# Affective States Explain Motivated Reasoning in Response to Political News

Ming M. Boyer

1 May 2020
Hot Politics Lab Meeting

Abstract

Emotions are a central explanatory variable in motivated reasoning research, and previous research suggests that anger drives motivated reasoning effects. However, focusing on such conscious, discrete emotions likely overlooks the role of affect, i.e. the preconscious, physiological experience of emotion. A focus on affective states thus accounts for the preconscious nature of emotion in motivated reasoning theory and is less vulnerable to motivated expressions of emotional response. Therefore, in a randomized laboratory experiment (N = 191), I exposed participants to a televised news item about immigration – varying the level of threat, while taking physiological measures of affect (i.e. negative valence and arousal), followed by self-reported indicators of motivated reasoning. As expected, the results indicate that exposure to threatening news about immigration leads to *high-arousal negative affective states*, which in turn cause counterarguing, opposition to immigration and less willingness to help refugees. This shows that applying a circumplex model of affect to motivated reasoning illuminates the importance of both valence *and* arousal for differential political information processing, which might help to explain under which circumstances motivated reasoning drives polarization.

*Keywords*: Motivated reasoning, emotion, affective states, psychophysiology

**Affective States Explain Motivated Reasoning in Response to Political News**

News regularly covers threatening issues, like terrorism (Gadarian, 2010) climate change (Hart & Feldman, 2014), or immigration (Brader, Valentino, & Suhay, 2008). According to the theory of motivated reasoning, citizens boost their scrutiny of political information that threatens their prior beliefs (e.g. Taber & Lodge, 2006) or social identity (e.g. Slothuus & De Vreese, 2010). This has important effects on citizens' policy attitudes and their behavior toward outgroups. Emotion is thought to mediate this effect, such that citizens counterargue or dismiss political information that causes preconscious negative emotional states (Lodge & Taber, 2013). While anger seems to play a pivotal role in motivated reasoning effects (e.g. Marcus, Mackuen, & Neuman, 2011; Redlawsk, Civettini, & Emmerson, 2010), discrete emotions are not the only way to think about the role of emotion in motivated reasoning. In fact, as a preconscious process, motivated reasoning is more likely linked to affect – the part of emotion that consists of physiological reactions before conscious awareness (Lodge & Taber, 2013; Marcus, 2013). What is more, conscious appraisals of discrete emotions might be *influenced* by motivated reasoning (Brader, 2006), leading to problems of causality. Affective states are thus more closely related to motivated reasoning theory and might validate causal claims of discrete emotions in motivated reasoning.

Even though affective states are most commonly operationalized as a multidimensional concept, motivated reasoning theory has mostly focused on the valence dimension of affect: threatening information causes negative affect, which causes motivated reasoning (Lodge & Taber, 2013). However, in line with research in other fields, motivated reasoning may benefit from an (at least) two-dimensional model of affective states, where arousal denotes the level of activation associated with an emotional experience (Russell, 1980). As motivated reasoning is an active process, in which more time and cognitive effort is spent on counterarguing threatening information than bolstering information (Jain &

Maheswaran, 2000; Taber & Lodge, 2006), I argue that mostly *high-arousal negative affective states* lead to increased scrutiny, as well as attitudinal and behavioral backlashes.

To test these assumptions, I conducted a randomized laboratory experiment in Austria (N = 191) where participants were exposed to one of two televised news items about immigration – designed to vary only on the level of threat. During exposure, I measure direct physiological measures of negative valence and arousal and relate them to self-reported measures of counterarguing, policy attitudes and behavioral intent. In doing so, I present evidence that the arousal dimension of affect is imperative in the study of motivated reasoning, offering a novel way to differentiate emotional responses that precede cognitive biases in political information processing.

## Emotion Motivates Reasoning

Over the last decades, scholars have increasingly found that, to a certain extent, citizens may be able to "believe what they want to believe because they want to believe it" (Kunda, 1990: p. 480). This idea has been strengthened by a growing number of studies showing that partisans continue to believe their party's stance – or even become more extreme in their beliefs – in the face of counterevidence (Bolsen, Druckman, & Cook, 2014; S. P. Hart & Nisbet, 2012; Leeper & Slothuus, 2014; Taber & Lodge, 2006). This process of motivated reasoning inevitably enhances division between partisan groups, and it is often mentioned as an important cause for growing political polarization across the globe (e.g. Lebo & Cassino, 2007).

One possible explanation for motivated reasoning is cognitive dissonance theory, where we assume that information that threatens citizens' prior attitudes causes more scrutiny than information that bolsters them (see, for example, Druckman & McGrath, 2019; Leeper & Slothuus, 2014; Taber & Lodge, 2006). However, the current paper focuses on another prominent explanation. A large number of studies have shown that, because we are driven by

a fundamental need for a positive self-image (Baumeister & Leary, 1995), motivated reasoning effects can be explained by social identification (Kahan, 2010). Sometimes called *identity-defensive cognition*, this line of reasoning for why citizens counterargue is supported by the findings that party identification drives persuasion more strongly than ideology (Cohen, 2003), and that citizens show more support for a policy if their party explicitly supports it (Slothuus & De Vreese, 2010), or even when an opposing party rejects it (Bolsen et al., 2014). Besides partisan identities, this identity-as-motivation hypothesis has also been found to apply to other social identities such as race (Feldman & Huddy, 2018; Shoda, McConnell, & Rydell, 2014), gender (Boyer, Lecheler, & Aaldering, n.d.), religion (Landrum, Lull, Akin, Hasell, & Jamieson, 2017), and cultural identities (Kahan et al., 2007, 2008).

Regardless of its source of motivation, the hypothesized mechanism through which motivated reasoning operates, relies heavily on emotional responses. At the base of the theory lies the idea that cognition is not based on "cold" rationality, but stored in the mind together with emotional evaluations about it (Abelson, 1963). This "hot cognition" hypothesis states that coming across new information also activates the associated emotional information, and influences its possessors' emotional state (Redlawsk, 2002). Because such states develop before conscious awareness (Marcus, 2013), they subconsciously determine someone's motivation to reason in a certain direction (Lodge & Taber, 2013). Any reasoning outcomes are, in this view, post-hoc rationalizations of emotional reactions, triggered by the emotional associations that are linked to any piece of information. Therefore, motivated reasoning theory has two major predictions about emotion: (1) information that threatens one of citizens' social identities leads to negative emotion, and (2) negative emotion leads to counterarguing against the information that causes it, as well as attitudinal and behavioral effects that are favorable to one's ingroup – or unfavorable to an outgroup.

Based on this theory, the available research shows that emotions are important in the process of motivated reasoning. Functional MRI imaging suggests that motivated reasoning is associated with implicit emotion regulation (Westen, Blagov, Harenski, Kilts, & Hamann, 2006). Moreover, citizens with a stronger need to seek out emotions are more likely to engage in motivated reasoning (Arceneaux & Vander Wielen, 2013). Most prominent in the field, however, and influenced by affective intelligence theory, recent research has shown that motivated reasoning is likely connected to feelings of anger (Marcus et al., 2011; Marcus, Neuman, & Mackuen, 2000). Results show that anger is correlated with motivated reasoning in response to negative information about a preferred candidate (Redlawsk et al., 2010), as well as information about different political policies (Suhay & Erisen, 2018), and misinformation about partisan issues (Weeks, 2015).

## A Circumplex Model of Affect in Motivated Reasoning

Previous research thus shows that discrete emotions matter in motivated reasoning. However, discrete emotions are only part of the larger concept of emotion. Another part of emotion is *affect*, which denotes the preconscious, physiological experience of emotion (Keltner & Gross, 1999). Affective states therefore precede discrete emotions, which are interpretations of experienced affective states. These conscious appraisals of emotion *can* align with affective states (Bradley, Codispoti, Cuthbert, & Lang, 2001), but this is not necessarily the case (LeDoux & Pine, 2016). This is relevant for motivated reasoning research, because the hot cognition hypothesis and motivated reasoning theory are largely built on the idea that reasoning is influenced by emotion *before conscious awareness* (Lodge & Taber, 2005, 2013; Redlawsk, 2002). It is therefore important to study both aspects of emotion when we attempt to understand its role in motivated reasoning.

This theoretical argument also has an empirical equivalent. The second reason that affective states are so important in motivated reasoning research is that the process of motivated reasoning itself can influence the formation of discrete emotions. The role of affect in motivated reasoning is that it causes, and therefore precedes, motivation. However, because they require conscious processing, discrete emotions can actually be dependent on citizens' motivations (Brader, 2006). They can be a *product* of motivated reasoning, instead of its *cause*. In this line of reasoning, both self-reported measures of discrete emotions and of counterarguing and attitudes can be subject to the same process of motivated reasoning and are therefore logically correlated. However, such correlations could be either the product of the hypothesized mediating role of emotion in motivated reasoning, or the *result* of that same motivated reasoning process. Again, the advantage of studying affect in motivated reasoning is that it entails a physiological experience (Keltner & Gross, 1999), and takes place before conscious awareness (Marcus, 2013). This means that affective states cannot be influenced by motivated reasoning and correlations with counterarguing, attitudes and behavioral intent must be an effect of such affective states rather than a product of motivated reasoning itself.

Affective states are often conceptualized two-dimensionally as a product of valence and arousal (Russell, 1980). The valence dimension denotes whether the experience of affect is positive or negative, while the arousal dimension reflects how active (aroused) or inactive (sleepy) someone's emotional state is. As depicted in Figure 1, this *circumplex model of affect* results in four quadrants. Positive and negative low arousal affective states are summarized under the terms 'relaxation' and 'depression', respectively, while high arousal affective states can be called 'excitement' and 'distress'. Motivated reasoning theory has had a strong focus on the valence dimension of affect and poses that threatening information leads to negative affective states, which lead to counterarguing, identity-defensive attitudes and identity-defensive behavior (Lodge & Taber, 2013). This only refers to the valence

dimension of affect and ignores the arousal dimension. It can therefore refer to both the distress and the depression quadrants in Figure 1. Indeed, recent research has shown that politically incongruent information leads to more negative affective states (Bakker, Schumacher, & Rooduijn, 2020). This leads to the first two hypotheses.

H1: Threatening political information causes negative affective states.

H2: Negative affective states lead to (a) counterarguing against the political information that caused them, (b) less support for policies associated with the threat and (c) less willingness to help related outgroups.

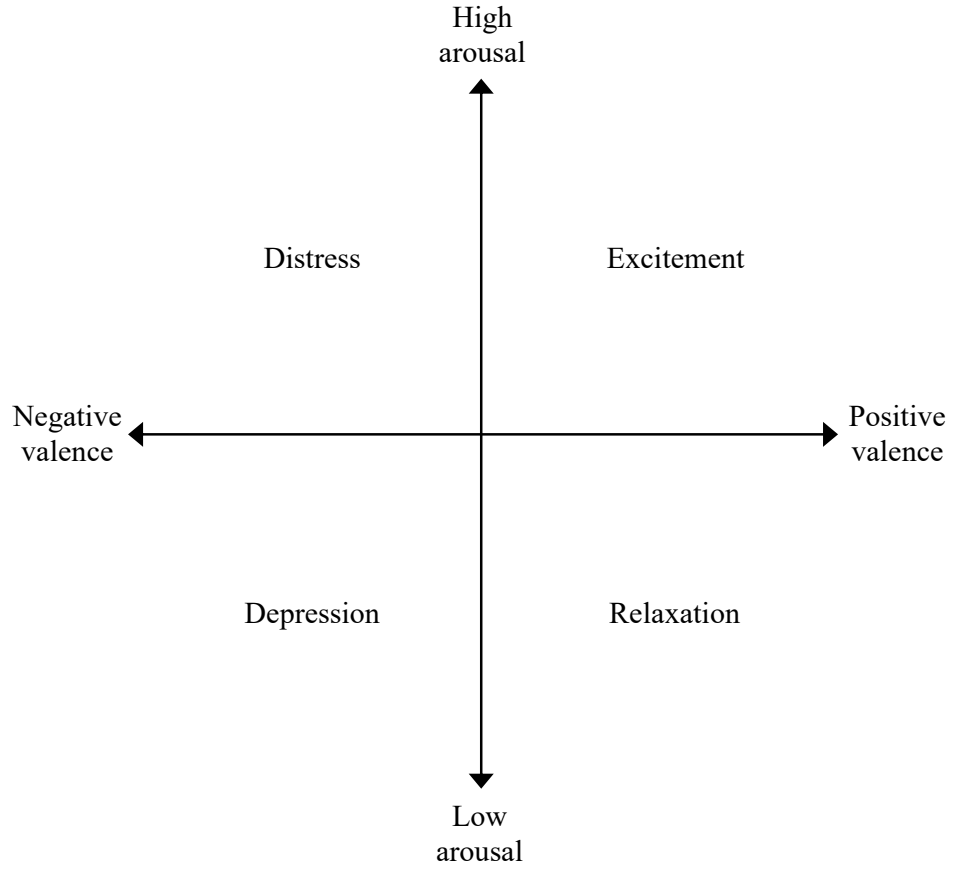


**Figure 1** A circumplex model of affective states, figure slightly adapted from Russell (1980).

Political information also affects states of arousal (Bakker et al., 2020; Bradley, Angelini, & Lee, 2007; Soroka, Fournier, & Nir, 2019; Soroka & McAdams, 2015), but the role of arousal in motivated reasoning is likely dependent on the valence dimension, because high arousal can signal either positive emotion (excitement) or negative emotion (distress) (Russell, 1980). Motivated reasoning is an active process, in which citizens use their cognitive energy to counterargue against threatening information (Jain & Maheswaran, 2000; Lodge & Taber, 2013; Taber & Lodge, 2006). While low-arousal negative affective states could give citizens the motivation to reduce this state, their low level of activation would inhibit them to spend the cognitive energy for motivated reasoning. In contrast, high arousal negative affective states provide both the motivation and the level of activation to actively scrutinize threatening political information, leading to the biased formation of attitudes and identity-defensive behavior. It can therefore be expected that motivated reasoning is specifically caused by *high-arousal negative affective states*. This is in line with previous findings on emotion in motivated reasoning, as anger is considered a high-arousal negative emotion (Russell, 1980). I thus formulate the last two hypotheses on the basis of an interaction between the valence and arousal dimensions, in which the link between negative affective states and motivated reasoning is stronger in combination with high arousal than with low arousal.

H3: Threatening political information causes *high-arousal negative affective states*.

H4: *High-arousal negative affective states* lead to (a) counterarguing against the political information that caused them, (b) less support for policies associated with the threat and (c) less willingness to help related outgroups.

## Method

**Design and sample**

In a laboratory experiment, I randomly expose participants to one of two TV news items about immigration, of which one is designed to be more threatening than the other. Immigration serves as a fitting case for this study, as research has shown that immigration is perceived as threatening by many citizens (e.g. Ted Brader, Valentino, & Suhay, 2008), and has effects on emotions, attitudes and intergroup behavior (Seate & Mastro, 2017). During exposure to the stimulus material, I take physiological measures to gauge participants' affective states and shortly after exposure, participants rate the arguments in the news item, their attitude toward the proposed policy, and their intention to engage in helping or harming behavior toward the refugees in the news item. The sample consists of 199 participants at *[anonymized for review].* One was not eligible, as he was an exchange student, two had to be excluded from the analyses because they sneezed during the experiment, which strongly affects the physiological measures. Finally, five participants had to be excluded because of technical problems with the measuring equipment, leading to a final sample of 191 participants. Most participants are undergraduate students of Communication Science, but also students of Chemistry and Information Science participated, as well as other interested citizens. All participants received a small monetary compensation, in addition to minor course credit for some.

As is to be expected of a sample comprised predominantly of students of communication, the sample is significantly skewed in some accounts. Women are overrepresented (68%) and the sample is relatively young (M = 23.41, SD = 5.02). In addition, the sample is skewed on ideological identification, as participants scored an average of 3.46 (SD = 1.71) on a scale from 0 (very left-wing) to 10 (very right-wing). Although this is not a representative sample of the Austrian population, random assignment to one of the two groups ensures internal validity (Shapiro, 2002). Moreover, one could argue that young,

left-wing college students are the least likely group to experience threat by immigration news and that I might therefore rather underestimate than overestimate effects.

**Stimulus material and procedure**

The stimulus material consists of two nearly identical constructed TV news items, which were created using a professional voice actor and video editing studio, and in cooperation with an editor of the Austrian public service newscaster. The news items state that, in following of international agreements, (1) Austria has to take on an additional [50/5000] refugees from certain African countries, (2) this will cost the taxpayer [nothing extra / 150 million euro's] and (3) that these refugees will [not / likely] obtain Austrian citizenship. These manipulations are designed to pose both real threat (number of refugees, additional cost to the taxpayer) and a symbolic (people with other ethnicities become Austrian citizens) threat (Ted Brader et al., 2008). Each news item lasts 54 seconds, and is identical in its footage, except for a manipulated graph depicting the number of refugees coming to Austria (see Appendix A). The first 8 seconds of the news items are entirely identical and serve as a baseline measure for each participant (see below).

Upon arrival in the laboratory, participants were told that they are taking part in a study into "the way citizens react to the news". They were informed of the exact measures that are taken and the electrodes that are placed on their finger and face – including that make-up needed to be removed and their skin had to be cleaned with medical cleaning alcohol. After signing an informed consent form, participants take place at a first site, where they answer pretest questions. When finished, they are seated behind a second computer, where the skin is prepared, and the electrodes are placed. Participants are instructed to watch 30 seconds of a grey screen in order to give the electrodes some time to settle in and give reliable measures, followed by the stimulus material. Between the grey screen and the stimulus material, respondents saw a 10 second countdown in order not to startle them when

the stimulus material begins. After the news item is finished, the post-test questionnaire is automatically displayed, and participants finish all remaining questions without researcher interference. When they are finished, the participants are detached from the physiological equipment and thoroughly debriefed, before receiving their monetary compensation. The entire procedure lasts under half an hour (see Figure 2). Both the participants and the researcher were blind to which version of the news item the participant would be exposed to.

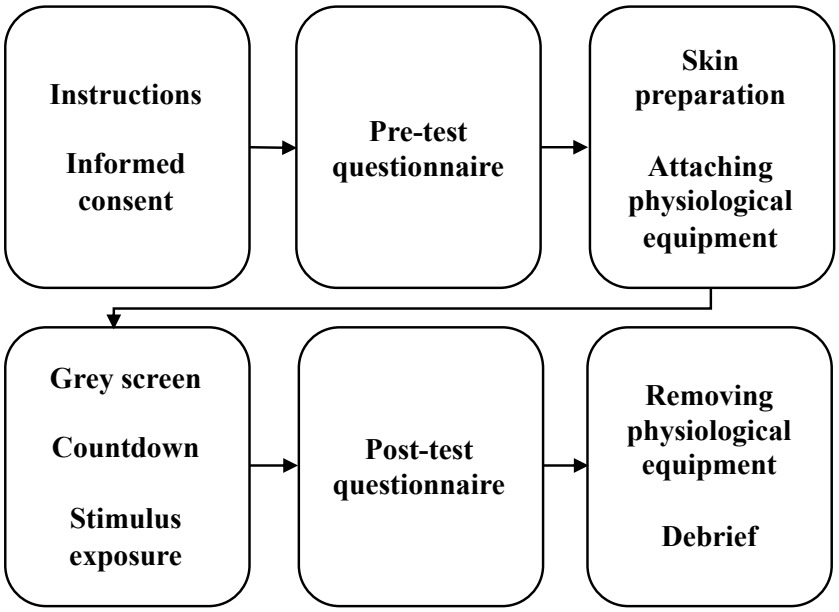


**Figure 2** Experimental procedure

To check whether participants took notice of the number of refugees supposedly coming to Austria, they were asked to choose one of four multiple choice categories: 50, 100, 5000 and 15000. In the low threat condition, 84% of participants named the correct number of refugees (50), and in the high threat condition even 89% of participants identified the correct number (5000). This difference was statistically significant, $\chi^2$ (3) = 142.10, p < .001.

**Physiological measures**

I use physiological measures to approximate the valence and arousal dimensions of affective states (Potter & Bolls, 2012). The valence of affective states is measured using

facial electromyography (EMG), and physiological arousal is measured using skin conductance levels (SCL). The physiological measures are taken using a Schuhfried BioFeedBack 2000 system, which includes a signal amplifier and a wireless system of electrodes for each measure. As the first eight seconds of the stimulus material are identical between the two conditions, the average score of participants in this period is used as the baseline on both the SCL and EMG measures. Comparing effects to the baseline measure ensures that different skin types and different placement of electrodes do not influence the results. Using the first part of the stimulus for this baseline, I take into account the differential effect of the increased threat, as opposed to the effect of immigration news as such.

**Valence.** As a measure of the *valence* of an affective state, EMG measures electrical activity in areas surrounding specific facial muscles using electrodes on the surface of the face. These pulses measure activity in muscles that correlate with the experience of certain affective states. The area that is most important for the purpose of this study is that surrounding the *Corrugator Supercilii*, which is located at the medial side of the eyebrows and is used to frown. It is correlated with the experience of negative affect, and increases in response to negative words (Wexler, Warrenburg, Schwartz, & Janer, 1992), images (Cacioppo & Petty, 1979), specific negative affective cues (Hietanen, Surakka, & Linnankoski, 1998), as well as to attitudinally incongruent political information (Bakker et al., 2020).

*Corrugator Supercilii* activity was measured using three electrodes in the face of each participant. For the EMG procedure and analysis, I followed the guidelines of Van Boxtel (2010). The two measurement electrodes are placed above the medial side of the right-hand side eyebrow and the reference electrode is placed in the center of the forehead, just below participants' hair line. The frequency was filtered between the range of 20-500Hz. The Schuhfried system automatically rectified the signal to be ready for analysis and, before I

averaged the signal per second. Following Van Boxtel (2010), in order to account for individual differences and electrode placement differences, I use the proportion of the EMG signal as compared to the baseline (average EMG levels during the identical first seconds of the news item). Artifacts in facial EMG are difficult to detect. However, to exclude the possibility that any effects are driven merely by a few very extreme cases, I treat three standard deviations above the mean of the final measure as a maximum possible value and impute cases that exceed it with that value. The analyses without this transformation lead to the same results and can be seen in Appendix C.

**Arousal.** As a measure of *arousal*, psychophysiologists often use the level of electrical conductance in the finger tips (Potter & Bolls, 2012). This *skin conductance level* (SCL) is associated with sweat secretion in the eccrine sweat glands. As opposed to the apocrine sweat glands that produce sweat to cool down the body, the eccrine sweat glands are mostly found at palms of the hands and feet and increase the amount of grip in arousing situations. As one would expect of a measure of arousal, SCL has been shown to increase in response to negative information, like negative political advertisements (Bradley, Angelini, & Lee, 2007) and negative news (Soroka et al., 2019; Soroka & McAdams, 2015). Likewise, SCL has been shown to correlate with positive affect, such as preferred political parties (Petersen, Giessing, & Nielsen, 2015), politicians (Wagner et al., 2015), and football teams (Potter & Keene, 2012).

The SCL measurement took place with a single electrode on the index finger of the non-dominant hand, and the data is processed following the recommendations of Potter and Bolls (2012). The non-dominant hand is used because it usually has less scar tissue, which secrets less sweat. The average of the baseline measurement is detracted from each value to phase out individual differences and differences in the placement of the electrodes. Next, similar to the EMG measure, the time points are averaged per second for the remaining 46

seconds. Following Potter and Bolls (2012), artifacts are defined as when the signal increases (> 20% per second) decreases (> 5% per second) unnaturally fast. Those data points are replaced by linearly imputing values between the last previous valid value and the first following valid value. Again, the analyses without this transformation lead to the same results and can be seen in Appendix C.

**Survey measures**

**Counterarguing.** Counterarguing against the information in the news item is operationalized in two nine-point semantic differentials, in which participants are asked to rate the argument that Austria should accept the refugees "because of international agreements". This is a common measure for counterarguing in motivated reasoning research (e.g. Taber & Lodge, 2006). The first semantic differential ranged from 1 (very weak) to 9 (very strong), and the second ranged from 1 (completely invalid) to 9 (completely valid). The two items are correlated, $r = .65$, $p < .001$, and I took the average of the inverted items such that a higher score means less perceived argument strength and therefore more counterarguing ($M = 3.16$, $SD = 1.65$).

**Attitudes.** Attitudes toward the immigration policy are measured using three statements on a nine-point Likert scale ranging from completely disagree to completely agree, which stated that "it is good that Austria accepts the refugees," "Austria should adhere to international agreements to take in legal refugees" and "Austria should have negotiated to take in fewer refugees" (reversely coded). These items formed a reliable scale, Cronbach's Alpha = .77, and the mean score was formed such that higher scores means more agreement with the policy to accept refugees into Austria on a scale from 1 through 9 ($M = 7.48$, $SD = 1.50$).

**Willingness to Help.** Willingness to help was measured using six questions gauging the likelihood of participants engaging in behaviors that would harm or help the refugees in

the stimulus material, on a scale from 1 (very unlikely) to 9 (very likely). The items concerning behavioral intent to harm the refugees were "join a demonstration against taking the refugees," "donating money to an anti-immigration group," and "convince others that it is not a good idea to accept the refugees," which were inverted such that a higher score means less intent to engage in this behavior. The items of behavioral intent to harm the refugees were "volunteering in a refugee center," "donating money to a refugee supporter group" and "signing a petition for better living standards of refugees." The final score of willingness to help is the mean score of the six items (M = 6.60, SD = 1.30, Cronbach's Alpha = .67).

**Data analysis and robustness checks**

Because this experiment focuses on the interaction between SCL and EMG levels, I leave the data disaggregated per second, such that each unit of analysis is one second of one participant. This has the advantage that we can see whether participants experience negative valence and arousal *at the same time*. However, in order to account for the fact that we use multiple data points per participants, I use panel corrected standard errors (PCSEs) in all analyses. As especially SCLs tend to decrease over time, I control for the time within the stimulus exposure in all analyses. The full regression models with panel corrected standard errors can be found in Appendix B and, as described above, the same analyses without transforming the artifact measures can be found Appendix C. Moreover, SCL has a delayed response time of around one second. Therefore, all analyses were also conducted with a one-second lag on the EMG measures in Appendix D. Finally, to check whether the effects on counterarguing, policy attitudes and helping behavior are not consequences of pretreatment immigration attitudes, all analyses are repeated with pretest immigration attitudes as a control variable in Appendix E. These robustness checks lead to the same conclusions as the analyses reported below.

## Results

### The role of negative valence (H1 & H2)

First, I look at the role of the valence dimension in the low-threat and high-threat condition. Upon initial inspection of the data, the results of the EMG measurement show an interesting finding (see Figure 3). While the average EMG levels remain fairly similar between the low-threat and high-threat condition for most of the news item, EMG levels rise at the final part of the news video in the low-threat condition. The timing coincides with the symbolic threat, where the group of refugees is not eligible for Austrian citizenship in the low-threat condition. As a result, the regression analysis shows that, contradicting hypothesis 1, affective states were more negative in the low-threat condition than in the high-threat condition, b = -.032, PCSE = .008, p = .00010 (Appendix B, Table A1, model 1). In other words, the high-threat condition elicited less negative affective states than the low-threat condition.

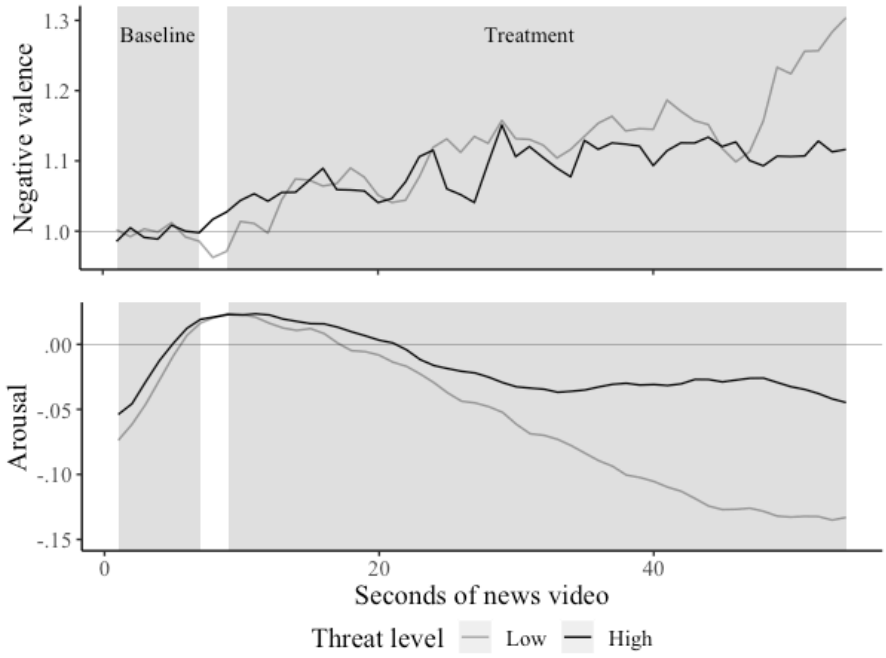


**Figure 3** Negative valence (EMG of the *Corrugator Superclii* muscle) and arousal (SCL) as response to the stimulus material.

Secondly, I focus on the effect of negative affective states on the three indicators of motivated reasoning. As expected, there is a significant positive effect of negative valence on counterarguing, b = .464, PCSE = .055, p < .00001 (Appendix B, Table A2, model 1), and a significant negative effect of negative valence on participants' attitude toward the immigration policy, b = -.284, PCSE = .044, p < .00001 (Appendix B, Table A2, model 3). In contrast, there was no effect of negative valence on participants' willingness to help the refugees, b = .005, PCSE = .035, p = .87576 (Appendix B, Table A2, model 5). The experience of negative affect led to more counterarguing, and less support for the immigration policy, but it did not lead to less willingness to help refugees. The findings thus only partly support hypothesis 2.

**High-arousal negative affective states (H3 & H4)**

In this section, I include arousal in the analyses to gauge the role of *high-arousal negative affective* states in motivated reasoning. An initial look at the arousal levels in response to the stimuli shows fewer surprises than those of negative valence. Average SCL rises in response to the immigration news and then slowly decreases over time (see Figure 3). However, in the high-threat condition, the decrease in average SCL is slower than in the low-threat condition and even rises again around 38 seconds into the stimulus material. Accordingly, and in line with previous research on negativity biases, SCLs are higher in the high-threat condition than in the low-threat condition, b = .038, PCSE = .005, p < .00001 (Appendix B, Table A1, model 2).

However, hypothesis 3 states that threatening information will specifically lead to more high-arousal negative affective states. I thus predict that arousal in the high-threat condition is specifically higher in combination with high levels of negative valence.

Therefore, I model arousal as a function of the experimental manipulation and negative valence. In line with hypothesis 3, there is a significant interaction effect of the threatening condition and negative valence on arousal levels, b = .114, PCSE = .020, p < .00001 (Appendix B, Table A1, model 3). As depicted in Figure 4, in the low-threat condition, negative affective states are associated with a strong drop in arousal. In other words, when participants in the low-threat condition experienced negative affect, they were low-arousal negative affective states. In contrast, arousal is much higher in combination with negative affect in the high-threat condition. In other words, and in support of hypothesis 3, high-arousal negative affective states – states of high arousal and negative valence – were more prevalent in the high-threat condition than in the low-threat condition.

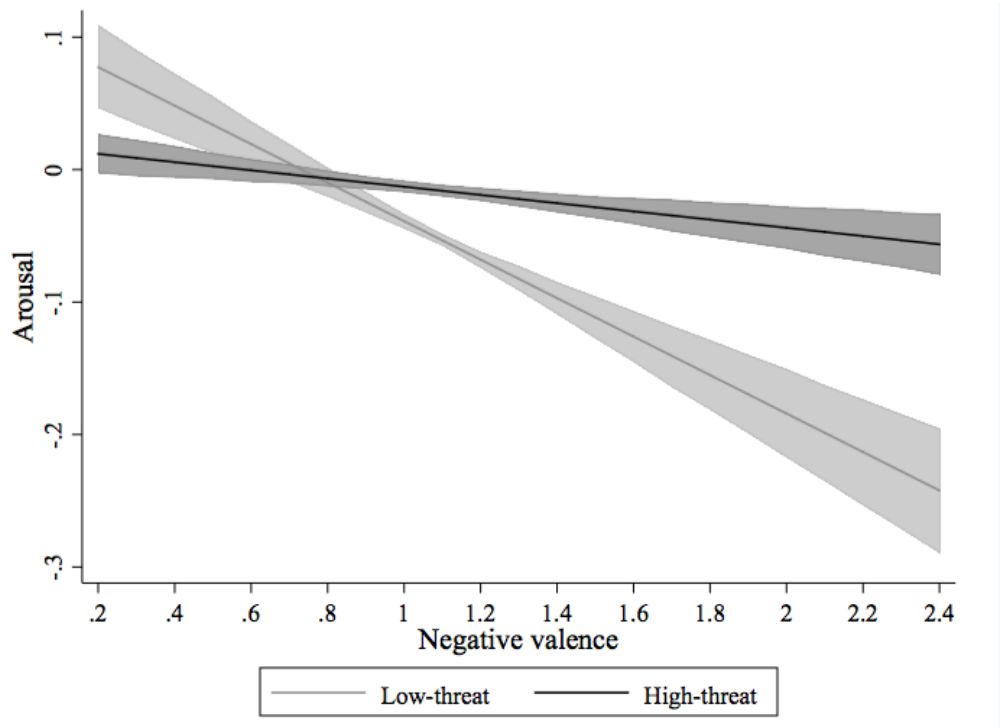


**Figure 4** Predicted values and 95% confidence intervals for arousal (SCL), as a function of negative valence (*Corrugator Superclii* activity) in the low-threat and high-threat conditions (see Appendix B, Table A1, model 3).

In this section, I investigate the role of arousal in predicting the indicators for motivated reasoning. Physiological arousal seems to lead to more counterarguing, b = .051, PCSE = .016, p = .00115 (Appendix B, Table A2, model 1), and to less willingness to help the refugees, b = .056, PCSE = .12, p < .00001 (Appendix B, Table A2, model 5). However, there is no significant effect on arousal on participants' attitudes toward the immigration policy, b = -.015, PCSE = .009, p = .092637 (Appendix B, Table A2, model 3). The direct effects of arousal on motivated reasoning thus show mixed results.

However, as expressed in hypothesis 4, I expect that specifically high-arousal negative affective states lead to more counterarguing, less support for the immigration policy and less willingness to help the refugees. Therefore, I model the interaction effect of valence and arousal on these indicators of motivated reasoning. Indeed, the results indicate that there is a highly significant interaction effect of valence and arousal on counterarguing, b = 1.153, PCSE = .149, p < .00001 (Appendix B, Table A2, model 2). As Figure 5 shows, there is a much stronger effect of negative valence on counterarguing in combination with high arousal (M + SD) than in combination with low arousal (M - SD). Similarly, the results indicate that there is a highly significant interaction effect of negative valence and arousal on attitudes toward the immigration policy, b = -.493, PCSE = .094, p < .00001 (Appendix B, Table A2, model 4). There is a much stronger negative effect of negative valence on participants' attitudes towards the immigration policy for high levels of arousal than low levels of arousal (see Figure 5). Finally, there is a significant interaction effect of negative valence and arousal on participants' willingness to help the refugees, b = -.503, PCSE = .079, p < .00001 (Appendix B, Table A2, model 6). As expected, Figure 5 shows that for high levels of arousal, negative valence leads to less willingness to help. In contrast, for low levels of arousal, negative valence even leads to *more* willingness to help the refugees. In conclusion, I find that threatening news indeed leads to more high-arousal negative affective states. In turn,

high-arousal negative affective states lead to counterarguing against the information that causes it, to negative attitudes toward the immigration policy, and to less willingness to help outgroups.

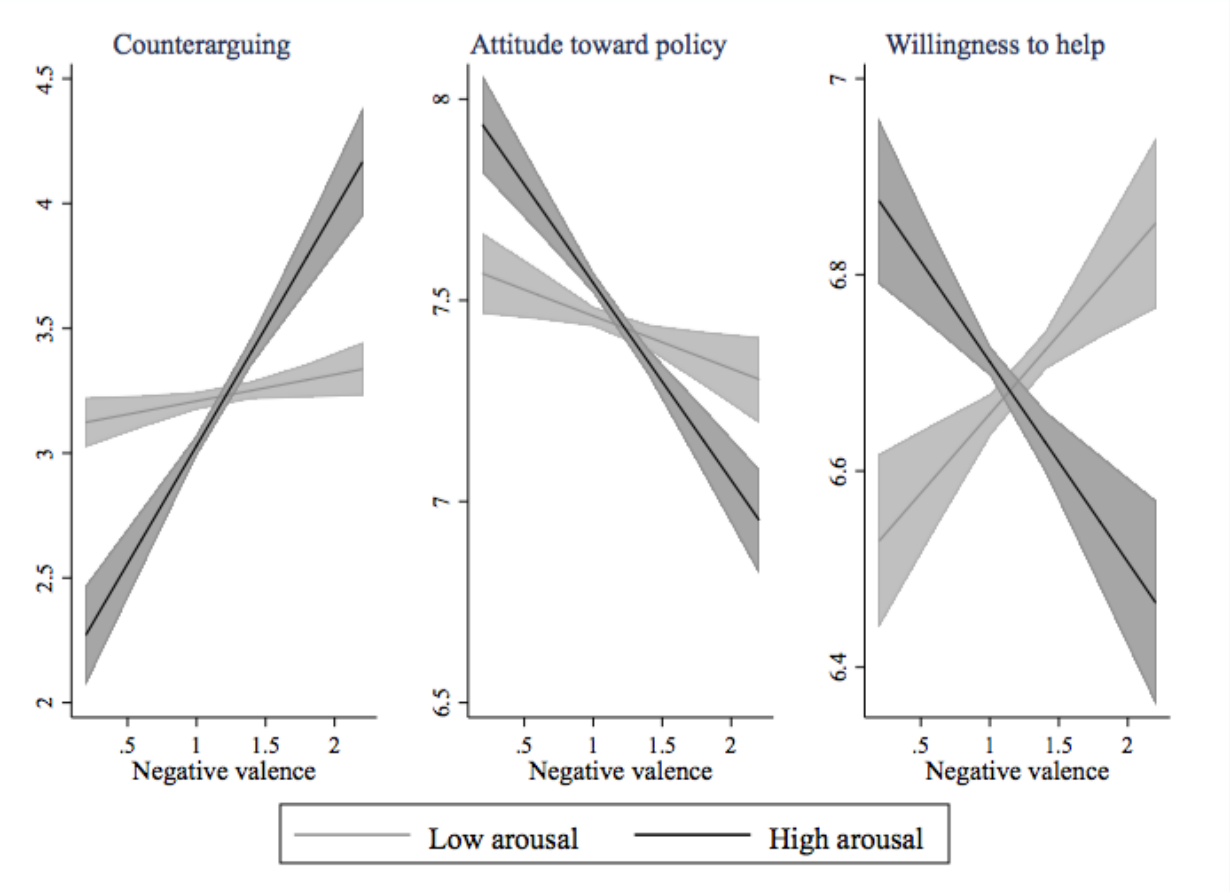


**Figure 5** Predicted values and 95% confidence intervals for counterarguing, attitudes toward the immigration policy and the willingness to help refugees, as a function of negative valence (*Corrugator Superclii* activity), at low (M – SD) and high (M + SD) levels of arousal (SCL; see Appendix B, Table A2, models 2, 4 and 6, respectively).

## Discussion

This study set out to explore the role of affective states in motivated reasoning. In order to do so, it applied physiological measures of affective states that occur preconsciously and uncontrollably. Unexpectedly, the findings show that more threatening news about

immigration leads to more arousal, but less negative affective states, among Austrian citizens. However, combining these two dimensions of affect indicated that citizens experienced low-arousal negative affective states in response to low-threat political information, but they experienced more high-arousal negative affective states in response to threatening news. Subsequently, the results showed that, to some extent, both negative valence and arousal led to counterarguing and opposition against accepting refugees, and less intent to help them. Again, combining the two measures showed that it was mostly high-arousal negative affective states that caused these effects. In contrast, low-arousal negative affective states had much smaller effects on counterarguing and policy attitudes, and even a reverse effect on the willingness to help outgroup members. These findings can contribute to motivated reasoning research in at least three ways.

Firstly, this study shows that the negative valence dimension of affect does not fully describe the role of affective states in motivated reasoning. Applying a two-dimensional circumplex model of affect to motivated reasoning (Russel, 1980), shows that physiological arousal functions in combination with negative affect in specific ways. A key finding of this study is, therefore, that threatening news does not just lead to more negative affect, but specifically to more *high-arousal* negative affective states. It also shows that exactly this type of affective state leads to the strongest motivated reasoning effects. Since anger is considered a high-arousal negative emotion (Russel, 1980), this is in line with previous findings that show that anger is the main driver of motivated reasoning (Marcus et al., 2011). However, this theoretical advancement has some important implications.

Because motivated reasoning is based on the active scrutiny of threatening information (Lodge & Taber, 2013), it makes sense that low-arousal affective states lead to less counterarguing of political information than high-arousal negative affective states. People with equivalent discrete emotions – who are sad or depressed – are usually better

described as inactive and should be expected to ignore or zone out of threatening information environments instead of actively engaging with them. Arousal was even more important in the effect on the willingness to help refugees, since low-arousal negative affective states led to *more* willingness to help the outgroup. Possibly, participants in low-arousal negative affective states wanted to help the refugees because they felt sad for them. Indeed, the willingness to help others has long been thought to be motivated by negative-state relief too, albeit low-arousal negative affective states (Cialdini et al., 1987). Without incorporating discrete emotions, though, this explanation is merely speculation, and future research is necessary to illuminate the interplay between affective states and discrete emotions in motivated reasoning more precisely.

Notably, in my results, low-arousal negative affective states still caused some polarizing effects by, for instance, leading to *some* counterarguing and *somewhat* more negative attitudes toward the immigration policy. This finding seems crucial in the current debate of whether motivated reasoning is (always) the mechanism through which threats lead to polarization. Instead of through motivated reasoning, citizens may also in certain situations merely take on the expected stance of their group (Han & Federico, 2018). Perhaps the level of arousal that is elicited by threatening political information may explain such differential cognitive mechanisms. After all, processes like self-stereotyping should cost less energy than the active counterarguing of political information. Studying the differential cognitive mechanisms caused by low-arousal and high-arousal negative affective states in political information processing would thus be a fruitful next endeavor.

Secondly, this paper validates the causal path that is assumed in previous research about emotions in motivated reasoning. Several studies have found that anger mediates motivated reasoning effects, based on correlational evidence between self-report measures (Redlawsk et al., 2010; Suhay & Erisen, 2018; Weeks, 2015). Such studies assume that there

is a causal direction in which emotions are experienced after threatening information on the one side and before counterarguing, attitudes and behaviors on the other. However, we know that the expression of emotions is subject to motivations too (Brader, 2006). The use of physiological measures in the current study shows that *preconscious* experiences of emotion affect the reasoning patterns that we observe in other research. These results thus show that studies that use self-reported measures of emotion have a valid claim of causality because it shows that emotion actually *precedes* motivated reasoning.

Finally, this paper shows how we can combine physiological measures to study a circumplex model of affect in motivated reasoning research. Research incorporating physiological measures in political science has usually focused on only one dimension – most commonly arousal (e.g. Soroka et al., 2019; Soroka & McAdams, 2015), or analyzed arousal and valence as two separate entities (e.g. Bakker et al., 2020). Yet, the two dimensions are inherently connected. As the results in this paper underline, both positive and negative affective states are very different in combination with low or high arousal. And, conversely, arousal has very different effects for citizens in positive or negative affective states. Modeling the two dimensions together as interaction effects allows researchers to take all four quadrants of the circumplex model of affect into account (Russel, 1980). This is important because, as my results show, adding the arousal dimension to the study of affective states in motivated reasoning can illuminate differential effects. This study may thus inspire researchers to move beyond simplified unidimensional models and analyses of affective states when studying political information processing, leading to more nuanced results.

Yet the results in this study are not without caveats. First of all, the results showed that threatening news lead to less negative affective states. Some might say that this finding contradicts a strand of research that finds that *Corrugator Supercilii* activity is affected by negative political information (e.g. Cacioppo & Petty, 1979; Hietanen, Surakka, &

Linnankoski, 1998; Wexler et al., 1992, Bakker et al., 2020). The results in this study, however, suggest that only considering the valence dimension of affect is simply not enough: threatening political information elicited less *low-arousal* negative affective states, but more *high-arousal* negative affective states. One can imagine that those in the low-threat condition were only sad for the refugees and not threatened at all. While this shows that using sensitive physiological measures in studying complex societal issues can be challenging, it also shows that incorporating a more comprehensive model of affective states can help understand citizens' emotional reactions better.

A second challenge posed by this experiment is how to interpret these results with regard to previous findings of discrete emotions in motivated reasoning. The question remains, as what emotion(s) are the affective states in this experiment interpreted by those experiencing them and how does this interpretation affect information processing. The theory of affective intelligence states that anger leads to motivated reasoning, while anxiety leads to information seeking behavior (Marcus et al., 2011). As those are both high-arousal negative affective states (Russel, 1980), the results of this experiment cannot distinguish between these emotions. Yet, anger and anxiety also often exist simultaneously, and can sometimes have similar effects on immigration attitudes as well (Brader et al., 2008). The goal of the current experiment, though, was not to differentiate between different discrete emotions but to address the physiological process preceding them. As mentioned before, it would be fruitful for future research to investigate this interplay between affect and discrete emotions in motivated reasoning.

In conclusion, the use of combined physiological measures of affective states in this study has offered support for the hypothesis that high-arousal negative affective states in response to threatening political information cause counterarguing against this information, as well as opposition against immigration policy and less willingness to help associated

outgroups. This is in line with theories of "hot cognition" (Redlawsk, 2002) and motivated reasoning (Kunda, 1990; Lodge & Taber, 2013). These findings improve our understanding of the role of emotions in political information processing and help to explain how citizens' political reasoning comes to be.

Literature

Abelson, R. P. (1963). Computer simulation of "hot cognition." In S. S. Tomkins & S. Messick (Eds.), *Computer Simulation of Personality* (pp. 277–294). New York: Wiley.

Arceneaux, K., & Vander Wielen, R. J. (2013). The effects of Need for Cognition and Need for Affect on partisan evaluations. *Political Psychology*, *34*(1), 23–42. https://doi.org/10.1111/j.1467-9221.2012.00925.x

Bakker, B. N., Schumacher, G., & Rooduijn, M. (2020). *Hot politics? Affective responses to political rhetoric*. Retrieved from https://osf.io/dqc74/

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, *117*(3), 497–529. https://doi.org/10.4135/9781483326573.n112

Bolsen, T., Druckman, J. N., & Cook, F. L. (2014). The influence of partisan motivated reasoning on public opinion. *Political Behavior*, *36*(2), 235–262. https://doi.org/10.1007/s11109-013-9238-0

Boyer, M. M., Lecheler, S., & Aaldering, L. (n.d.). Don't throw the frame out with the bathwater: How episodic news frames can prevent identity-motivated reasoning.

Brader, T. (2006). *Campaigning for Hearts and Minds: How Emotional Appeals in Political Ads Work*. Chicago: University of Chicago Press.

Brader, Ted, Valentino, N. A., & Suhay, E. (2008). What triggers public opposition to immigration? Anxiety, group cues, and immigration threat. *American Journal of Political Science*, *52*(4), 959–978. https://doi.org/10.1111/j.1540-5907.2008.00353.x

Bradley, M. M., Codispoti, M., Cuthbert, B. N., & Lang, P. J. (2001). Emotion and motivation I: Defensive and appetitive reactions in picture processing. *Emotion*, *1*(3), 276–298. https://doi.org/10.1037/1528-3542.1.3.276

Bradley, S. D., Angelini, J. R., & Lee, S. (2007). Psychophysiological and memory effects of

negative political ADS aversive, arousing, and well remembered. *Journal of Advertising*, *36*(4), 115–127. https://doi.org/10.2753/JOA0091-3367360409

Cacioppo, J. T., & Petty, R. E. (1979). Attitudes and cognitive response: An electrophysiological approach. *Journal of Personality and Social Psychology*, *37*(12), 2181–2199. https://doi.org/10.1037/0022-3514.37.12.2181

Cialdini, R. B., Schaller, M., Houlihan, D., Arps, K., Fultz, J., & Beaman, A. L. (1987). Empathy-based helping: Is it selflessly or selfishly motivated? *Journal of Personality and Social Psychology*, *52*(4), 749–758. https://doi.org/10.1037/0022-3514.52.4.749

Cohen, G. L. (2003). Party over policy: The dominating impact of group influence on political beliefs. *Journal of Personality and Social Psychology*, *85*(5), 808–822. https://doi.org/10.1037/0022-3514.85.5.808

Druckman, J. N., & McGrath, M. C. (2019). The evidence for motivated reasoning in climate change preference formation. *Nature Climate Change*, *9*(2), 111–119. https://doi.org/10.1038/s41558-018-0360-1

Feldman, S., & Huddy, L. (2018). Racially motivated reasoning. In *The Feeling, Thinking Citizen: Essays in Honor of Milton Lodge* (pp. 171–193). New York and London: Routledge. https://doi.org/10.4324/9781351215947

Gadarian, S. K. (2010). The politics of threat: How terrorism news shapes foreign policy attitudes. *Journal of Politics*, *72*(2), 469–483. https://doi.org/10.1017/S0022381609990910

Han, J., & Federico, C. M. (2018). The polarizing effect of news framing: Comparing the mediating roles of motivated reasoning, self-stereotyping, and intergroup animus. *Journal of Communication*, *68*(4), 685–711. https://doi.org/10.1093/joc/jqy025

Hart, P. S., & Feldman, L. (2014). Threat without efficacy? Climate change on U.S. network news. *Science Communication*, *36*(3), 325–351.

https://doi.org/10.1177/1075547013520239

Hart, S. P., & Nisbet, E. C. (2012). Boomerang effects in science communication: How motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Communication Research*, *39*(6), 701–723. https://doi.org/10.1177/0093650211416646

Hietanen, J. K., Surakka, V., & Linnankoski, I. (1998). Facial electromyographic responses to vocal affect expressions. *Psychophysiology*, *35*(5), 530–536. https://doi.org/10.1017/S0048577298970445

Jain, S. P., & Maheswaran, D. (2000). Motivated reasoning: A depth-of-processing perspective. *Journal of Consumer Research*, *26*(4), 358–371. https://doi.org/10.1086/209568

Kahan, D. (2010). Fixing the communications failure. *Nature*, *463*(7279), 296–297. https://doi.org/10.1038/463296a

Kahan, D. M., Braman, D., Gastil, J., Slovic, P., & Mertz, C. K. (2007). Culture and identity-protective cognition: Explaining the white-male effect in risk perception. *Journal of Empirical Legal Studies*, *4*(3), 465–505. https://doi.org/10.4324/9781849776677

Kahan, D. M., Slovic, P., Braman, D., Gastil, J., Cohen, G. L., & Kysar, D. A. (2008). Biased assimilation, polarization, and cultural credibility: An experimental study of nanotechnology risk perceptions. *Project on Emerging Nanotechnologies, Brief No.3*. https://doi.org/10.2139/ssrn.1090044

Keltner, D., & Gross, J. J. (1999). Functional accounts of emotions. *Cognition and Emotion*, *13*(5), 467–480. https://doi.org/10.1080/026999399379140

Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, *108*(3), 480–498. https://doi.org/10.1037/0033-2909.108.3.480

Landrum, A. R., Lull, R. B., Akin, H., Hasell, A., & Jamieson, K. H. (2017). Processing the

papal encyclical through perceptual filters: Pope Francis, identity-protective cognition, and climate change concern. *Cognition*, *166*, 1–12. https://doi.org/10.1016/j.cognition.2017.05.015

Lebo, M. J., & Cassino, D. (2007). The aggregated consequences of motivated reasoning and the dynamics of partisan presidential approval. *Political Psychology*, *28*(6), 719–746. https://doi.org/10.1111/j.1467-9221.2007.00601.x

LeDoux, J. E., & Pine, D. S. (2016). Using neuroscience to help understand fear and anxiety: A two-system framework. *American Journal of Psychiatry*, *173*(11), 1083–1093. https://doi.org/10.1176/appi.ajp.2016.16030353

Leeper, T. J., & Slothuus, R. (2014). Political parties, motivated reasoning, and public opinion formation. *Advances in Political Psychology*, *35*(1), 129–156. https://doi.org/10.1111/pops.12164

Lodge, M., & Taber, C. S. (2005). The automaticity of affect for political leaders, groups, and issues: An experimental test of the hot cognition hypothesis. *Political Psychology*, *26*(3), 455–482. https://doi.org/10.1111/j.1467-9221.2005.00426.x

Lodge, M., & Taber, C. S. (2013). *The Rationalizing Voter*. New York: Cambridge University Press.

Marcus, G E. (2013). *Political Psychology: Neuroscience, Genetics, and Politics*. Oxford: Oxford University Press.

Marcus, George E, Mackuen, M., & Neuman, W. R. (2011). Parsimony and complexity: Developing and testing theories of affective intelligence. *Political Psychology*, *32*(2), 323–336. https://doi.org/10.1111/j.1467-9221.2010.00806.x

Marcus, Geroge E, Neuman, W. R., & Mackuen, M. (2000). *Affective Intelligence and Political Judgment*. Chicago: Chicago University Press.

Petersen, M. B., Giessing, A., & Nielsen, J. (2015). Physiological responses and partisan

bias: Beyond self-reported measures of party identification. *PLoS ONE*, *10*(5), 1–10. https://doi.org/10.1371/journal.pone.0126922

Potter, R. F., & Bolls, P. D. (2012). *Psychophysiological Measurement and Meaning: Cognitive and Emotional Processing of Media*. New York: Routledge.

Potter, R. F., & Keene, J. R. (2012). The effect of sports fan identification on the cognitive processing of sports news. *International Journal of Sport Communication*, *5*(3), 348–367. https://doi.org/10.1123/ijsc.5.3.348

Redlawsk, D. P. (2002). Hot cognition or cool consideration? Testing the effects of motivated reasoning on political dcision making. *The Journal of Politics*, *64*(4), 1021–1044. Retrieved from http://www.jstor.org/stable/pdf/1520074.pdf

Redlawsk, D. P., Civettini, A. J. W., & Emmerson, K. M. (2010). The affective tipping point: Do motivated reasoners ever "get it"? *Political Psychology*, *31*(4), 563–593. https://doi.org/10.1111/j.1467-9221.2010.00772.x

Russel, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178. https://doi.org/10.1037/h0077714

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, *39*(6), 1161–1178. https://doi.org/10.1037/h0077714

Seate, A. A., & Mastro, D. (2017). Exposure to immigration in the news: The impact of group-level emotions on intergroup behavior. *Communication Research*, *44*(6), 817–840. https://doi.org/10.1177/0093650215570654

Shapiro, M. A. (2002). Generalizability in communication research. *Human Communication Research*, *28*(4), 491–500. https://doi.org/10.1093/hcr/28.4.491

Shoda, T. M., McConnell, A. R., & Rydell, R. J. (2014). Having explicit-implicit evaluation discrepancies triggers race-based motivated reasoning. *Social Cognition*, *32*(2), 190–202. https://doi.org/10.1521/soco.2014.32.2.190

Slothuus, R., & De Vreese, C. (2010). Political parties, motivated reasoning, and issue framing effects. *The Journal of Politics*, *72*(3), 630–645. https://doi.org/10.1017/s002238161000006x

Soroka, S., Fournier, P., & Nir, L. (2019). Cross-national evidence of a negativity bias in psychophysiological reactions to news. *Proceedings of the National Academy of Sciences of the United States of America*, *116*(38), 18888–18892. https://doi.org/10.1073/pnas.1908369116

Soroka, S., & McAdams, S. (2015). News, politics, and negativity. *Political Communication*, *32*(1), 1–22. https://doi.org/10.1080/10584609.2014.881942

Suhay, E., & Erisen, C. (2018). The role of anger in the biased assimilation of political information. *Political Psychology*, *39*(4), 793–810. https://doi.org/10.1111/pops.12463

Taber, C. S., & Lodge, M. (2006). Motivated skepticism in the evaluation of political beliefs. *American Journal of Political Science*, *50*(3), 755–769.

Van Boxtel, A. (2010). Facial EMG as a tool for inferring affective states. In A. J. Spink, F. Grieco, O. E. Krips, L. W. S. Loijens, L. P. J. J. Noldus, & P. H. Zimmerman (Eds.), *Proceedings of Measuring Behavior*. Eindhoven: Noldus Information Technology bv.

Wagner, M. W., Deppe, K. D., Jacobs, C. M., Friesen, A., Smith, K. B., & Hibbing, J. R. (2015). Beyond survey self-reports: Using physiology to tap political orientations. *International Journal of Public Opinion Research*, *27*(3), 303–317. https://doi.org/10.1093/ijpor/edu036

Weeks, B. E. (2015). Emotions, partisanship, and misperceptions: How anger and anxiety moderate the effect of partisan bias on susceptibility to political misinformation. *Journal of Communication*, *65*(4), 699–719. https://doi.org/10.1111/jcom.12164

Westen, D., Blagov, P. S., Harenski, K., Kilts, C., & Hamann, S. (2006). Neural bases of motivated reasoning: An fMRI study of emotional constraints on partisan political

judgment in the 2004 U.S. presidential election. *Journal of Cognitive Neuroscience*, *18*(11), 1947–1958. https://doi.org/10.1162/jocn.2006.18.11.1947

Wexler, S. E., Warrenburg, G., Schwartz, B. E., & Janer, L. D. (1992). EEG and EMG responses to emotion-evoking stimuli processed without conscious awareness. *Neuropsychologia*, *30*(12), 1065–1079. https://doi.org/10.1016/0028-3932(92)90099-8

## Appendix A: Graphics

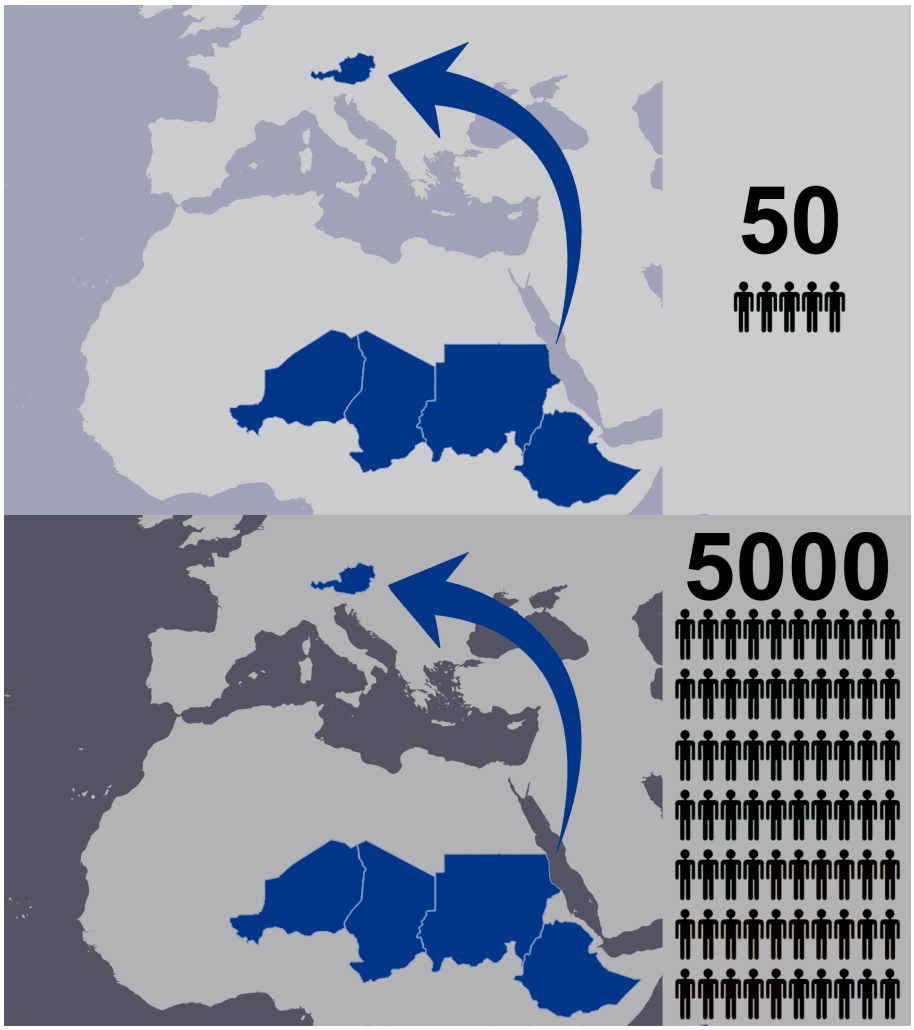


**Figure A1** Screenshot of the dynamic graphics included in the low-threat (above) and high-threat (below) condition.

## Appendix B: Regression Models

This appendix shows the regression models that belong to the analyses as discussed in the body text of the paper. All analyses are controlled for each second of the stimulus material through a dummy variable for each second, except the first (the first variable served as the reference category). These 53 dummy variables are not of interest for the research question, and in order to save space, they are omitted from the tables.

Table A1

*Regression analyses predicting negative valence (EMG) and arousal (SCL) with the manipulated immigration threat, controlled for the time in seconds (omitted from the table).*

| *Dependent variable:* | Negative valence (EMG) | Arousal (SCL) | |
|---|---|---|---|
| *Model* | 1 | 2 | 3 |
| Threat (high) | -.032** | .038*** | -.088*** |
| | (.008) | (.005) | (.021) |
| EMG | | -.081*** | -.145*** |
| | | (.009) | (.018) |
| Threat * EMG | | | .114*** |
| | | | (.020) |
| Constant | 1.009*** | .082*** | .151*** |
| | (.004) | (.009) | (.018) |
| Adjusted $R^2$ | .021 | .012 | .015 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

Table A2

*Regression analyses predicting counterarguing, policy attitudes and the willingness to help refugees with negative valence (EMG) and arousal (SCL), controlled for the time in seconds (omitted from the table).*

| *Dependent variable:* | Counterarguing | | Attitude toward immigration policy | | Willingness to help refugees | |
|---|---|---|---|---|---|---|
| *Model* | 1 | 2 | 3 | 4 | 5 | 6 |
| Negative valence (EMG) | .464*** | .566*** | -.284*** | -.328*** | .005 | -.039 |
| | (.055) | (.062) | (.044) | (.046) | (.035) | (.035) |
| Arousal (SCL) | .051* | -1.399*** | -.015 | .606*** | -.056*** | .576*** |
| | (.016) | (.189) | (.009) | (.120) | (.012) | (.097) |
| Negative valence (EMG) | | 1.153*** | | -.493*** | | -.503*** |
| * arousal (SCL) | | (.149) | | (.094) | | (.079) |
| Constant | 7.299*** | 7.391*** | 7.757*** | 7.796*** | 6.683*** | 6.723*** |
| | (.054) | (.061) | (.044) | (.045) | (.035) | (.035) |
| Adjusted R2 | .003 | .012 | -.002 | .000 | -.005 | -.002 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$*p < .01$, **$p < .001$, ***$p< .0001$;* dummy variables for each second of the stimulus material are omitted from the table.

## Appendix C: Regression Models, no transformations

This appendix shows the regression models without transformations of the physiological data. That means that the SCL results are not smoothed when they increased faster than 25% per second or decrease faster than 5% per second, and that the EMG results are allowed to go higher than 3 SD above the mean. Again, all analyses are controlled for each second of the stimulus material through a dummy variable for each second, except the first (the first variable served as the reference category). These 53 dummy variables are not of interest for the research question, and in order to save space, they are omitted from the tables.

Table A3

*Regression analyses predicting negative valence (EMG) and arousal (SCL) with the manipulated immigration threat, controlled for the time in seconds (omitted from the table) and using the untransformed data.*

| *Dependent variable:* | Negative valence (EMG) | Arousal (SCL) | |
|---|---|---|---|
| *Model* | 1 | 2 | 3 |
| Threat (high) | -.033* | .039*** | -.016 |
| | (.013) | (.005) | (.016) |
| EMG | | -.040*** | -.070*** |
| | | (.007) | (.014) |
| Threat * EMG | | | .049** |
| | | | (.015) |
| Constant | 1.061*** | .055*** | -.086*** |
| | (.007) | (.007) | (.015) |
| Adjusted $R^2$ | .009 | .011 | .012 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

Table A4

*Regression analyses predicting counterarguing, policy attitudes and the willingness to help refugees with negative valence (EMG) and arousal (SCL) controlled for the time in seconds (omitted from the table) and using the untransformed data.*

| *Dependent variable:* | Counterarguing | | Attitude toward immigration policy | | Willingness to help refugees | |
|---|---|---|---|---|---|---|
| *Model* | 1 | 2 | 3 | 4 | 5 | 6 |
| Negative valence (EMG) | .299*** | .341*** | -.144** | -.155** | .003 | -.018 |
| | (.048) | (.052) | (.042) | (.040) | (.034) | (.033) |
| Arousal (SCL) | .044* | -.959*** | -.015 | .259 | -.077*** | .276* |
| | (.016) | (.153) | (.010) | (.134) | (.012) | (.092) |
| Negative valence (EMG) | | .783*** | | -.214 | | -.275** |
| * arousal (SCL) | | (.119) | | (.101) | | (.071) |
| Constant | 2.849*** | 2.816*** | 7.625*** | 7.634*** | 6.693*** | 6.705*** |
| | (.050) | (.053) | (.043) | (.042) | (.035) | (.035) |
| Adjusted R2 | .002 | .008 | -.003 | -.003 | -.005 | -.004 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

## Appendix D: Regression Models, EMG Time-Lagged Correction

This appendix shows the regression models with a one-second time-lagged correction on the EMG measurement, as SCL measurement of sweat secretion responses take about one second to react. All analyses are controlled for each second of the stimulus material through a dummy variable for each second, except the first (the first variable served as the reference category). These 53 dummy variables are not of interest for the research question, and in order to save space, they are omitted from the tables.

Table A5

*Regression analyses predicting negative valence (EMG) and arousal (SCL) with the manipulated immigration threat, controlled for the time in seconds (omitted from the table) and using the lagged measure for negative valence as predictor.*

| *Dependent variable:* | Negative valence (EMG) | Arousal (SCL) | |
|---|---|---|---|
| *Model* | 1 | 2 | 3 |
| Threat (high) | -.032** | .040*** | -.093*** |
| | (.008) | (.005) | (.021) |
| EMG (t-1) | | -.082*** | -.149*** |
| | | (.009) | (.018) |
| Threat * EMG (t-1) | | | .120*** |
| | | | (.020) |
| Constant | 1.009*** | .085*** | .157*** |
| | (.004) | (.009) | (.018) |
| Adjusted $R^2$ | .021 | .012 | .014 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

Table A6

*Regression analyses predicting counterarguing, policy attitudes and the willingness to help refugees with negative valence (t-1) (EMG) and arousal (SCL), controlled for the time in seconds (omitted from the table) and using the lagged measure for negative valence as predictor.*

| *Dependent variable:* | Counterarguing | | Attitude toward immigration policy | | Willingness to help refugees | |
|---|---|---|---|---|---|---|
| *Model* | 1 | 2 | 3 | 4 | 5 | 6 |
| Negative valence (EMG, t-1) | .464*** | .567*** | -.284*** | -.328*** | .006 | -.040 |
| | (.055) | (.062) | (.044) | (.046) | (.035) | (.035) |
| Arousal (SCL) | .047* | -1.382*** | -.013 | .588*** | -.055*** | .573*** |
| | (.015) | (.186) | (.008) | (.115) | (.012) | (.099) |
| Negative valence (EMG, t-1) * arousal (SCL) | | 1.137*** | | -.478*** | | -.499*** |
| | | (.147) | | (.090) | | (.080) |
| Constant | 2.701*** | 2.609*** | 7.757*** | 7.796*** | 6.683*** | 6.724*** |
| | (.054) | (.061) | (.044) | (.045) | (.035) | (.035) |
| Adjusted R2 | .003 | .012 | -.002 | .000 | -.005 | -.002 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

## Appendix D: Regression Models, controlled for immigration attitudes

This appendix shows the regression models, controlled for pretest immigration attitudes. In the pretest of the experiment, participants were asked to rate their stance on ten political issues regarding among others socio-economic policy, gender issues, and immigration. The two items regarding immigration read “Austria should try to accept as few immigrants as possible” and “People who flee from violence should always be welcome in Austria”. Participants could answer the questions on a scale from 1 (completely disagree) through 9 (completely agree). The items were recoded such that higher scores mean more positive attitudes toward immigration and averaged. Again, all analyses also controlled for each second of the stimulus material through a dummy variable for each second, except the first (the first variable served as the reference category). These 53 dummy variables are not of interest for the research question, and in order to save space, they are omitted from the tables.

Table A7

*Regression analyses predicting negative valence (EMG) and arousal (SCL) with the manipulated immigration threat, controlled for pretest immigration attitudes and the time in seconds (omitted from the table).*

| *Dependent variable:* | Negative valence (EMG) | Arousal (SCL) | |
|---|---|---|---|
| *Model* | 1 | 2 | 3 |
| Threat (high) | -.032** | .038*** | -.088*** |
| | (.008) | (.005) | (.025) |
| EMG | | -.081*** | -.145*** |
| | | (.010) | (.018) |
| Threat * EMG | | | .114*** |
| | | | (.020) |
| Immigration attitude | .008*** | -.001 | .000 |
| | (.002) | (.002) | (.001) |
| Constant | .953*** | .086*** | .152*** |
| | (.014) | (.013) | (.022) |
| Adjusted $R^2$ | .022 | .012 | .015 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.

Table A8

*Regression analyses predicting counterarguing, policy attitudes and the willingness to help refugees with negative valence (EMG) and arousal (SCL), controlled for pretest immigration attitudes and the time in seconds (omitted from the table).*

| *Dependent variable:* | Counterarguing | | Attitude toward immigration policy | | Willingness to help refugees | |
|---|---|---|---|---|---|---|
| *Model* | 1 | 2 | 3 | 4 | 5 | 6 |
| Negative valence (EMG) | .512*** | .605*** | -.390*** | -.414*** | -.060* | -.092*** |
| | (.055) | (.061) | (.033) | (.036) | (.020) | (.022) |
| Arousal (SCL) | .056 | -1.268*** | -.026 | .315** | -.063*** | .397*** |
| | (.023) | (.183) | (.023) | (.086) | (.005) | (.065) |
| Negative valence (EMG) * arousal (SCL) | | 1.137*** | | -.271*** | | -.366*** |
| | | (.147) | | (.058) | | (.054) |
| Immigration attitude | -.314*** | -.311*** | .691*** | .690*** | .425*** | .424*** |
| | (.001) | (.001) | (.001) | (.001) | (.000) | (.000) |
| Constant | 4.981*** | 4.877*** | 2.744*** | 2.771*** | 3.596*** | 3.632*** |
| | (.052) | (.060) | (.032) | (.034) | (.019) | (.021) |
| Adjusted R2 | .089 | .096 | .503 | .504 | .249 | .250 |

*Note:* The table shows unstandardized regression coefficients and panel-corrected standard errors, *$p < .01$, **$p < .001$, ***$p < .0001$; dummy variables for each second of the stimulus material are omitted from the table.