the message or specific predispositions against attending to messages about climate change and/or from John Oliver.

Party identification. All participants completed standard branching questions that yielded a 7-point scale capturing strength of party identification, from 1 (*strong Republican*) to 7 (*strong Democrat; M* = 3.88, *SD* = 1.40).

Results

The first analyses tested whether participants' own views about global warming and their perceptions of scientists' views differed depending on whether they watched the *Last Week Tonight* segment on climate change. Consistent with H1a, participants who watched this clip scored .33 points higher on the 7-point index measuring their own belief in global warming ($M = 5.97$, $SD = 1.36$) than did control participants ($M = 5.64$, $SD = 1.33$). The difference was statistically significant ($t = 2.01$, $p < .05$). As captured by Cohen's *d*, the effect size was .24; thus, it was closer to small (.2) than medium (.5), using the thresholds suggested by Cohen (1988). The results also provided support for H1b. Compared to control participants ($M = 5.63$, $SD = 1.44$), participants who watched the *Last Week Tonight* segment on climate change scored .58 points higher ($M = 6.21$, $SD = 1.11$) on the 7-point index measuring their perceptions of scientists' belief in global warming. This difference was highly significant ($t = 3.63$, $p < .01$), with a Cohen's *d* of .44—indicating an effect closer to medium than small.

Following the approach used by Baum (2003) and Feldman et al. (2011), regression analyses tested whether the effects of the treatment depended on participants' levels of interest in the environment and global warming.[6] The model for each dependent variable included a dichotomous variable for condition, the index for interest, and a multiplicative term (Condition × Interest). The models were estimated using ordinary least squares. The results of the analysis for participants' own views about global warming did not reveal a significant interaction at the .05 level between condition and interest ($b = -.18$, $SE = .15$). Thus, the results did not support H2a, which predicted that the effect of watching the *Last Week Tonight* climate change segment on participants' belief in global warming would be greater among those with low interest than among those with high interest. In this model, greater interest in the environment and global warming predicted greater belief in global warming ($p < .01$).

The analysis for participants' perceptions of scientists' views about global warming yielded a significant interaction between condition and interest ($b = -.32$, $SE = .16$, $p < .05$), such that the effect of the treatment was stronger among those with low levels of interest in the environment and global warming than among those with high levels of interest. Thus, the results supported H2b. Greater interest in the environment and global warming also predicted greater belief in global warming ($p < .01$).

To illustrate the results of these analyses, Figures 1 and 2 depict the predicted values for participants' own views about global warming and their perceptions of scientists' views, respectively, by condition and level of interest in the environment and global warming. Figure 1 shows that among participants with the lowest levels of interest, belief in global warming was greater for those exposed to the *Last Week Tonight* segment on climate change (4.87) than those in the control condition (4.04). This gap narrowed, though not significantly so, with greater interest: Among those with the highest levels of interest, belief in global warming differed little from the treatment condition (6.75) to the control condition (6.64). Figure 2, in turn, shows that among participants with the lowest levels of interest, perceptions that scientists believe in global warming were substantially greater for those exposed to the *Last Week Tonight* segment on climate change (5.87) than those in the control condition (4.48). In contrast, there was little difference between the treatment (6.43) and control (6.32) conditions among participants with the highest levels of interest. Put another way, watching *Last Week Tonight*'s coverage of climate change narrowed a "belief gap" between those with high levels of interest in the topic and those with low levels of interest.

[6]Similar results emerged when these interactions were tested through two-way analyses of variance in which a median split was performed on interest. Interest did not differ significantly across conditions, suggesting that the moderator itself was not influenced by the treatment.

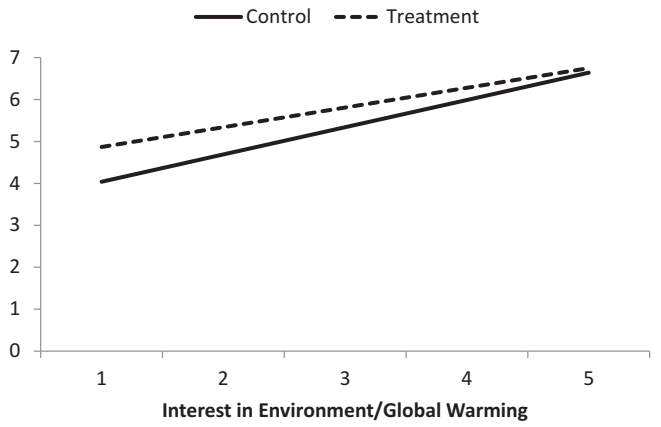

Figure 1. Mean participant belief in global warming, by condition and interest in environment/global warming.

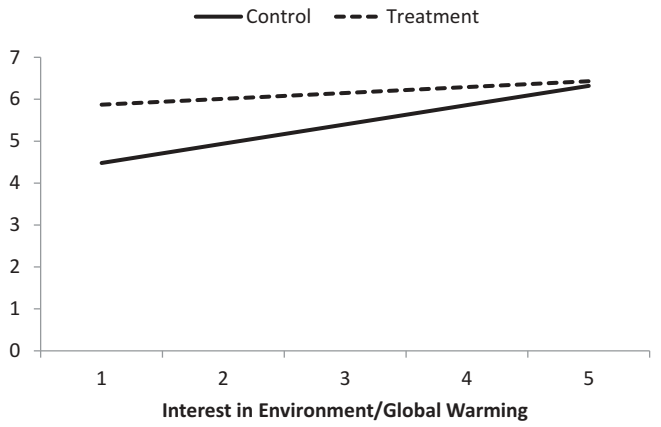

Figure 2. Mean participant perceptions of scientific consensus on global warming, by condition and interest in environment/global warming.

Tests using the Johnson–Neyman technique (conducted using MODPROBE; see Hayes & Matthes, 2009) captured the range of values of the key moderator, interest in the environment and global warming, for which the effects of the treatment were significant. Viewing *Last Week Tonight*'s coverage of climate change significantly influenced participants' own beliefs about global warming among those with interest levels of 4.00 (a "good deal" of interest) or lower on the 5-point index. Similarly, exposure to this treatment significantly influenced perceptions of scientists' views among those with interest levels of 4.16 or lower.

An additional pair of regression analyses tested whether the effects of the treatments depended on participants' party identification. These analyses revealed significant relationships between party identification, on one hand, and participants' own beliefs and their perceptions of scientists' views ($p < .01$ for each), on the other. However, they revealed no significant interactions with condition for either the former dependent variable ($b = .03$, $SE = .11$) or the latter ($b = .11$, $SE = .11$).[7] Thus, there was no evidence that partisanship moderated the effects of *Last Week Tonight*'s coverage on

[7]Similar results emerged when these interactions were tested through (a) two-way analyses of variance in which party identification was treated as a three-category variable, and (b) and OLS model where a 5-point measure of political ideology was substituted for party identification.

participants' own beliefs (RQ1a) or their perceptions of scientists' beliefs (RQ1b). The Johnson–Neyman technique indicated that the effect of the treatment on participants' beliefs in global warming was significant for those who scored 2.00 ("not very strong Republican") or greater on the party identification measure. The effect of the treatment on participants' perceptions of scientists' views was significant for those who scored 3.34 (where 3 = "leans Republican") or greater on the party identification measure.

Following van der Linden et al. (2015), the final analysis tested whether participants' perceptions of scientists' views mediated the effects of the experimental treatment on their own beliefs. The analysis (conducted used the modeling tool PROCESS; see Hayes, 2012) yielded a significant and positive indirect effect of experimental condition on participants' own beliefs through its impact on perceptions of scientists' beliefs (effect = .37, SE = .11, $p < .01$). In contrast, the direct effect of condition on participants' own beliefs was not statistically significant (effect = –.05, SE = .13). Thus, the results are consistent with H3's prediction: The effects of *Last Week Tonight*'s coverage on viewers' own beliefs would flow through its effects on viewers' recognition of the scientific consensus.

Note that the evidence for this hypothesis depends on causal inference from a correlational mediation analysis and, thus, should be interpreted with more caution than the evidence for the other hypotheses (which rely on purely experimental logic). For example, participants may have projected their own beliefs about global warming onto scientists, rather than the other way around. However, an alternative specification that treated perceptions of scientists' beliefs as the dependent variable and participants' own beliefs as the mediator yielded no significant indirect effect. Thus, the results fit better with the hypothesized causal path (from perceptions of scientific consensus to beliefs) than a reverse causal path.

Conclusion

The May 11, 2014, segment of *Last Week Tonight* uses a "statistically representative climate change debate" to reinforce the scientific consensus on anthropogenic climate change while satirizing "balanced" television news coverage of the topic. The experimental results presented here demonstrate that exposure to satirical television news coverage that includes consensus messaging can influence both viewers' own beliefs about global warming and their perceptions of scientists' views on the topic. Compared to control participants, those who watched the *Last Week Tonight* segment expressed greater belief in global warming—including human-caused warming—and more accurate perceptions of the scientific consensus surrounding the subject. Thus, the findings from this study extend previous research on both the effects of satirical climate change coverage (Brewer & McKnight, 2015; Feldman et al., 2011) and the effects of consensus messaging about climate change (Bolsen et al., 2014; Cook & Jacobs, 2014; Myers et al., 2015; van der Linden et al., 2014, 2015). The same findings may carry broader implications, given that perceptions about climate change can shape the extent to which members of the public are willing to engage in individual behaviors and support government actions to address the issue (Bord et al., 2000; van der Linden et al., 2015).

The results also suggest that the effect of watching the *Last Week Tonight* segment on perceptions of scientists' views was strongest among participants with relatively low levels of interest in the environment and global warming (the results for participants own views' followed a similar but nonsignificant pattern). This finding, which dovetails with and extends previous research on the gateway hypothesis (Baum, 2003; Feldman et al., 2011), suggests that satirical programs such as *Last Week Tonight* may be particularly effective in promoting recognition of the scientific consensus on anthropogenic climate change among less attentive citizens. Furthermore, it is plausible that some citizens with relatively little interest in the environment or global warming would encounter these programs' messages about climate change, given that many viewers of satirical television news programs consume them primarily to be entertained rather than informed (Young, 2013). In short, such programs offer one potential solution to the challenge of communicating the scientific

consensus on anthropogenic climate change to audience members with relatively little motivation to seek out information on the topic.

On the other hand, the results yielded no evidence that partisanship moderated the impact of the segment on viewers. This finding suggests that viewers did not engage in motivated reasoning in response to satirical consensus messaging, a result that is consistent with previous research on nonsatirical consensus messaging (Myers et al., 2015; van der Linden et al., 2014, 2015). The results here are also consistent with Brewer and McKnight's (2015) finding that partisanship did not moderate the impact of viewing *The Daily Show* or *The Colbert Report* on belief in global warming. Future research might explore in further depth the extent to which consensus messaging and satirical humor discourage motivated reasoning about climate change, either separately or in conjunction with one another.

In regard to how watching *Last Week Tonight* coverage influenced participants' own beliefs about global warming, the findings suggest that its impact on these beliefs flowed through the segment's effects on their perceptions of the scientific consensus. Put another way, Oliver may have led viewers to express greater belief in anthropogenic climate change by leading them to believe that an overwhelming majority of scientists agreed on the topic. This result, which extends van der Linden et al.'s (2015) gateway belief model to the context of satirical television news, reinforces the argument that consensus messaging can be an effective tool at fostering belief in global warming. Again, the results on this point should be interpreted with caution given that they depend on correlational mediation analysis. At the same time, the segment's heavy emphasis on reinforcing the scientific consensus makes it plausible that exposure to it shaped viewers' own beliefs by shaping acceptance of this consensus.

It is important to consider other potential limitations of the study, as well. To begin with, the size of the effects was relatively modest. In particular, the effect of watching the segment on viewers' own beliefs about climate change was closer to small than medium. In contrast, the effect on viewers' perceptions of scientists' views was closer to medium than small. In addition, the study tested for effects immediately following exposure to the treatment video. Thus, the results cannot speak to the duration of the effects observed or the impact of repeated exposure to satirical television news coverage of climate change.

Another limitation revolves around the sample of participants, who were recruited through convenience sampling and were not representative of the general public. In particular, they were disproportionately young, educated, and likely to identify as Democrats or independents. Given that each of these characteristics is associated with greater belief in climate change among the general public (Pew Research Center, 2015), one might expect the sample here to be disproportionately predisposed toward Oliver's messages regarding the topic. However, a nationally representative telephone survey conducted in November 2015 (N = 901) by one of the authors found that *Last Week Tonight* viewers (n = 216) also tended to be disproportionately young, educated, and likely to identify as Democrats or independents. Thus, the real-world audience for the program might also tend to be favorably predisposed toward messages affirming climate change. Even so, it would be useful to replicate the results here among a more representative sample of viewers to test their generalizability. This may be particularly important regarding tests for motivated reasoning, in light of arguments that convenience samples may not fully capture its extent among the broader public (Kahan, 2014).[8]

Yet another limitation is that the present study tested the impact of a single segment from a single program. Thus, the results may not necessarily generalize to other satirical programs. However, the parallel between one key finding from this study (viewing *Last Week Tonight* fostered greater belief in climate change) and the findings from Brewer and McKnight's (2015) earlier study (viewing *The*

[8]Field experiments could also be useful in testing the external validity of the results in regard to setting (laboratory vs. more naturalistic; see Kahan, 2014).

Daily Show and *The Colbert Report* promoted such belief) reinforces confidence in the generalizability of the other results. Furthermore, the present study's focus on *Last Week Tonight* is also an advantage, in that previous research regarding the impact of satirical television news has focused primarily on *The Daily Show* and *The Colbert Report*.

Last, the study's design does not allow for isolating what specific features of the *Last Week Tonight* segment produced the effects observed, nor does it allow for comparisons to other forms of consensus messaging (see, e.g., van der Linden et al., 2014). At the same time, the use of a real-world stimulus lends the findings greater external validity. Moreover, the results here provide a starting point for future research comparing how audience members respond to satirical and nonsatirical consensus messaging in media outlets ranging from cable news to public television (e.g., PBS programs such as *NewsHour* and *Frontline*) to documentaries (e.g., *An Inconvenient Truth*), as well as for comparing how those with low and high interest in the topic respond to such messaging.

If satirical television news programs such as *Last Week Tonight* can influence perceptions of climate change, as this study's findings suggest, then such programs offer a potentially promising alternative route to traditional news media for communicating about climate change to members of the public. Moreover, this route may reach some audience members who are merely seeking amusement instead of actively searching for information about the environment and global warming. In light of these implications, future research could build on this study by exploring the effects of other forms of and outlets for satirical humor (including non-U.S. outlets) on perceptions of climate change among different audiences (including non-U.S. audiences). Researchers could also examine the effects of *Last Week Tonight* and other satirical humor outlets within other environmental domains. Finally, future research could explore other effects of satirical humor on audience members' responses to climate and environmental issues, including effects not only on beliefs but also on behaviors and support for policy action.

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