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Shifting public engagement: How media coverage of climate change conferences affects climate change audience segments

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Abstract

While it is often assumed that media attention for events, such as international climate change conferences, can influence public opinion, research studying changes in public opinion concerning climate change is scarce. Research on climate change audience segments and the theory of motivated reasoning suggest that media effects depend on the level of audience engagement with climate change. We analyze how exposure to media coverage of the COP21 affected public opinion in the Netherlands. Based on a two-wave online panel survey ($N=876$), we identified five audience segments that varied in their degree of climate change beliefs, involvement, policy preferences, and behavioral intentions. Different media effects across segments were found indicating (dis)confirmation bias, specifically, for medium levels of positive and negative engagement. The findings indicate that important events may cause limited changes in public opinion and emphasize the importance of studying segment-specific and content-specific media effects.

Keywords

climate change audience segments, COP21, media exposure, public engagement

1. Introduction

Media coverage about climate change and, particularly, coverage of international climate change conferences has received plenty of scholarly attention (Christensen and Wormbs, 2017; Gurwitt et al., 2017). An underlying assumption of these studies is that higher levels of media attention during such events can influence public opinion concerning the perceived relevance and threat of climate change or the necessity to engage in mitigation or adaptation efforts. An increasing body of research taps into public responses to climate change coverage (e.g. Nisbet et al., 2013; Stamm

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et al., 2000). Greater levels of exposure have been found, for instance, to be associated with increased policy support or belief in governmental responsibility to mitigate climate change (Feldman et al., 2014). However, only limited attention has been paid to study how specific events, such as climate change conferences, influence public opinion or engagement (Flora et al., 2014; Krosnick et al., 2000).

Media effects in contested media environments have been considered highly dependent on individual predispositions or motivations (Nisbet et al., 2013). Hence, no general media effects can be expected, particularly, for a complex issue that is represented by conflicting information and contested viewpoints, such as climate change (Stamm et al., 2000). Specifically, the contrast between those who are highly concerned or engaged in the issue and those who are less engaged or even skeptical toward it presents an important dilemma for climate change communication. Audience segmentation studies have revealed a nuanced picture of shared views and understandings related to climate change in subgroups of national populations (Maibach et al., 2009; Metag et al., 2017). The analysis of climate change segments in the United States over several years indicates that these segments are to some extent volatile (Roser-Renouf et al., 2016). Thus far, however, evidence is missing to what extent underlying changes in public opinion could be triggered by specific events.

This study investigates changes in public views and engagement over the course of the United Nations Climate Change Conference, COP21, held in Paris in 2015. The resulting Paris Agreement has—at the time—been widely applauded as important milestone toward more effective international action tackling climate change adaptation and mitigation. We, therefore, assumed that this positive context might have triggered changes in public opinion and engagement. We, first, identify and describe climate change audience segments in the Netherlands. Second, we analyze shifts in segment membership after the conference and relate these changes to sociodemographic characteristics, political attitudes, and exposure to COP21 media coverage.

2. Conceptual framework

Climate change audience segments

A broad range of beliefs and attitudes affect how people perceive and respond to messages concerning climate change. Often, however, the public is presented as polarized concerning the issue, for instance, consistent with the political divide between Republicans and Democrats in the United States (Krosnick et al., 2000; McCright and Dunlap, 2011). Ideological differences seem to coincide with differences in beliefs about climate change or perceived threat (McCright and Dunlap, 2011). Such cognitions as well as more general value orientations have been found to determine skepticism but also engagement with climate change (Corner et al., 2014; Poortinga et al., 2011). Moreover, previous studies have concluded that media effects related to climate change strongly depend on individual beliefs and attitudes concerning the issue (Wiest et al., 2015). The belief that climate change is happening, for instance, can reinforce positive media effects on policy support (Feldman et al., 2014). Climate change skepticism, in contrast, has been identified as a strong barrier for support of mitigation policies or for carbon-reducing activities (Engels et al., 2013).

Audience segmentation studies combine different beliefs and attitudes toward climate change and, thereby, offer a more nuanced and comprehensive picture of shared views and understandings related to climate change in subgroups of national populations (Maibach et al., 2009; Metag et al., 2017). This stream of research has been initiated by the Global Warming's Six Americas studies conducted by the *Yale Program on Climate Change Communication* and the *George Mason University Center for Climate Change Communication* (Maibach et al., 2009). The authors have introduced four categories of factors as relevant for classifying the US population with respect to

their beliefs, attitudes, and behaviors related to climate change: (1) global warming beliefs, (2) issue involvement, (3) policy preferences, and (4) behaviors. The resulting six segments have been found to vary along these dimensions:

The Alarmed (18%) are fully convinced of the reality and seriousness of climate change and are already taking individual, consumer, and political action to address it. The Concerned (33%)—the largest of the six Americas—are also convinced that global warming is happening and a serious problem, but have not yet engaged the issue personally. Three other Americas—the Cautious (19%), the Disengaged (12%) and the Doubtful (11%)—represent different stages of understanding and acceptance of the problem, and none are actively involved. The final America—the Dismissive (7%)—are very sure it is not happening and are actively involved as opponents of a national effort to reduce greenhouse gas emissions. (Maibach et al., 2009: 1)

The initial survey from 2008 has been repeated multiple times in the United States revealing a considerable stability of the six segments but also fluctuations over time (Roser-Renouf et al., 2016). In addition, the measurement instrument or adapted versions have been applied in countries, such as India (Leiserowitz et al., 2013), Australia (Hine et al., 2013; Morrison et al., 2013), Singapore (Detenber et al., 2016), and Germany (Metag et al., 2017) revealing that publics in different countries vary in their degree of engagement with global climate change, their perceptions of the severity of the issue, and the necessity and effectiveness of taking action. In India, for instance, engagement levels, specifically, in terms of behavioral changes seem to be lower compared to the United States. However, a segment of Experienced has been identified due to higher levels of personal experiences with direct consequences of climate change (Leiserowitz et al., 2013). The German study, in contrast, identified a relatively large segment of Alarmed (24%) in addition to Concerned Activists (18%) indicating higher levels of political engagement but also private behavioral consequences (Metag et al., 2017). In both countries, Germany and India, less concerned or disengaged segments were identified, while the group of Dismissive which rejects the existence of anthropogenic climate change was absent. The six climate change segments found in Australia seem to resemble the US ones most strongly—albeit with several subtle differences and a greater share of the less engaged segments (Morrison et al., 2013). In sum, while the number of countries in which comparable segmentation studies have been conducted is relatively limited, these studies have revealed parallels but also cultural differences.

Context dependence and media effects

While particularly the longitudinal design of the Yale Project has revealed the stability of the six US segments but also a certain level of volatility (Roser-Renouf et al., 2016), insights from other countries and, moreover, on underlying mechanisms explaining changes in climate change segments are scarce. Considering possible changes in audience segments in the context of important events, such as international climate change conferences, brings the media coverage about such events into play. More generally, climate change as a global, complex, and abstract phenomenon is presumed to elicit relative high levels of media dependency rendering the media as an important source of information and opinion formation (Stamm et al., 2000). While overall, we may expect minimal media effects which are oftentimes explained by selective exposure and reinforcement of pre-existing attitudes (Stroud, 2010; Westerwick et al., 2013), it can be argued that climate change audience segments are not equally susceptible to such processes and may thus differ in how they consume information about climate change conferences—or other events related to climate change—and in the extent to which they possibly change their attitudes or beliefs in such a context.

Audience segments and motivated reasoning

The theory of motivated reasoning (Kunda, 1990) describes mechanisms underlying selective exposure or selective processing of information. Information selection and processing are assumed to be guided by individual predispositions, such as pre-existing attitudes or beliefs, and the prevalence of either defensive motivations or accuracy motivations (Chaiken et al., 1989). While defensive motivations (sometimes labeled directional motivations) trigger a reinforcement of predispositions via selective exposure or (dis)confirmation bias, accuracy motivations can counter such selective or heuristic mechanisms and lead to more elaborated forms of reasoning with the goal of forming accurate opinions or beliefs about an issue.

The type and strength of motivations has been found to vary due to individual differences and contextual factors (e.g. Flynn et al., 2017). Strong attitudes but also high levels of knowledge and involvement can trigger defensive motivations to reinforce these predispositions (Strickland et al., 2011; Westerwick et al., 2013). Also negative forms of issue engagement can trigger defensive motivations leading to a disconfirmation bias (Kunda, 1990; Strickland et al., 2011). In addition, affect-laden contexts may increase defensive motivations (Erisen et al., 2014; Flynn et al., 2017; Lodge and Taber, 2000). A specific context, such as a climate change conference, may be more affect-laden for people who are either strongly convinced that climate change is a severe problem that needs to be solved (Leiserowitz, 2005) or highly skeptical about the nature and severity of the problem and strongly object to any related action (Poortinga et al., 2011). Consequently, the most extreme audience segments, that is, the Alarmed and Dismissive, may show greater levels of defensive motivations compared to less engaged segments.

While less engaged segments might thus be less driven by defensive motivations, this does not necessarily lead to high-accuracy motivations. Specifically, for complex issues, such as climate change, low-accuracy motivation can help to balance resources and commitment (Chaiken et al., 1989). Moreover, possible solutions to mitigate or adapt to climate change are seldom uncontested and oftentimes discussed in an ambiguous manner, again facilitating pathways of biased reasoning (Lodge and Taber, 2000). Particularly, for low issue involvement, heuristic processing can be considered the default (Petty and Cacioppo, 1990). Finally, situations of increased perceived accountability were found to lead to more accurate judgments (Tetlock, 1985). Hence, perceiving a low accountability for mitigating the consequences of climate change may lower accuracy motivations.

Event-related opinion change

So far, only one study has assessed event-related effects on climate change audience segments (Flora et al., 2014). The authors applied audience segmentation measures to study attitude change in students after participating in an entertainment-education high-school program. The two-wave panel study revealed that the engaging educative format led to positive changes in students' knowledge, beliefs, involvement, and behavior with respect to climate change. Remarkably strong effects, specifically, among initially low-engaged students might be explained by the fact that the school setting could circumvent effects of selective exposure. Part of the less engaged students, however, did not change their beliefs, attitudes, or intentions or did so in a negative direction (Flora et al., 2014) indicating a mix of indifference and reinforcement of pre-existing negative attitudes toward the issue. In their study on the effects of the public debate about the United States joining the Kyoto protocol on public opinion in 1997, Krosnick et al. (2000) have focused on the climate change issue public. Issue public is thereby used as a label for the segment of the general public that is highly engaged with an issue. Comparing two independent samples before and after the

debate revealed a small increase in the issue public. Moreover, taking partisanship into account revealed increasing polarization between Democrats and Republicans after the debate. These findings thus indicate that prior attitudes were mainly reinforced during the debate about the Kyoto protocol (Krosnick et al., 2000).

The reinforcement of political polarization in terms of climate change attitudes and beliefs, specifically in the US context, can partly be explained by selective exposure to either democratic or conservative media outlets that reinforces pre-existing certainty of climate change beliefs (Feldman et al., 2014). Comparing information seeking behavior across climate change audience segments has revealed that more engaged segments were more actively looking for information about climate change (Metag et al., 2017; Roser-Renouf et al., 2015). Consequently, patterns of reinforcement can be expected to prevail, specifically, for members of highly engaged segments due to higher levels of media exposure in addition to defensive motivations. Less engaged segments, in contrast, may have lower defensive motivations potentially eliciting changes toward higher engagement. But the less engaged may also be less inclined to pay attention to media coverage about the issue rendering potentially effective situations of high exposure to climate change information less likely.

Study context and research questions

The UN Climate Change Conference held in Paris, France, in 2015 (COP21) from 30 November to 12 December 2015 served as a context for this study—ensuring a sufficient amount of media attention for the issue of climate change (Schäfer et al., 2013). With a relatively high level of climate skepticism (TNS Opinion & Social, 2015), the Netherlands form a relevant case for the study of climate change-related mobilization effects. Since so far, climate change audience segments have not yet been identified in the Netherlands, this study has an explorative nature, first, aiming at identifying and describing audience segments and, second, analyzing changes of these segments in the context of the COP21:

RQ1: Which climate change audience segments can be observed in the Netherlands and how do their members differ in terms of individual characteristics and media exposure?

RQ2: To what extent can changes in segment membership be observed in the context of the COP21?

RQ3: To what extent are segment changes related to individual characteristics?

RQ4: To what extent do media effects differ between audience segments?

3. Method

A two-wave online panel survey and a content analysis of national media coverage on climate change were conducted in the Netherlands. The respondents were part of a Dutch online panel of the market research company Survey Sampling International. The first survey wave was conducted 2 weeks prior to the Paris conference, and the second wave followed in the week succeeding the conference; 72.3% of all respondents of wave 1 ($N=1,539$) participated in wave 2; 61.1% of these fully completed the survey. Response times of less than 5 min were deemed unrealistic, and such cases omitted yielding a final sample of $N=876$ for both waves. While no substantial differences in terms of sample demographics were detected between the initial sample and completed wave 2, the omitted speeders consisted of slightly more men and had a lower average age. The final sample

Table 1. Concepts included in the cluster analysis.

Global warming beliefs	Issue involvement	Policy preferences	Behavioral intentions
Climate change belief	Issue importance	Mitigation responsibility	Private behaviors
Climate change skepticism	Attitude strength	Mitigation support	Activism
Perceived threat	Environmental concern	Confidence in science and technology	Opinion leadership
Internal political efficacy	Issue-specific knowledge		
PCE			
Government efficacy			

PCE: perceived consumer effectiveness.

roughly reflected the Dutch adult population in terms of age (18–74 years, $M=46.40$ years; $SD=13.04$ years), gender (53.0% female), and education (7 levels, $M=4.36$; $SD=1.48$). Proportional demographic weighting was applied based on the Dutch population values for age, gender, and education.

We combined the survey data with content analytic data of the media coverage about the COP21. An initial selection of media outlets was made based on market shares and later adapted based on the news media use reported by the survey respondents (see in the following). The final selection included nine offline newspapers (retrieved via *LexisNexis*), three major national television news programs (one public and two private broadcasters) and 13 online news websites consisting of the online offers of the offline newspapers and TV news programs in addition to the most popular news website *Nu.nl*. With this selection, the media sample included the most prominent news sources used by Dutch citizens, quality and popular sources, and reflected the ideological spectrum of Dutch news media with more left, liberal, conservative, and more balanced outlets.

All articles containing at least two references to the term “climate” published between 16 November 2015 and 13 December 2015 were coded by three coders ($N=572$; online: 36.2%, offline newspaper: 58.0%, TV news: 5.8%). A pretest ($n=45$) yielded sufficient levels of inter-coder reliability for all variables used for the present study (standardized Lotus coefficients for recognition of the news outlet: 1.00 (online), .96 (offline), and relevance of COP21 coded as main versus secondary topic: .82).

Measures

While typically climate change–related segmentation studies and, specifically, the global warming’s six Americas have relied on single-item measures (Maibach et al., 2011), we measured a range of concepts based on previously established multi-item scales. The selection of concepts was, however, based on the 36 items used for the US segmentation studies (see also Metag et al., 2017) and reflected the four categories global warming beliefs, issue involvement, policy preferences, and behaviors (Maibach et al., 2011; see Table 1). This approach allowed us to use measures that have partly been tested and used in a European context. Although it has been shown that a valid segmentation can be obtained based on short scales of 15 or even four items (Chryst et al., 2018), we opted for a more inclusive approach for two reasons. First, since no comparable segmentation study has been conducted with Dutch audiences, we could not determine up front which discriminating concepts would yield an optimal segmentation solution. Second, using a wider range of concepts would allow us to give a more comprehensive description of the obtained segments. This is why, for instance, environmental concern and issue-specific knowledge were added

as involvement factors based on other climate change audience segmentation studies (Hine et al., 2013; Metag et al., 2017). A full list of items, reliability coefficients, and descriptives per scale can be found in the online Supplemental Material.

Based on the manual content analysis of the national media coverage on the climate change conference, the amount of media attention for the COP21 was determined on the outlet level. To account for the difference between articles with a main focus on COP21 versus those that mentioned the conference in another context, we determined the relative amount of COP21 coverage per outlet by weighting the total number of news items mentioning the conference by the percentage of items with the conference as main topic (64.7%). These data were combined with detailed survey measures of media exposure in wave 2 to obtain a proxy for individual media exposure to the COP21 coverage. Respondents were asked to report how many days per week they were using each of the 25 news outlets (all outlets combined: $M=0.85$, $SD=0.88$). Following the approach of linkage studies (De Vreese et al., 2017), individual exposure was calculated by summing all outlet exposure scores weighted by their scores of the relative amount of COP21 coverage.

Identification of audience segments

The audience segments were determined via multiple steps ensuring the robustness of the final solution. Single-linkage clustering based on the segmentation factors measured for wave 1 revealed four outliers. All remaining cases were included in a hierarchical cluster analysis using Ward's method (see Metag et al., 2017). Five segments were identified based on the dendrogram and interpretability in comparison to neighboring solutions. To further enhance the robustness of the cluster solution and the comparability of segment membership across the two waves, we compared two approaches. First, the cluster means of the segmentation variables were used as seeds for k-means clustering to derive audience segments for both survey waves (Milligan and Sokol, 1980). Second, segment membership was determined based on discriminant analysis for both waves (see Maibach et al., 2011). In comparison to the k-means solution, an acceptable rate of 94.3% of all cases was classified correctly by the discriminant analysis. Comparing the changes in segment membership between wave 1 and wave 2 for both approaches revealed slightly fewer segment changes based on the discriminant analysis ($M=-0.03$, $SD=0.95$) compared to the k-means solution ($M=0.19$, $SD=0.99$). Therefore, we selected the more conservative approach based on the discriminant analysis to further analyze, first, the segment characteristics and, second, changes of segment membership over time.

4. Results

Climate change segments

The five resulting audience segments varied in their degree of climate change beliefs, involvement, policy preferences, and relevant behavioral intentions (Table 2, Figure A1 in Supplemental Material). The following overview presents a brief description of each cluster.

Alarmed. Of the respondents, 16.2% were most convinced of the existence and severity of global climate change and consequently the least skeptic. In addition, this group scored highest on perceived threat and all involvement factors, that is, issue importance, attitude strength, environmental concern, and knowledge. They were more confident in the effectiveness of individual compared to political solutions. Nonetheless, perceptions of mitigation responsibility and support for mitigation policies were higher compared to other segments. In terms of behavioral intentions, the Alarmed were more inclined to take private actions and opinion leadership compared to others but also scored relatively high on activist behaviors.

Concerned. Of the respondents, 11.1% constituted the smallest segment. The Concerned scored similar or slightly lower than the Alarmed on climate change belief, perceived threat, and the involvement factors issue importance, attitude strength, and environmental concern. At the same time, the Concerned were most skeptical concerning the actual impact of climate change and, thus, the most ambivalent in terms of climate change attitudes. Interestingly, issue-specific knowledge of this group was relatively low. While they considered their own actions (perceived consumer effectiveness (PCE)) less effective compared to the Alarmed, the government was perceived as most effective. Correspondingly, perceptions of mitigation responsibility and support were relatively high—albeit on lower levels compared to the Alarmed. Their behavioral intentions spanned all three dimensions: private behaviors, activism, and opinion leadership.

Cautious. The third and largest segment comprised 30.3% of the respondents. There was a considerable decrease in climate change belief, perceived threat, and the involvement factors issue importance, attitude strength, and environmental concern compared to the two more engaged segments. The Cautious scored relatively high on perceived mitigation responsibility. However, in line with individual efficacy beliefs (PCE) outweighing government efficacy, their intended behavioral response clearly focused on private actions, however, on a substantially lower level compared to the Concerned and Alarmed.

Disengaged. For 26.1% of the sample, skepticism regarding the existence and relevance of climate change was almost on the same level as climate change belief and issue importance. In spite of this ambivalence, there were reasonable levels of perceived effectiveness, perceived mitigation responsibility, and support for corresponding policies. Knowledge, however, was as low as in the Concerned segment. The Disengaged were inclined to take private actions and even scored considerably higher on activism and opinion leadership intentions compared to the Cautious segment.

Doubtful. Finally, 16.3% of the respondents were similarly skeptical as the Disengaged but at the same time also the least convinced and the least involved with the issue of climate change. The Doubtful were not convinced that they could make a difference individually but also not that the government could change much. Still, they were not opposed political action and showed the strongest confidence in science and technology. Their behavioral intentions were considerably lower compared to all other segments.

A range of sociodemographic differences could be observed across segments (Table 3). The Concerned and Disengaged were on average slightly younger, while the two most extreme segments, the Alarmed and Doubtful, had on average slightly older members. The Disengaged and Doubtful were the segments with the lowest levels of average education followed by the Concerned. The level of political interest gradually decreased with the level of climate change engagement. While the Alarmed positioned themselves more on the left of the political spectrum, the Doubtful showed the strongest tendencies toward the right. The other three segments were closer to the most right than to the most left position. Considerable differences could be observed for the level of exposure to media coverage about the COP21. Specifically, the Concerned were significantly more exposed to Conference of Parties (COP) coverage than all other segments.

Changes in segment membership

To get a first impression about the extent of changes in segment membership between the two waves, we subtracted the number of each respondents' segment in wave 2 from his or her segment in wave 1. Comparing segment membership before and after the conference revealed that 16.3% of

Table 2. Segmentation characteristics per audience segment in wave 1 (means and standard deviations).

Segmentation characteristic	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Total
Climate change belief	6.31 (0.91)	5.83 (0.83)	5.66 (0.90)	4.16 (0.96)	3.67 (1.27)	5.07 (1.38)
Climate change skepticism	1.56 (0.73)	4.05 (1.29)	2.13 (0.83)	3.81 (0.80)	3.82 (1.05)	2.97 (1.34)
Perceived threat	5.96 (0.80)	5.32 (0.79)	5.26 (0.90)	4.40 (0.76)	3.97 (1.25)	4.94 (1.13)
Internal political efficacy	4.64 (1.06)	4.78 (0.94)	3.63 (1.03)	3.87 (0.76)	2.96 (1.15)	3.88 (1.15)
Perceived consumer effectiveness	5.09 (1.46)	3.35 (1.19)	4.53 (1.33)	4.12 (0.95)	3.89 (1.17)	4.28 (1.32)
Government efficacy	3.78 (1.82)	5.00 (0.98)	3.55 (1.39)	3.85 (1.01)	3.52 (1.34)	3.82 (1.40)
Issue importance	5.72 (0.74)	5.23 (0.69)	4.46 (0.83)	4.06 (0.88)	2.89 (0.90)	4.39 (1.20)
Attitude strength	5.35 (0.86)	5.36 (0.73)	4.33 (0.89)	4.11 (0.58)	3.11 (0.95)	4.36 (1.09)
Environmental concern	5.83 (0.77)	5.16 (0.82)	4.38 (0.87)	4.12 (0.87)	2.89 (0.88)	4.39 (1.23)
Issue-specific knowledge	3.48 (1.15)	2.05 (1.38)	2.68 (1.45)	2.04 (1.52)	2.13 (1.54)	2.48 (1.52)
Perceived mitigation responsibility	6.52 (0.72)	5.62 (0.72)	5.91 (0.93)	4.56 (0.94)	5.02 (1.00)	5.48 (1.13)
Mitigation support	6.32 (0.76)	5.36 (0.75)	5.46 (0.87)	4.38 (0.93)	4.19 (1.04)	5.10 (1.16)
Confidence in science and technology	4.32 (1.15)	4.03 (0.66)	4.36 (0.94)	4.14 (0.68)	4.47 (0.95)	4.28 (0.90)
Behavioral intentions: private	5.62 (0.79)	5.38 (0.79)	4.45 (0.90)	4.26 (0.65)	2.74 (1.06)	4.42 (1.23)
Behavioral intentions: activism	3.84 (1.47)	4.63 (1.11)	2.01 (0.86)	3.32 (0.96)	1.41 (0.55)	2.84 (1.46)
Behavioral intentions: opinion leadership	5.45 (1.12)	5.38 (0.91)	3.10 (1.15)	4.05 (0.68)	1.74 (0.86)	3.76 (1.59)
Percentage	16.17	11.12	30.28	26.15	16.28	100.00
N	141	97	264	228	142	872

Table 3. Sociodemographics and political attitudes per climate change segment.

	Alarmed	Concerned	Cautious	Disengaged	Doubtful	Total
Age	46.58 ^{ab} (12.64)	39.66 ^{ac} (13.34)	43.55 ^d (12.69)	39.89 ^{bde} (12.84)	45.88 ^{ce} (12.70)	43.03 (13.05)
Female	0.50 (0.50)	0.43 (0.50)	0.58 (0.50)	0.52 (0.50)	0.55 (0.50)	0.53 (0.50)
Education	4.85 ^{ab} (1.49)	4.49 (1.55)	4.89 ^{cd} (1.42)	4.12 ^{ac} (1.40)	4.22 ^{bd} (1.45)	4.53 (1.48)
Political interest	4.85 ^{abcd} (1.35)	4.52 ^{ef} (1.50)	3.78 ^{ab} (1.48)	3.79 ^{ce} (1.55)	3.29 ^{df} (1.82)	3.96 (1.62)
Political orientation (left-right)	4.02 ^{abcd} (2.49)	5.44 ^a (2.66)	5.10 ^b (2.45)	5.44 ^c (2.16)	5.67 ^d (2.34)	5.15 (2.44)
COP exposure	7.53 ^a (8.31)	11.44 ^{abcd} (13.88)	5.52 ^b (4.13)	6.35 ^c (7.55)	5.21 ^d (4.25)	6.67 (7.67)

COP: Conference of Parties. N = 872. Values are represented as means (and standard deviations). Superscripts denote significant post hoc comparisons ($p < .05$, Scheffé).

the respondents changed to a more engaged segment, while 19.4% changed to a segment with lower levels of engagement.¹ The majority of changes concerned one level either to a more engaged (8.8%) or less engaged segment (11.5%). Slightly fewer respondents moved two levels (positive: 7.8%, negative: 7.5%) while less than 1% of changes of three levels could be observed. To analyze to what extent these changes were associated with individual characteristics and media exposure, individual change scores ranging from -1 to 1 were calculated ($M = -0.03$, $SD = 0.60$). Inspection of mean plots revealed non-linear relationships between change scores and the predictor variables gender, education, political orientation, and media exposure, thus indicating differential relationships for positive and negative changes. Therefore, separate logistic regression models for positive and negative change were estimated. Positive change was analyzed excluding the most engaged segment, the Alarmed. Negative change was analyzed excluding the least engaged segment, the Doubtful. All predictors except for gender and dummy-coded segment membership were mean centered (see Tables A2 and A3 in Supplemental Material).

Explaining changes to more engaged segments

Respondents who were classified as more engaged in wave 2 compared to wave 1 were on average older ($\text{Exp}(B) = 1.016$, 95% CI = (1.001, 1.032)) and more likely to position themselves on the left side of the political spectrum ($\text{Exp}(B) = 0.903$, 95% CI = (0.832, 0.980)). Compared to the Doubtful, positive change was significantly less likely among the other three included segments (Table A2 in Supplemental Material, model 1.1). No main effect for media exposure was found. However, looking at segment-specific media effects by including interaction terms (Table A2 in Supplemental Material, model 1.2) revealed a negative exposure effect for the Doubtful ($\text{Exp}(B) = 0.888$, 95% CI = (0.800, 0.986)). In addition, a significant interaction ($\text{Exp}(B) = 1.173$, 95% CI = (1.034, 1.330)) for the Cautious indicated a more positive effect for this group compared to the reference group of the Doubtful. Further illustrating these interactions, Figure 1 depicts the predicted probabilities of changing to a more engaged segment for different levels of media exposure for the four included audience segments. Based on the regions of non-overlapping confidence intervals (Figure A2 in Supplemental Material), significant differences were found between the Doubtful and the two segments Concerned and Cautious for below average levels of media exposure. Hence, while overall positive changes were most likely for the Doubtful, this difference declined with increasing levels of media exposure. This declining difference may indicate that for the Doubtful, higher levels of exposure to climate change coverage could trigger stronger defensive motivations contributing to a disconfirmation bias. Incidental exposure, in contrast, seemed to be associated more often with shifts toward greater engagement.

Explaining changes to less engaged segments

In contrast to positive changes, younger respondents were more likely to change to less engaged segments ($\text{Exp}(B) = 0.982$, 95% CI = (0.967, 0.997)). Negative changes were more likely for men ($\text{Exp}(B) = 0.588$, 95% CI = (0.401, 0.863)) and less educated respondents ($\text{Exp}(B) = 0.798$, 95% CI = (0.699, 0.912)), whereas political attitudes did not contribute to less engagement. Specifically, the Disengaged were less likely to change to a lower segment compared to the Alarmed and Concerned (Table A3 in Supplemental Material, models 3.1 and 4.1). Again, we did not find a main effect for media exposure but a conditional negative effect for the Concerned ($\text{Exp}(B) = 0.937$, 95% CI = (0.888, 0.989); model 4.2). Moreover, significant interactions indicated more positive exposure effects for the Alarmed ($\text{Exp}(B) = 1.110$, 95% CI = (1.034, 1.192)) and for the Cautious ($\text{Exp}(B) = 1.103$, 95% CI = (1.012, 1.202)) compared to the Concerned.

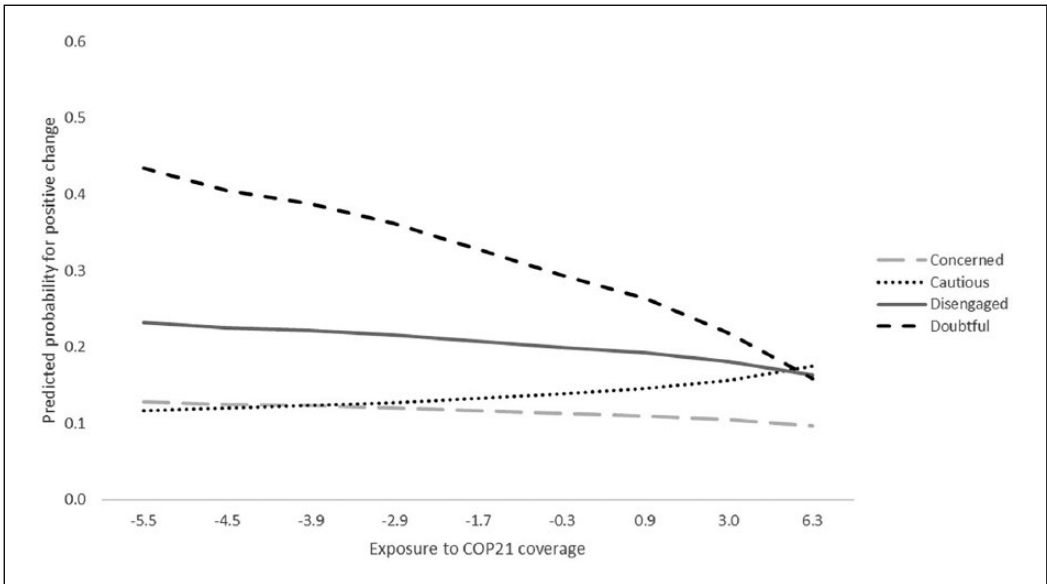


Figure 1. Predicted probabilities of changes to more engaged segments for different levels of exposure to COP21 coverage per audience segment (based on model 1.2 in Table A2 in Supplemental Material, $n = 731$, excluding the alarmed segment).

Figure 2 depicts the predicted probabilities of changing to a less engaged segment for different exposure levels for the four included audience segments. Negative changes were less likely for the Disengaged compared to all three other segments over all levels of media exposure (Figure A3 in Supplemental Material). In addition, a minor difference for very low exposure levels could be observed between the Concerned and the Cautious. The Concerned were most likely to change to less engaged segments at the lowest exposure levels ($M = 0.51$, 95% CI = (0.35, 0.66)) but decreasingly so when they were more exposed to the COP21 coverage ($M = 0.32$, 95% CI = (0.21, 0.44)).

5. Discussion and conclusion

This study aimed to analyze changes in climate change audience segments in the context of the COP21 held in Paris in 2015 and the role of media coverage for changes in public engagement. Based on the theory of motivated reasoning, we have argued that the extent of such media effects may differ for more or less engaged audience segments. In line with previous research, we did not find any general effects of media exposure to the COP21 coverage (e.g. Nisbet et al., 2013). Our findings indicate, first, that media effects are segment-specific and, second, that exposure to event-specific media coverage mainly evokes defensive motivations. These can trigger a confirmation bias for those with higher—albeit not extreme—engagement levels (the Concerned), while higher exposure levels seem to contribute to a disconfirmation bias for the least engaged segment (the Doubtful). These tendencies confirm the view that media coverage mainly reinforces pre-existing attitudes (e.g. Stroud, 2010). But more importantly, the finding that, specifically, segments with a medium level of positive or negative engagement were prone to reinforcement effects indicates that assumptions about linear relationships

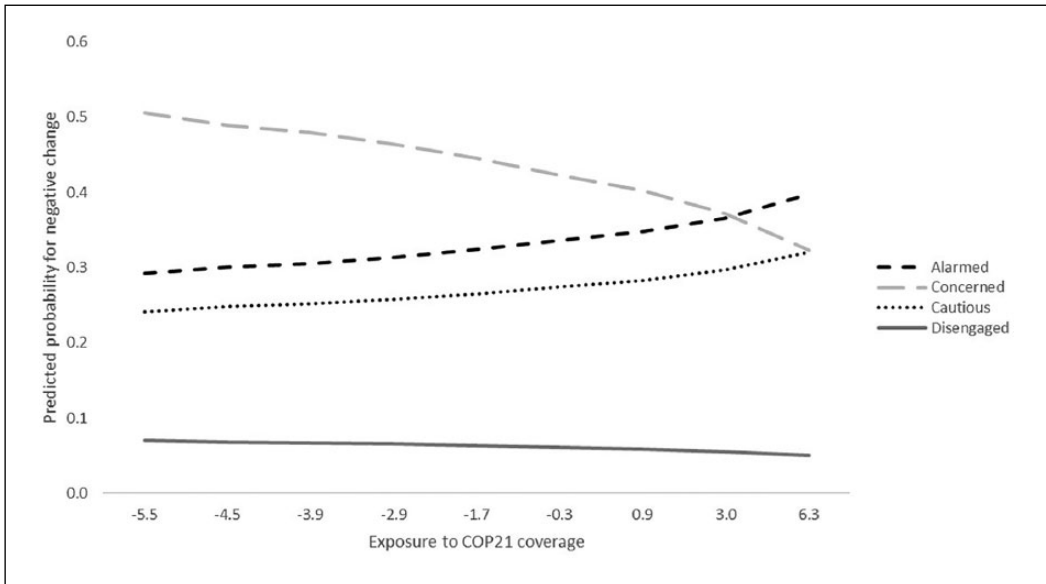


Figure 2. Predicted probabilities of changes to less engaged segments for different levels of exposure to COP21 coverage per audience segment (based on model 4.2 in Table A3 in Supplemental Material, $n = 730$, excluding the doubtful segment).

between engagement factors and media effects may not hold. Considering alternatives, such as the bimodal relationship that is reflected by our findings, might help to better understand how media coverage or other messages can affect public opinion and engagement concerning climate change.

To what extent might these findings be specific to the Dutch context? The five identified Dutch climate change segments showed high similarities to the segments identified in Germany (Metag et al., 2017).² Specifically, the absence of a clear opposition of climate change deniers as identified in the United States (Leiserowitz et al., 2015) and Australia (Hine et al., 2013) might be typical for Western European countries. As the most striking difference to other countries, we found that the middle segments were particularly strong in the Netherlands while relatively fewer citizens were assigned to the two most engaged segments on either end of the spectrum. Since, particularly, the two groups with medium positive and medium negative engagement levels and the most pronounced reinforcement effects—the Concerned and the Doubtful—were considerably smaller compared to similar segments in other countries, generalizability might be limited and points to the need for more internationally comparative approaches.

Our data revealed that Dutch citizens ascribed higher levels of individual responsibility for tackling climate change (also see TNS Opinion & Social, 2015). This is as well reflected by the strong focus on individual as opposed to political action and higher levels of consumer as opposed to government efficacy in the present study, specifically, among the Alarmed. The Dutch Concerned, in contrast, were highly comparable to the “Concerned Activists” identified in Germany but with even higher levels of political activism, while the Concerned in the United States were characterized by relatively low levels of political activism. This could explain, for instance, why the Dutch Concerned were more interested in and also more affected by the political event studied here compared, for instance, to the Alarmed.

However, also similarities to other countries should be emphasized. Across countries, specifically, the Disengaged segments have been characterized by the lowest level of education indicating the importance of formal education and knowledge for climate change engagement (Detenber et al., 2016; Metag et al., 2017). Moreover, in line with previous findings from Germany and the United States (Metag et al., 2017; Roser-Renouf et al., 2015), we find that lower levels of engagement are associated with lower levels of media exposure rendering it plausible that even effects of incidental news exposure would be the least likely among these segments across countries. An exception to this might be Singapore where the least engaged paid most attention to climate change in the news media (Detenber et al., 2016).

Our results confirm, first, that public opinion change concerning climate change, possible actions, and responsibilities is a challenge and, second, precisely targeted messages are necessary to reach different audience segments (Roser-Renouf et al., 2015). As opposed to more specifically targeted communication programs (Flora et al., 2014), this study focused on possible effects of national public debates about climate change on public opinion. While such discourses are vital for democratic decision making and might facilitate public support for mitigation or adaptation strategies, our findings indicate that audience segments vary in how selectively they select and process information from such a debate. While consequences of climate change or responsibilities to engage in mitigation are not confined to certain segments of national populations, with the most engaged segments most strongly exposed to the corresponding media coverage, an inclusive public debate seems not yet in reach.

While the success of the Paris Agreement has created a scenario of hope (Christensen and Wormbs, 2017), our study indicates that effects on the general public were limited. With an increasing number and diversity of societal participants, climate change conferences have developed beyond a place for political negotiations. Investing in accompanying communication programs, particularly, targeted at lower engagement segments could foster a broader societal impact. This may raise awareness and interest in the issue among the Cautious, Disengaged, and Doubtful who showed the lowest level of attention to the COP21 coverage. Greater exposure to the mainstream debate seems to be the least mobilizing for the Doubtful. Since this segment is most conservative and also least politically interested, alternative moral arguments could be offered to counter the stronger defensive motivations this group seems to develop with greater exposure to the debate (Brown et al., 2019).

But also tendencies of the Cautious or Alarmed to lower their engagement with increasing media exposure could be attenuated by more specific information about possible solutions reinforcing their individual and governmental efficacy beliefs. Moreover, further encouraging their opinion leadership could contribute to greater efficacy beliefs (Roser-Renouf et al., 2015). Our findings indicate that, specifically, the least engaged segments are the hardest to reach by media coverage about climate change. For a greater inclusion of these segments, it has been suggested to rely less on factual information but more on engaging messages, such as narratives, facilitating effortless, heuristic forms of processing (Roser-Renouf et al., 2015).

Limitations and outlook

In this study, we have estimated individual levels of exposure to the COP21 coverage by linking self-reported media use and outlet-specific attention to the conference. Considering the multifaceted character of climate change coverage consisting of conflicting information and positions, members of the various audience segments may differ in their response to different message characteristics. While the Alarmed or Concerned may be receptive to threat or efficacy appeals, the Doubtful might respond more strongly to factual information concerning the

evidence of climate change (Roser-Renouf et al., 2015). Accompanying experimental studies could allow to simultaneously test such contrasting effects and offer more insights concerning the content characteristics triggering differentiated media effects. Moreover, our theoretical argument regarding segment-specific media effects is not restricted to climate change conferences and should be studied in the context of other events related to climate change.

Although two waves allow us to track changes over time, conclusions concerning, first, causal explanations and, second, the stability and duration of such changes are limited. In addition, online panels have their limitations in terms of generalizability. However, high levels of Internet penetration in the Netherlands (92%, Mediamonitor, 2015) allowed us to reach all segments of the population online, in contrast to countries with considerably lower penetration rates, such as India, where typically different sampling strategies and survey modes are employed (Leiserowitz et al., 2013).


The reinforcing tendencies of media coverage once again point to clear limits of public information or campaigns. While this study shows that audience segments can help to explain differentiated media effects, this approach could also be used to study more engaging activities, such as interactive simulation programs (Rooney-Varga et al., 2018). Moreover, the limited relationships we found between people's news exposure and climate change-related attitudes and behaviors might be explained by other relevant information sources, such as direct social contacts or social media. Specifically, social media have been found to increase trust in science in general (Huber et al., 2019) and may be more successful in reaching younger generations with scientific information compared to traditional media (Metag et al., 2018).


Overall, our study finds small media effects. Certainly, no large and sudden changes should be expected from a single event that is competing for attention with other events or ongoing problems and debates. Nonetheless, more specifically targeting audience segments might be a step toward intensifying surrounding public debates that might help to increase public concern and support for climate change action. This is a call directed at climate change campaigners, journalists and educators. We as researchers should further study how different climate change segments respond in various contexts and also over longer periods of time to better understand the differentiated underlying mechanisms and factors contributing to public opinion change.

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Supplemental material

Supplemental material for this article is available online.

Notes

1. A comparable study that has applied a panel design to track segment changes in the context of a specific event has yielded a change rate of 51% which was considerably higher compared to our findings (Flora et al., 2014).
2. It should be noted that the comparisons made here are limited due to different methodological approaches including sampling procedures, measurement of segmentation variables, and the different types of segmentation approaches applied including hierarchical cluster analysis, discriminant analysis, and latent class analysis.

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