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Cognitive, Emotional and Excitative Responses to Satirical News

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ABSTRACT

While satirical news has the potential to sway viewers' political opinions, empirical evidence for these effects remains mixed. Although some studies have shown that satire consumption results in viewer attitudes being more in line with satirists' positions, other studies did not. A possible explanation for these conflicting findings is the lack of clarity about the mediating processes that play a role in this relationship. Therefore, the aim of this study was to examine the degree to which both self-reported as well as physiological cognitive, emotional, and excitative responses influence viewers' attitudes when watching satirical news. We conducted a lab experiment in which participants watched either three satirical or three regular news videos about the same topics. Results showed that satire affected viewers' self-reported and physiological cognitive, emotional and excitative responses. Nevertheless, viewers' attitudes were mainly impacted through an affective rather than a cognitive or excitative route. More specifically, only positive emotions mediated the relationship between satirical (vs. regular) news on message-congruent attitudes, but in two opposite directions, which suppressed an overall direct effect on viewers' attitudes. This indicates the need to differentiate between emotions with the same valence when studying effects of satirical news.

Satirical news is a popular genre that manifests in various countries throughout the world. In many cases, satirical news shows can be seen as local variations of American shows. The Dutch show *Zondag met Lubach* is for example, similar in terms of style and the types of topics covered to the

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American *Last Week Tonight with John Oliver*, and the German *Heute-Show* is inspired by the American *The Daily Show*. Satirical news offers humorous news updates containing critiques of political, economic or social affairs (Tandoc et al., 2018). In this way, satirical news can point out social problems, expose wrongdoings or take an advocacy position (Fox, 2018).

Satirical news often mimics traditional news, especially through its format and appearance. However, most satirists primarily think of themselves as comedians or entertainers instead of journalists or newscasters (Tandoc et al., 2018). Nonetheless, similarities between satirical and traditional news go beyond appearances (Fox, 2018). Studies show that satirical news contains the same amount of substantive information as traditional news outlets (Fox et al., 2007). The combination of humor with journalistic content is also known as “satirical journalism” (Fox, 2018), which may even outperform real news in drawing attention to important problems (Fox, 2018). Satirical news thus has the potential to play an important part in key democratic processes, especially because the entertaining nature of satire can attract viewers that are not intrinsically interested in politics (Young, 2013).

Although satire consumption has the ability to sway viewers’ political opinions to become more in line with the position advocated in the satirical message, empirical evidence for these effects remains mixed (Burgers & Brugman, 2021). While some studies show that satire can lead to viewer attitudes being more in line with satirists’ positions (Baumgartner & Morris, 2006; LaMarre et al., 2014), others do not find such effects (Polk et al., 2009; Young, 2008). One explanation for these mixed results is that many studies have primarily focused on the direct effects of satirical news consumption on viewers’ attitudes, while the opinion-influencing potential of satire may depend on various underlying processes (Boukes et al., 2015). However, these underlying mediating processes have received little attention so far in the satire literature (Boukes et al., 2015).

Some of these important underlying mediating mechanisms in media research are described in the *Differential Susceptibility to Media Effects Model* (DSMM; Valkenburg & Peter, 2013). The DSMM distinguishes between three processing states that can co-occur during media consumption: cognitive, emotional and excitative. These processing states are conceptualized as mediators between media consumption and media effects (Valkenburg & Peter, 2013). Cognitive responses refer to the amount of attention and cognitive effort invested by viewers when comprehending media content. Emotional responses are all affective valanced responses of audience members resulting from the media content, and excitative responses refer to audience members’ degree of physiological arousal in response to the media content (Valkenburg & Peter, 2013).¹

¹While in the dimensional views of emotions, physiological arousal is seen as an integral part of emotional processing (Potter & Bolls, 2012), we follow the theoretical argument of the DSMM and analyze these response states as separate entities (Valkenburg & Peter, 2013).

While many satire scholars investigated the cognitive processing of satirical news (Nabi et al., 2007; Young, 2008), the emotional and excitative processing of satire remain largely unexplored (Becker, 2020). Therefore, this study aims to provide a better understanding of the mixed results found in the satire literature by focusing on all three processing forms. Thus, the first novel contribution of this study is investigating how satire consumption impacts viewers' cognitive, emotional, and excitative responses, and how these processing states can, in turn, influence viewers' message-congruent attitudes.

Moreover, some aspects of attitudes are outside of our conscious awareness (Ravaja, 2004). Physiological measures can capture the less conscious dimensions of processes underlying the mental experiences of consuming media (Ravaja, 2004). Since satirical news often deals with controversial or sensitive issues, physiological measures can reveal responses that individuals cannot or do not want to reveal using traditional self-report measures. Using both physiological and self-report measures can also capture the multiplicity of various response states (Bettiga et al., 2017). Thus, the second novel contribution of this study is that we combine physiological and self-report measures to provide a more in-depth understanding of both conscious and unconscious processing of satirical news and their impact on viewers' opinions (Potter & Bolls, 2012).

The limited capacity model of motivated mediated message processing

The DSMM provides an overarching theoretical model to better understand how processing states mediate the relationship between media consumption and media effects (Valkenburg & Peter, 2013). However, the DSMM does not explicitly hypothesize which specific types of media content lead to which processing states. A theoretical model that does predict how particular types of media content can influence the processing of that content is the *Limited Capacity Model of Motivated Mediated Message Processing* (LC4MP; Lang, 2006).

According to the LC4MP, a message's tone and intensity can impact message processing. The tone of media content automatically activates two fundamental motivational sub-systems: the appetitive and the aversive systems (Lang, 2006). Positive content activates the appetitive (approach) system, which results in cognitive responses that support approach behavior such as paying attention, gathering information, heart rate deceleration, and positive emotional responses (Lang, 2006; Lang et al., 2007, 2013). Negative content activates the aversive (avoidance) system, resulting in cognitive responses that can be helpful in defending against potential harm, including heart-rate acceleration and negative emotional responses

(Lang, 2006; Lang et al., 2007, 2013). The intensity of the tone of media content (how exciting the content is) determines how strongly these motivational systems are activated (Lang et al., 2007). The strength of this activation in turn, influences viewers' experiences of (physiological) arousal (excitatory responses; Lang, 1990).

The LC4MP posits that viewers process positive and negative content differently (Lang, 2006). However, satire contains both positive and negative elements (Test, 1991). On the one hand, satire contains negative content, due to its judgmental nature and aggressive tone (Baumgartner & Morris, 2006; Test, 1991). On the other hand, satire also contains positive content, since satirical attacks are conveyed in a playful way and designed to elicit laughter (Holbert et al., 2011; Test, 1991).

Media containing positive and negative content are called co-active. Exposure to co-active content can activate both the appetitive and the aversive systems (Lang, 2006). The LC4MP predicts that co-activation of both systems can result in mixed emotional responses (Cacioppo et al., 1999). Positive elements of co-active media activate the appetitive system, which results in more positive emotional responses. Simultaneously, negative elements of co-active media activate the aversive system, which results in more negative emotional responses (Cacioppo et al., 1999). Moreover, while the activation of the appetitive system is characterized by the mobilization of attentional resources to the encoding of information (information intake), a moderately activated aversive system can also mobilize attentional resources to this encoding phase (threat identification; Lang, 2006). For the consumption of satirical news this would mean that both systems would allocate attentional resources to the encoding of the content at the same time, which should lead to greater attention to and cognitive effort for the processing of this coactive content, compared to single active messages (Lang, 2006).

However, Fisher et al. (2018) indicated in their review article that various studies that investigated the processing of co-active media content have so far either found (a) no evidence for LC4MP's claims, or (b) results inconsistent with the expectations of the LC4MP. Therefore, we discuss in more detail below how satire consumption could be expected to influence the cognitive, emotional and excitatory processing of viewers.

Cognitive responses to satirical news

Cognitive responses are the amount of attention and cognitive effort viewers invest in comprehending media content, and are often measured in two ways: through self-report, and through physiological measures such as heart rate (Potter & Bolls, 2012). Two theoretical perspectives provide different predictions about the amount of cognitive effort that is needed to

comprehend satirical humor: the message-discounting and the resource-allocation hypotheses. Both strands are based on the Elaboration Likelihood Model (ELM; Petty & Cacioppo, 1986).

The ELM describes two distinct processing routes: (1) the central route, which involves more deeper message processing and (2) the peripheral route, which is more superficial (Petty & Cacioppo, 1986). In the ELM, two factors predict whether recipients process messages centrally or peripherally: ability and motivation. When a recipient's ability and motivation to process a message are both high, central processing occurs. When one or both are low, viewers process messages through the peripheral route (Petty & Cacioppo, 1986). While both the message-discounting and the resource allocation principles assume that the processing of political messages in satire is superficial (i.e., the peripheral route; Petty & Cacioppo, 1986), the principles differ in their account of the underlying mechanisms (motivation and ability) that are at work (Nabi et al., 2007; Young, 2008).

The message-discounting hypothesis assumes that, because of satire's entertaining form, satirical humor is processed with attention (Moyer-Gusé, 2008), but then discounted as "just a joke," meaning that the joke should not be taken seriously (Nabi et al., 2007). This means that although at first the joke grabs the viewer's attention, they willingly put little cognitive effort into the processing of the meaning of the joke and, as a result, they will not critically analyze the political message (i.e., viewers have little motivation to process the message; Nabi et al., 2007).

By contrast, the resource-allocation hypothesis assumes that to be able to understand and appreciate humor, viewers have to resolve a conflict between contradictory pieces of information such as two incongruent concepts or situations that are related in a surprising or unexpected manner. The detection and resolution of this conflict is said to require much attention and cognitive effort. Thus, viewers unwillingly would have less cognitive resources left to critically analyze the political message (i.e., viewers lack the ability to process the message; Young, 2008).

Although both principles argue that the processing of satirical humor requires attention, they differ in the amount of cognitive effort that is put into the processing of the humor (Nabi et al., 2007; Young, 2008). Findings from research into forms of media other than satirical news, are more consistent with the resource-allocation hypothesis, showing that humorous content attracts more attention and requires more cognitive processing effort than non-humorous content (Eisend, 2009). Studies following a LC4MP perspective also demonstrate that novel and unexpected media content, such as humor, induces an attentional reflex, which results in a greater allocation of attentional and cognitive resources to the humorous (vs. non-humorous) content,

as is also indicated by a decrease in viewers' heart rates (Sparks & Lang, 2015). For this reason, we expect:

H1: Satirical (vs. regular) news consumption results in (a) higher attention, (b) higher cognitive effort, and (c) slower heart rates.

Emotional responses to satirical news

Satire's tone is predominantly negative due to its judgmental and sometimes aggressive nature (Test, 1991), which can evoke negative emotional responses in viewers (Lang, 2006). Therefore, in a satire context, studies have primarily focused on the elicitation of negative affect and demonstrated that satirical news elicits more negative emotions than regular news (Chen et al., 2017; Lee & Jang, 2017).

Even though satire also contains positive elements such as play and laughter (Test, 1991), the elicitation of positive emotions has received less attention in the satire literature (Lee & Jang, 2017). One study that investigated satire's potential to elicit positive emotions showed that satirical news did not result in greater levels of positive affect than regular news (Lee & Jang, 2017). By contrast, another study has indicated that satirical humor can elicit more positive feelings than regular news (Peifer & Landreville, 2020).

Overall, studies found mixed results regarding the emotional processing of satirical news. Given that satire contains both positive and negative elements, the LC4MP would predict co-activation of the approach and avoidance systems during emotional processing (Lang, 2006). Therefore, we expect that satirical news elicits more positive and negative emotions, compared to regular news, which typically elicits only one motivational sub-system (Lang, 2006; Lang et al., 2013). This resulted in the following hypothesis:

H2: Satirical (vs. regular) news consumption results in higher levels of (a) negative and (b) positive emotional responses.

Excitative responses to satirical news

Excitative responses are individuals' degree of physiological arousal, and they are often measured through self-report or through physiological measurements such as skin conductance (Valkenburg & Peter, 2013). In a recent review article, Becker (2020) argued that, even though exploring the excitatory potential of satire is important in order to broaden the

theoretical understanding of the impact of satirical news, feelings of arousal due to satire consumption received little attention in the literature.

Arousal represents the level of activation in either or both of the approach and avoidance systems. While the tone of media content determines which motivational sub-system(s) are activated, the intensity of that tone determines strength of activation (Lang, 2006). Previous research showed that emotional content elicits more arousal than non-emotional content (Lang, 1990). Thus, viewers will likely experience high levels of arousal when emotional content highly activates one or both sub-systems but will experience low levels of arousal when less emotional content leads to low activation of one or both sub-systems (Lang, 1990).

The strength of the activation of the sub-systems is not the only factor that can influence viewers' arousal. Research following the LC4MP perspective also shows that novel or unexpected content, such as the use of humor, can result in greater feelings of (physiological) arousal (Schmidt, 2002; Sparks & Lang, 2015). Since satirical news conveys political information in a much more humorous (Test, 1991) and emotional tone (Ödmark, 2021) than its non-humorous counterpart, we expect:

H3: Satirical (vs. regular) news consumption results in higher levels of (a) self-reported as well as (b) physiological arousal.

Response states and message-congruent attitudes

Various scholars have argued that there is no consistent evidence for the persuasive power of satirical news (Boukes et al., 2015). According to Boukes et al. (2015), this lack of evidence can be explained by the fact that many studies have focused on the direct effects of satire consumption, and less on indirect effects that can explain this relationship. Boukes et al. (2015) demonstrate that satire can evoke opposing mediating processes that suppress an overall direct effect of satire consumption. In order to gain more insight into these underlying processes, this study focusses on how viewers' cognitive, emotional and excitative responses to satirical news have the potential to influence viewers' attitudes.

Regarding the cognitive responses, both the message-discounting (i.e., satire consumption requires little cognitive effort) and the resource-allocation hypotheses (i.e., satire consumption requires considerable cognitive effort) propose that the processing of satirical humor results in a reduction of counter-argumentation to the satirical message (Nabi et al., 2007; Young, 2008), which in turn could lead to more message-congruent attitudes (Nabi et al., 2007; Young, 2008). This means that the satire

literature does not provide a clear answer about the degree of cognitive resources needed to influence attitudes.

Concerning the emotional responses, previous studies show that regular news consumption can cause emotional reactions within viewers, which in turn can influence their attitudes (Lecheler et al., 2013). These studies generally indicate that news consumption can lead to attitude-congruent effects, in that news containing positive content induces positive emotions, which in turn leads to more positive attitudes about the subject discussed, and vice versa for negative emotions (Lecheler et al., 2013). Since satire is co-active (Test, 1991), the way in which emotions can mediate the relationship between satirical news and viewers' attitudes remains unclear.

With respect to the excitative responses, previous studies show that arousal can impact attitudes (Renshon et al., 2015; Walter et al., 2018). The relationship between arousal evoked by humor and its persuasive effect is characterized by an inverted U-curve (Berlyne, 1972; Walter et al., 2018). Humor is most effective when evoking moderate levels of arousal, while it is least effective when there is too much or too little arousal (Berlyne, 1972; Walter et al., 2018). This is because humor that evokes little arousal might not be funny enough to draw attention to the message, whereas humor that evokes too much arousal may overwhelm the processing of the message (Berlyne, 1972; Walter et al., 2018). However, since studies have not yet examined if and how strong satire can evoke feelings of arousal, it also remains unclear whether and how arousal mediates the relationship between satire consumption and viewers' attitudes.

To summarize, various studies show that cognitive, emotional, and excitative responses evoked by media consumption can influence viewers' attitudes. Since these underlying processes have received little scholarly attention in relation to satirical news, it remains unclear whether these processing states positively or negatively influence the relationship between satire consumption and its persuasive power. Therefore, we ask:

RQ1: How do (a) cognitive, (b) emotional, and (c) excitative responses mediate the relationship between satirical (vs. regular) news consumption and message-congruent attitudes?

Method

Participants and design

Data were collected through a lab experiment. The study was checked for compliance to the home institute's ethical guidelines. Due to the COVID-19 outbreak in early 2020, the university at which this study was conducted

unexpectedly closed. Therefore, data collection ended abruptly and the collection of data for already scheduled participants did not proceed.² In the end, 72 Dutch-speaking participants took part in this experiment. Our sample mainly consisted of university students, of which 26.4% were men, and 73.6% were women, with an age ranging from 18–58 years ($M_{age} = 23.50$ years, $SD_{age} = 6.98$). Of the 72 participants, 51.4% reported having a bachelor/master's degree. Regarding political preference, 51.4% reported being politically left, 22.2% politically central, and 26.4% politically right. Participants were offered 10 euros for their participation.

We conducted an experiment with a 2 (type of news: satirical vs regular) x 3 (policy issue: ban on fireworks vs. using more nuclear energy vs. abolishment of the Dutch referendum) mixed factorial design, with type of news as a between-subjects factor, and the policy issues covered in the videos as a within-subjects factor.

Materials

The videos consisted of original items from the Dutch satirical news show *Zondag met Lubach* (ZML) or from the Dutch regular news show *NOS Journaal*. ZML was selected because this show features lengthy and information-rich satirical segments that humorously cover societal and political issues for several minutes, comparable to other long comedy format shows such as *Last Week Tonight*. Moreover, ZML attracted the most viewers per episode of all Dutch satire shows in the year of data collection, with over 30% more viewers than the second and third most-watched satire shows (*Dit Was Het Nieuws*; *Even Tot Hier*; Kijkonderzoek, 2020). *NOS Journaal* was selected for the same reason, with it having more than twice as many viewers than the second most-watched regular news show in the Netherlands (*RTL Nieuws*; Kijkonderzoek, 2020).

To ensure that effects of satirical versus regular news consumption could not be attributed to the specific policy issues discussed in the videos, we used videos that discussed the same three policy issues in each condition (ban on fireworks, using more nuclear energy, abolishment of the Dutch referendum; for a detailed description of the materials and for more information about the satirical and regular news shows, see Online Appendix A at <https://edu.nl/budxh>). We also ensured that the three issues represented various political perspectives (the fireworks ban is a leftist issue, using more nuclear energy is a rightist issue, and the referendum is a centrist issue). We selected satirical and regular news videos that were as similar as possible in both substance (the general scope of the videos was

²Because we used various physiological measures in this experiment, the data collection could not proceed online.

similar in both conditions) and style (e.g., by only choosing male anchors). However, as a consequence of relying on real media content (which is important for external validity), the regular and satirical news videos differed slightly in content and length.

Procedure

Upon arrival in the lab, participants filled out a written informed consent form. Each participant then received further explanation about the experiment, including the physiological measurements, stimuli and questionnaire. Participants were individually tested in a quiet room. They were seated 70 cm away from a 24-inch Dell U2412M monitor (resolution: 1,920 × 1,200 pixels). Before setting up the physiological equipment, participants' hands were cleaned with pH neutral wipes. Then, baseline skin conductance and heart rate responses were measured during two minutes of rest.³ Hereafter, participants were randomly assigned to one of the two between-subjects conditions (satirical news, $n = 38$; regular news, $n = 34$).

At the start of the experiment, all participants watched a short nature video (80 seconds) to become accustomed to the set-up. Next, depending on condition, participants either watched three regular news videos or three satirical news videos (one for each of the three different topics), which were shown in a random order. After each video, participants completed a questionnaire including items about attention, cognitive effort, positive and negative emotions and arousal levels. After watching to the three videos, participants completed a final questionnaire which included items about their attitudes toward the topics and demographics.⁴ Upon completion, participants were thanked and debriefed. The entire experiment took about 45 minutes to complete.

Measures

Unless otherwise noted, all questionnaire variables were measured after each video on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

³An eye-tracker was also used in the data collection, but those results are not reported in this paper.

⁴Counter-arguing, eudaimonic and hedonic entertainment experiences, free recall and feelings of being informed, prior (satirical) news consumption, perceived funniness, and handedness were also measured in this study, but for reasons of space are not further discussed in the running text of this paper. See Online Appendix B for the operationalization and the results of these variables.

Cognitive responses

Cognitive effort and attention. Self-reported cognitive responses were measured by asking participants to which extent they agreed with two items (adapted from Salomon, 1984). One item measured cognitive effort “I tried very hard to understand the video” ($M = 2.65$, $SD = 1.52$), and the other item measured attention “I concentrated a lot while watching the video” ($M = 2.76$, $SD = 1.49$).

Heart rate (HR). The measurement of HR was used as an indicator of cognitive effort, with slower HR indicating greater cognitive effort (Potter & Bolls, 2012). See Online Appendix B for more measurement information. For the analyses, we calculated difference scores between participants’ mean beats per minute while at rest and during each video. A positive score indicates faster HR while watching the videos (vs. being at rest), while a negative score indicates slower HR while watching the videos.

Emotional responses

Emotions. Emotional responses to the videos were measured using four items from the Positive and Negative Affect Scale (PANAS; Watson et al., 1988). Participants were asked to which extent they agreed with the statements “while watching the video I felt (a) happy, (b) hopeful, (c) sad, and (d) worried.” Given that the two positive items did not form a reliable scale (Cronbach’s $\alpha = .63$), we followed the discrete emotions perspective and analyzed all the emotions separately (Nabi, 2010; happiness: $M = 3.58$, $SD = 1.51$; hopefulness: $M = 3.50$, $SD = 1.51$; sadness: $M = 2.40$, $SD = 1.40$; worry: $M = 3.52$, $SD = 1.62$).

Excitative responses

Arousal. Self-reported arousal was measured using one item adapted from Faseur and Geuens (2006), by asking participants to what extent they agreed with the statement “I felt calm while watching the video” (reverse coded: $M = 2.29$, $SD = .98$).

Skin conductance level (SCL). The measurement of SCL was used as an indicator of participants’ physiological arousal (Potter & Bolls, 2012). See Online Appendix B for more measurement information. For the analysis, we calculated difference scores between participants’ mean SCL while in rest, and while watching each video. A positive score indicates a higher SCL while watching the videos (vs. being at rest), while a negative score indicates a lower SCL while watching the videos.

Media effects

Message-congruent attitudes. The extent to which participants agreed with the messages in the videos was measured using responses to statements on three 7-point semantic differential scales (adapted from Boukes et al., 2015). Participants were asked whether they thought that (1) “A ban on fireworks,” (2) “Building more nuclear power plants in the Netherlands,” and (3) “The abolishment of the consultative referendum,” was (a) *a bad/good idea*, (b) *not at all important/very important*, and (c) *foolish/sensible*. The three items were averaged to create an attitude scale ($M = 4.62$, $SD = 1.60$, Cronbach’s $\alpha = .87$).

Data analysis

We conducted multilevel analyses using the lme4 package (version 1.1–23; Bates et al., 2015) for R (version: 3.5.2). News condition (satirical news vs. regular news) was included as a fixed independent variable.⁵ To control for individual and policy issue related differences, we also included random intercepts for participants, and for the policy issues of the videos. To determine the significance of our indirect effects, we created confidence intervals based on the Monte Carlo simulation method (Hayes & Scharkow, 2013). See online Appendices D–E for the statistical analyses, online Appendix F for the full multilevel models, online Appendix G for an overview of all means and standard deviations per video, and online Appendix H for the correlations between all dependent variables.

Results

Main analyses

Response states

Cognitive responses (H1). Participants paid less attention to satirical news than to regular news ($b = -0.50$, $SE = 0.23$, 95% CI $[-0.94, -0.06]$, $t = -2.22$, $p = .026$; see, Table 1 for means and standard deviations). However, we found no differences between the two conditions in the amount of cognitive effort needed to process the videos, either for the self-report measure ($b = -0.30$, $SE = 0.22$, 95% CI $[-0.72, 0.13]$, $t = -1.37$, $p = .170$) or the

⁵Before conducting the main analyses, we also conducted various control analyses to determine if we needed to include certain demographic or control variables as ***a*** fixed effects in our main multilevel analyses. The results of these control analyses indicated that the experimental conditions did not differ on any of these variables (see Online Appendix C).

Table 1. Means and (standard deviations) of dependent variables across experimental conditions.

	Regular News	Satirical News
Cognitive responses		
Cognitive Effort	2.80 (1.60) ^a	2.51 (1.44) ^a
Attention	3.02 (1.60) ^a	2.52 (1.34) ^b
HR	1.11 (15.28) ^a	-2.83 (20.47) ^a
Emotional responses		
Happiness	3.15 (1.41) ^a	3.97 (1.49) ^b
Hopefulness	3.76 (1.61) ^a	3.25 (1.37) ^b
Sadness	2.12 (1.40) ^a	2.66 (1.36) ^b
Worry	3.22 (1.65) ^a	3.80 (1.55) ^b
Excitative responses		
Arousal	2.37 (1.02) ^a	2.21 (0.94) ^a
SCL	11.27 (18.63) ^a	2.23 (16.52) ^b
Media effects		
Message-Congruent Attitudes	4.68 (1.45) ^a	4.57 (1.72) ^a

HR and SCL represents the means of the differences between participant's HR and SCL in rest and while watching each video. A higher SCL/HR score means higher SCL/faster HR, while a lower score means lower SCL/slower HR. Different superscripts in the same row indicate significant differences of at least $p < .05$.

physiological measure (HR) of cognitive effort ($b = -3.94$, $SE = 4.43$, 95% CI [-12.61, 4.74], $t = -0.89$, $p = .374$). This means that, contrary to our expectations, the consumption of satirical (vs. regular) news resulted in *less* attention to the political content. Satirical news did not affect the amount of cognitive effort used by viewers to process the messages differently when compared to regular news, and therefore the results do not support H1.

Emotional responses (H2). Consumption of satirical news elicited both positive and negative emotions. Compared to regular news, satirical news increased feelings of happiness ($b = 0.83$, $SE = 0.27$, 95% CI [0.31, 1.35], $t = 3.11$, $p = .002$), sadness ($b = 0.54$, $SE = 0.23$, 95% CI [0.09, 0.99], $t = 2.34$, $p = .020$) and worry ($b = 0.58$, $SE = 0.26$, 95% CI [0.07, 1.10], $t = 2.22$, $p = .026$), but decreased feelings of hopefulness ($b = -0.51$, $SE = 0.25$, 95% CI [-1.00, -0.02], $t = -2.03$, $p = .042$). Overall, these results indicate that the consumption of satirical (vs. regular) news led to greater feelings of negative emotions but influenced the two measured positive emotions differently. On the one hand, satire increased positive emotions such as happiness. On the other hand, satire also decreased positive emotions such as hopefulness. As a result, H2 is only partially supported.

Excitative responses (H3). We found a discrepancy in the self-reported and the actual physiological degree of arousal of the participants: the consumption of satirical (vs. regular) news led to lower levels of physiological arousal ($b = -9.04$, $SE = 3.68$, (95% CI) [-16.25, -1.82], $t = -2.46$, $p = .014$), while there were no significant differences in the amount of self-reported arousal

between the two conditions ($b = -0.16$, $SE = 0.19$, (95% CI) $[-0.53, 0.20]$, $t = -0.87$, $p = .386$). This means that, contrary to our expectations, participants were physiologically more relaxed during the consumption of satirical (vs. regular) news, and therefore the results do not support H3.

Response states and message-congruent attitudes

Correlation analysis. Correlations between all dependent variables are presented in Table H1 in Online Appendix H. Interestingly, no significant correlations between the self-reported and physiological measures of the response states (HR and SCL) were found (all p values $> .05$). Moreover, we found no significant correlations between participants' emotional responses and both their self-reported as well as physiological levels of arousal. However, the correlation table showed that self-reported (but not physiological) levels of attention and cognitive effort negatively correlated with positive emotional responses of the participants, but positively correlated with participants' self-reported (but not physiological) levels of arousal ($p < .05$). Because many of these response states are correlated, we accounted for these effects by including all response states into one mediation model to answer RQ1, so that all underlying pathways through which satire may affect attitudes were investigated at the same time.

Message-congruent attitudes (RQ1). We found no direct effect of satirical (vs. regular) news consumption on message-congruent attitudes ($b = -0.11$, $SE = 0.18$, 95% CI $[-0.11, 0.24]$, $t = -0.62$, $p = .553$). Nevertheless, our multilevel mediation analyses showed that the relationship between satire and attitude congruence seemed to be mediated through positive emotions, and not through negative emotional, cognitive or excitative responses (see, Figure 1).⁶ Monte Carlo confidence intervals showed significant indirect effects of satire consumption on attitudes through happiness and hopefulness (happiness: point estimate = .14, 95% CI $[.01, .33]$; hopefulness: point estimate = $-.11$, 95% CI $[-.27, -.01]$). This means that satire evoked two opposing underlying emotional processes that suppressed the overall direct effect of satire consumption. These opposing mediating effects occurred as follows: participants in the satirical (vs. regular) news condition reported higher levels of happiness, but lower levels of hopefulness. Participants who felt happier and more hopeful agreed more with the messages in the videos than participants who felt less happy and less hopeful (happy: $b = 0.17$, $SE = 0.08$, 95% CI $[0.02, 0.32]$, $t = 2.25$, $p =$

⁶In addition, we also tested for a non-linear (inverted U-curve) relationship between SCL and message-agreement, which turned out to be significant. However, when adding the other mediators to this model, the significance of the inverted U-curve disappeared (see Table F6 and F7 in online Appendix F).

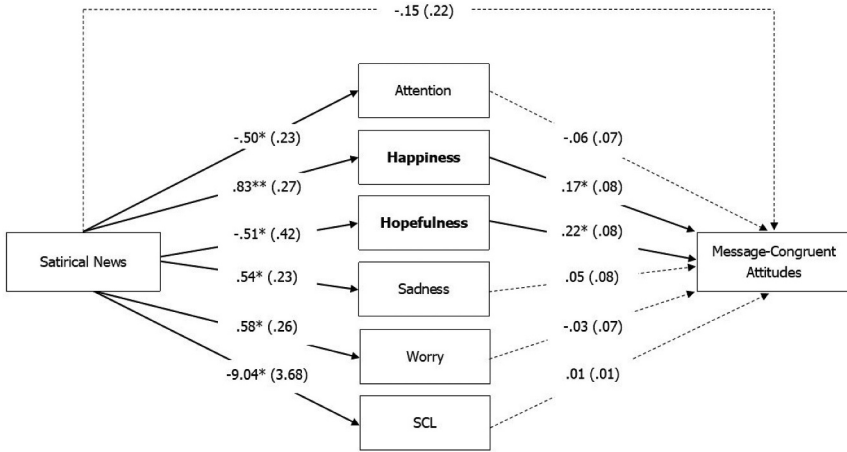


Figure 1.

Note. Path model shows the relationships between news condition, attention, happiness, hopefulness, sadness, worry, SCL, and message-congruent attitudes. Regression coefficient are shown, the standard errors are displayed between the brackets. Paths with continuous lines are significant. * $p < .05$, ** $p < .01$.

.025; hopeful: $b = 0.22$, $SE = 0.08$, 95% CI [0.07, 0.37], $t = 2.83$, $p = .005$). Thus, satire consumption led to *more* agreement with the satirical messages when participations felt happier while watching satirical (vs. regular) news. At the same time, satire consumption led to *less* agreement with the satirical messages when participant felt less hopeful while watching satirical (vs. regular) news (see, Figure 1).

Conclusion and discussion

The aim of this study was to investigate the degree to which cognitive, emotional, and excitative responses influence viewers' attitudes when watching satirical news. Overall, results show that satire (vs. regular) news consumption impacts viewer responses differently, subsequently impacting viewers' message-congruent attitudes.

H1 proposed that the consumption of satirical (vs. regular) news would result in (a) higher attention, (b) cognitive effort, and (c) slower heart rates. Contrary to our expectations, we found that satirical (vs. regular) news resulted in less attention and did not differently affect viewers' self-reported and physiological (heart rate) cognitive effort. A possible explanation for why satirical (vs. regular) news consumption resulted in less attention could lie in our operationalization of attention. We measured attention to the videos in general. Therefore, it could be that although viewers might have paid more attention to the humorous parts of the satirical videos, as

a whole, the source of the satirical news videos (comedian versus serious news host) may have functioned as a discounting cue, in that content of the satirical videos in general should not be taken seriously. Therefore, viewers might have paid less attention to the satirical versus the regular news videos (Nabi et al., 2007). This highlights the need for future research to differentiate between various forms of attention (e.g., attention to the video as a whole, to the satirical humor, to the political message), to be able to better predict how satire consumption influences viewers' cognitive processing of both the entertaining and informative content of satire, and how this cognitive processing in turn can influence viewers' attitudes.

H2 predicted that satirical (vs. regular) news consumption would result in higher levels of (a) negative and (b) positive emotions. Our results supported H2a, because satire consumption increased feelings of sadness and worry. However, the results for H2b were mixed, because satire consumption increased feelings of happiness, but decreased feelings of hopefulness. Taken together, these results indicate that (1) co-active content such as satirical news indeed induce mixed emotional response states (Cacioppo et al., 1999), and that (2) satire consumption can differently influence emotions with the same valence.

The unexpected result for H2b could be explained by the differences between happiness and hopefulness (Lazarus, 1991). Happiness is a subjective feeling of pleasure, and is elicited by the perception of humor (Peifer & Landreville, 2020). By contrast, hope reflects beliefs in an uncertain but possible positive (goal-congruent) outcome (Lazarus, 1991). Since satirical humor is designed to elicit laughter (Test, 1991), it is not surprising that our satirical content evoked feelings of happiness. However, contrary to the results of Peifer and Landreville (2020), our study showed that the consumption of satirical content decreased feelings of hopefulness. Nevertheless, this result is in line with previous research indicating that satire consumption can result in greater political cynicism (Baumgartner & Morris, 2006). However, since different situations can influence discrete emotions differently (Lazarus, 1991; Nabi, 2010), differences in satirical content might also influence discrete emotions, like hopefulness, differently.

Peifer and Landreville's (2020) stimulus materials consisted of a personal attack on US President Donald Trump, which may have made viewers feel superior to the object of the satirical attack, which induced feelings of hope. By contrast, our stimulus materials may have highlighted how bad the current state of affairs was concerning the issues we presented, and this may have lowered viewers' hopes in the possibility of a positive (goal-congruent) outcome in the future (e.g., if there is no ban on fireworks now, it probably will not happen in the future either). This indicates that experiences of discrete emotions like hopefulness are dependent on whether the content of the satirical message describes the prospect

of a desired and uncertain but possible future event (Lazarus, 1991). More research is needed to investigate which specific types of satirical content lead to the elicitation of which specific emotions to provide a better understanding of the emotional processing of satirical news.

H3 posited that the consumption of satirical (vs. regular) news would result in higher levels of (a) self-reported as well as (b) physiological arousal. Contrary to our expectations, we found that viewers had lower levels of physiological arousal during the consumption of satirical (vs. regular) news. This finding contrasts earlier research which shows that the consumption of humorous (vs. non-humorous) content results in higher levels of arousal (Eisend, 2009; Schmidt, 2002; Sparks & Lang, 2015). These results may be explained by the message-discounting hypothesis: if the news source (comedian versus regular-news host) served as a discounting cue, in that the content of these videos as a whole should not be taken seriously, it may have made viewers more physiologically relaxed while watching the satirical (vs. regular) news videos (Nabi et al., 2007).

Moreover, we found a discrepancy in participants' physiological and self-reported arousal: satirical (vs. regular) news led to lower levels of physiological arousal, but not self-reported arousal. Satirical news can thus seemingly impact viewers' conscious and unconscious arousal differently. In addition, correlation analyses showed no relationships between the self-reported and physiological measures of the response states, suggesting that conscious and unconscious responses are independent from each other. This is in line with research indicating that conscious and unconscious arousal are two independent responses and can influence attitudes differently (Bettiga et al., 2017). This discrepancy could be explained by the fact that although individuals can be consciously aware of their arousal initially, this awareness dissipates over time (Cacioppo et al., 1987). This means that, during the consumption of a lengthy stimulus, various individual satirical messages could have impacted viewers' conscious arousal levels differently than the regular news messages. However, since this conscious arousal dissipates over time, differences in self-reported arousal are not apparent when viewers are asked for their conscious arousal afterward. This is not the case for physiological arousal because it is measured continuously through the media consumption. Thus, physiological measurements should not be used as substitutes of self-report measures but should be used as complementary measures. Therefore, future research should make greater use of combining physiological measures with self-report measures in satire research to gain a more complete understanding of viewers' processing of satirical news.

These results also have important implications for satire theory. First of all, most satire processing theories like the message discounting theory start

from a cognitive perspective (Nabi et al., 2007). Nevertheless, this study provides initial evidence that it is important to expand these existing theories by also including the excitative processing of satirical news. In doing so, researchers should distinguish between conscious and unconscious routes to persuasion. Moreover, satirical news episodes contain multiple humorous satirical messages, each of which might be processed differently consciously and unconsciously. This means that it is important for satire theory to take this content/time-related factor into account, by making a more specific distinction between the processing of individual satirical humorous messages versus the overall processing of satire. We could for example, expect a discrepancy in participants' levels of conscious and unconscious arousal in exposure to stimuli containing single versus multiple humorous messages. In this case there should be no differences between recipients' levels of physiological and self-reported arousal for stimuli containing a single humorous message, while there should be differences between physiological and self-reported arousal for stimuli containing multiple humorous messages. Thus, by including these factors we can make more specific predictions about the processing and persuasive effects of satirical news.

RQ1 asked how (a) cognitive, (b) emotional, and (c) excitative responses mediated the relationship between satirical (vs. regular) news consumption and message-congruent attitudes. We found no direct effect of satire consumption on attitudes. However, satire consumption did affect viewers' attitudes indirectly only via positive emotional responses and not through the cognitive or excitative routes. This aligns with earlier research by Kim and Vishak (2008), who found that political comedy influences viewers' attitudes based on affective rather than cognitive responses, whereas regular news evokes a more cognitive processing style based on factual knowledge. For satire consumption, this means that, out of the three response states distinguished by the DSMM (Valkenburg & Peter, 2013), emotional responses seem to play the most important role in affecting viewers' attitudes. It is therefore important to take satire's emotional processing into account in theories explaining satire's persuasive effect. However, the correlation analyses showed that individuals' self-reported cognitive and emotional responses and individuals self-reported cognitive and excitative responses were related. Future experimental research should therefore focus more on the relationships between these response states by manipulating each of these processing routes separately.

Even though we expected that both positive and negative emotions would have attitudinal impact (Lecheler et al., 2013), only positive emotions elicited by satire consumption impacted viewers' attitudes, while negative emotions did not. Surprisingly, we found two opposing ways through which the positive emotions induced by satire consumption indirectly affected

message-congruent attitudes. On the one hand, satire led to *more* message-congruent attitudes because participants felt happier while watching satirical (vs. regular) news, while on the other hand, satire also led to *less* message-congruent attitudes because participants felt less hopeful while watching satirical (vs. regular) news.

Our findings demonstrate that, although happiness and hopefulness have a positive valence, they were influenced differently by satire consumption, and hence had different attitudinal effects. This supports the view that it is important to use a discrete emotions perspective in further research into the affective dimension of satirical news, rather than generalizing to the level of valence. Using a discrete-emotion perspective allows for more precise predictions regarding the specific types of satirical content that elicit discrete emotional responses, and in which directions these emotions in turn influence attitudes and behavior (Nabi, 2010).

Taken together, the current study shows *how* satire consumption can lead to more message-congruent attitudes, by demonstrating the indirect processes that underlie this relationship. Our study builds on the DSMM (Valkenburg & Peter, 2013) by showing *which* response states are evoked by satire consumption, and how these processing states in turn influence viewers' attitudes. These findings may help to explain the mixed results found in the literature regarding satire's persuasive impact (Boukes et al., 2015). Our results indicate that the absence of a direct persuasive effect can be explained by the fact that satire consumption increases feelings of happiness, while it decreases feelings of hopefulness. These effects in turn, suppress an overall direct effect on viewers' attitudes.

This study also builds on the LC4MP (Lang, 2006), because it provides more insight into the validity of the original predictions of the LC4MP with regard to the processing of co-active media content. While the LC4MP hypothesized that the consumption of co-active content should result in (1) mixed emotional responses, and to stronger effects on (2) viewers' attentional and cognitive resources that are allocated to the content, and on (3) their excitatory responses (Lang, 2006), we only found supporting evidence for the first claim, and contradictory evidence for the second and third. These findings reinforce Fisher et al.'s (2018) arguments in that so far, experimental studies have found only little, and sometimes even contradictory evidence for LC4MP's predictions regarding the processing of co-active media content. Our findings highlight the need for further critical analyses into the nature of certain processing states that are thought to result from the consumption of co-active content (Fisher et al., 2018).

Because a large portion of viewers watch satirical news to be entertained rather than informed (Young, 2013), satire offers a potentially promising route for communicating about important societal issues, particularly for viewers who initially show little interest in acquiring such information

(Brewer & McKnight, 2017). Based on the results of this experiment, we would recommend that, if satire is to have an impact on viewers beyond entertainment, the satire should appeal to the emotions of viewers, rather than to their cognitive engagement or excitement. But more importantly, the satirical messaging should not be so critical that viewers no longer derive feelings of hope from the message.

Some caveats should be noted about our study. First, due to the COVID-19 pandemic our data collection did not proceed as planned, which resulted in fewer participants than originally planned for. Nevertheless, due to our mixed study design we had more than 100 observations per experimental condition, which is comparable or even larger than other studies that used physiological measures when investigating responses to political news (e.g., Renshon et al., 2015; Soroka & McAdams, 2015). Nevertheless, we recommend replicating our study with different samples and different experimental materials to further test the robustness of our findings.

Moreover, our sample mainly consisted of young, female, and highly educated participants. A recent meta-analysis shows that gender does not have a moderating influence on the relationship between satire and persuasion (Burgers & Brugman, 2021). However, satire's persuasive effect is stronger in student samples than in samples drawn from the general population (Burgers & Brugman, 2021). Since student samples are typically younger and more highly educated than the general population, the results of our experiment are probably also stronger than they would be with a sample of the general population. Nevertheless, viewers of satire shows are, on average, more educated and younger than the general population (Young, 2019), which means that the characteristics of our participants align with those of typical satire viewers.

Overall, our findings provide a better understanding of how satire (vs. regular) news consumption influences the cognitive, emotional, and excitative response states of viewers differently. Our study shows that although satirical news impacted most of the self-reported and physiological cognitive, emotional and excitative responses of viewers, their attitudes were mainly impacted through an affective rather than a cognitive or excitative route. More specifically, only positive emotions mediated the relationship between satire consumption and message-congruent attitudes, but in two opposite directions, which appeared to suppress an overall direct effect on viewers' attitudes. This indicates the need to differentiate between various discrete emotions when studying the persuasive effects of satire consumption, rather than generalizing effects to the level of emotional valence.

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