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The Role of Charismatic Leadership Tactics and Inconsistent Messages in Processing and Evaluating Climate Change Information

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Climate change poses an unprecedented challenge to humanity, and persuasive environmental communication is a crucial step for global leaders to counteract its consequences. Charismatic leaders are especially effective in communicating information. Interestingly, in recent years, there have been frequent incidences where charismatic leaders made inconsistent environmental statements. How people process such inconsistencies can provide key insights into understanding the processing of climate information. In two preregistered online studies ($N = 668$), we examined how people read and evaluate pro- and contra-environmentalism messages from an environmental, charismatic leader. We found persistent effects of message inconsistencies, leading to longer reading times and lower convincingness ratings for information. However, we failed to find an interaction effect of the experimental manipulations or a main effect of charisma on reading times for environmental messages. In Study 2, we detected an interaction effect of leader charisma and message inconsistency on how convincing participants rated text messages. Participants rated contra-environmental messages as more convincing when following displays of charismatic rather than neutral leader behavior. We discuss future research avenues to explore charismatic leader influences on processing climate change information.

1. Introduction

International leaders who frequently express their opinions on the global climate crisis often use charismatic leadership tactics (CLTs). For example, the statement “*Instead of ‘going public,’ you could say we’re ‘going purpose.’*” (McCormick, 2022) by Yvon Chouinard, Founder, Environmentalist and Outdoor Industry Businessman, represents a contrast and intentional repetition constituting two of the nine verbal CLTs identified in research on charismatic leadership (Antonakis et al., 2011). These tactics are powerful instruments used to deliver persuasive speeches on global crises (e.g., COVID-19; Jensen et al., 2023). They entail a set of nine rhetorical (e.g., *metaphors, stories, lists and repetitions, contrasts, moral conviction, setting high goals, creating confidence, rhetorical questions, sentiments of the collective*) and three non-verbal (*facial expressions, gestures, and tone of voice*) communication techniques that appeal to the emotions and values of the audience (Antonakis et al., 2011). Leaders work with these tactics to signal their vision and

appeal to the emotions and values of their audience (Antonakis et al., 2016).

The urgency and need to act on climate change have been debated on the international stage for decades. Throughout the years, there have been frequent incidences where charismatic politicians, celebrities or other public figures made environmentalism statements inconsistent with the scientific consensus on climate change or their previous (pro or contra environmental) standpoints. Whether and how inconsistent environmental messages and CLTs affect the underlying processing and evaluation of climate change information is the focus of this article. For example, in 2015, former U.K. Prime Minister Boris Johnson stated that “*Global leaders [at Paris] were driven by a primitive fear that the present ambient warm weather is somehow caused by humanity; and that fear – as far as I understand the science – is equally without foundation.*” (Harvey, 2021). Yet, in 2022, he contradicted this previous skepticism when he expressed the need to adhere to climate action policies: “*I think that the risk is that some people will go weak and wobbly on net zero, we can’t have that.*” (Rhoden-

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Paul, 2022). Comparably, President of France Emmanuel Macron gave a speech at the United Nations General Assembly in 2017, pointing out the urgency of the climate crisis: “*These disasters will be worse tomorrow if we do nothing – even though many opportunities and developments are possible – and if we don’t decide to act now.*” (Ministry for Europe and Foreign Affairs France, 2017). However, at the New Year’s address in 2022, Emmanuel Macron caused confusion about the consistency of his climate agenda when he seemingly ignored the work of hundreds of climate scientists who warned society already decades ago and asked: “*Who could have predicted the climate crisis?*” (Goar, 2023). Followers are also confronted with inconsistent messages from leaders on social media. Examples include Elon Musk, who at times clearly argued for the environmental movement (Musk, 2017) but at other times was less consistent in his posts (Musk, 2023a, 2023b). In two separate online studies, we explored 1) how people read climate change information coming from a charismatic or rather non-charismatic leader and that is inconsistent with the leader’s pro-environmental standpoint and 2) how convincingly people perceive environmental messages that are consistent (pro) or inconsistent (contra) with environmentalism. To examine the involved cognitive processes, the present article focuses on assessing reading behavior and the frequency of viewing information communicated by a charismatic leader. Below we elaborate on the theoretical background and the rationale of the hypotheses we tested.

1.1. Processing Environmental Information

Currently, we understand little about the underlying cognition and behavior of processing environmental messages from charismatic leaders. Whereas climate communication is often the focus of research studies (e.g., Bergquist et al., 2022; Cologna et al., 2022; Kronrod et al., 2023; van de Wetering et al., 2022), leadership and its influence on information processes have not been investigated so far. In times when the discourse about sustainability, climate change, and the environment keeps growing, understanding how climate information from influential leaders is processed is essential (Trémolière & Djeriouat, 2021). Many people are still skeptical and deny the existence of climate change. For example, in a recent global market survey conducted on representative samples in different countries (e.g., Australia, Chile, China, France, India, South Africa and the USA), fewer people considered climate change a human-made problem (63% as opposed to 69% in 2019; 37% were skeptical of climate change; Petit et al., 2022). Understanding how leaders guide the processing of climate change information is an important element in understanding this worrying trend because leaders – and especially those who communicate in a charismatic manner – have a large influence on public opinions and actions.

Charismatic leaders commonly express their opinion on climate change on large (inter)national stages, and thus, how they behave and communicate with the audience impacts how persuasively people perceive climate facts. Inconsistent environmental messages originating from charismatic leaders – i.e., messages that contradict previ-

ously communicated pro-environmental standpoints of the leader – may especially contribute to a decreasing persuasiveness of facts on human-made climate change. Generally, people tend to pay more attention to conflicting information (see, e.g., Rinck et al., 2003). Processing conflicting information about a preferred leader has been associated with increased activity in prefrontal brain networks, implying motivated attention to such information from a leader (Westen et al., 2006). Inconsistent information on public issues can also lead to confusion and decreased engagement in healthy eating or pro-environmental behavior (cf., unhealthy eating behavior following inconsistent nutrition information; Lee et al., 2018). In particular, individuals may weigh contra-environmentalism even more heavily when it is presented by a charismatic environmental leader because it is in sharp contrast with the leader’s perceived skill, qualities, and communicated environmental mission. Thus, being confronted with inconsistent environmental statements is likely to have negative consequences for public climate action.

One way of measuring how inconsistent information from a charismatic leader is processed is to look at reading times for written contra-environmental messages originating from an otherwise pro-environmental leader. Reading paradigms are commonly used to study the processing of inconsistent text passages (e.g., Rinck et al., 2003) or assess the effects of source cues – such as credibility – on processing information (e.g., Sparks & Rapp, 2011). With the present set of studies, we aimed to shed light on the underlying cognition and behavior of processing inconsistent environmental messages from charismatic leaders by examining reading times for consistent and inconsistent text messages from a charismatic leader.

1.2. Charismatic Environmental Leadership

Traditionally, charismatic leadership and its influence on followers have been extensively examined in the field of organizational psychology (e.g., Antonakis et al., 2022; Ernst et al., 2022; Fest et al., 2021; Meslec et al., 2020). While notoriously difficult to define in the past, the construct has been redefined by leadership scholars as a *values-based, emotion-laden and symbolic signal* (Antonakis et al., 2016). This definition of charisma is based on signaling theory and postulates that one party (e.g., a leader) has more information than another party (e.g., a follower; Spence, 1973). In a leadership context, this translates to a scenario in which the leader sends specific signals to the follower to communicate information that would otherwise not be observable by the follower. Such information includes, for example, cues on the leader’s intelligence, competence, trustworthiness or other leadership qualities that are not directly observable. Using CLTs requires the application of *values-based* and *symbolic* rhetoric, and producing these signals requires intelligence (Antonakis et al., 2011). Applying CLTs, charismatic leaders are able to appeal to followers’ emotions and values in a meaningful way that is easy to understand (Bastardo, 2020). When interpreting the signals, followers infer specific leadership qualities from the charismatic signals (e.g., intelligence; Akstinaite

et al., 2022). Thus, charisma is a *costly* signal that enables the leader to signal otherwise undetectable leadership qualities to an audience. In order for a signal to be costly, it should be hard for others to imitate it (Bastardo, 2020). In the case of charismatic leadership, this entails that not every individual possesses the ability to produce effective CLTs. Even with new technologies - such as language-based AI programs - communicating effectively by using CLTs *on-the-go* remains difficult. Additionally, the signal is costly because it is bound to an honest intention to guide the group. When the leader does not follow up on what is said, the audience will become suspicious of the leader's true motivations and abilities, and eventually, the leader will lose followers. The robustness of the effectiveness of CLTs in increasing followers' motivation and performance has been proven in a growing body of literature over the past years (e.g., Ernst et al., 2022; Fest et al., 2021; Meslec et al., 2020).

In the present article, we argue that charismatic signals serve as heuristic cues of a message source (the leader) and should affect how people process and evaluate information they receive from the leader. We posit that followers initially judge messages from a charismatic leader as valuable and important enough to pay attention to (cf., prestige-bias, Price & van Vugt, 2014). Charismatic leadership is a prestigious leadership style - rooted in the voluntary submission of followers. Followers voluntarily defer to these leaders because they offer guidance in accomplishing a shared goal (e.g., implementing climate change policies). Charismatic leaders are a valuable social-learning resource, sharing their knowledge and important information with followers (Henrich & Gil-White, 2001; Price & van Vugt, 2014). Thus, from an evolutionary perspective, the charismatic signal primes followers to anticipate high-quality information from the leader. These leaders are at the center of the followers' attention. Because of their status and position within the group, information that charismatic leaders share should initially be less subject to scrutinization and skepticism. While this could lead followers to process information from charismatic leaders with less scrutiny, it may simultaneously make them more attentive to inconsistent (environmental) messages because such messages are not in line with what they anticipate from the leader (i.e., contra-environmental messages from an environmental leader). Followers of charismatic leaders share the leader's values - and messages contrasting these values are also in conflict with the followers' own values, their trust in the leader, and their voluntary submission to this leader. In sum, charismatic leaders constitute a social learning source for followers and operate at the center of followers' attention (Henrich et al., 2015). Thus, inconsistent information they share is easy to spot because followers already pay more attention to these individuals (see, e.g., the effect of high-status group members on gaze behavior of observers; Gerpott et al., 2018). From an evolutionary perspective, not detecting incongruent information from high-status individuals within a group could be dangerous to followers (e.g., concerning safety or securing resources). It would be beneficial for followers to have the

ability to easily spot inconsistencies in information shared by their leaders - particularly for those who have exceptional influence on the group through their communication strategies (CLTs). In the case of charismatic leaders, inconsistent messages should be especially noticeable when messages deviate from the leader's originally communicated mission and values (e.g., contra- vs. pro-environmentalist actions).

Research on phrasing persuasive environmental communication shows interesting links with charismatic leadership in that environmental psychology studies have investigated effects of message delivery that are strikingly similar to the usage of CLTs. For example, a recent study showed how integrating both encouraging and discouraging language in messages increases engagement with pro-environmental behaviors (Kronrod et al., 2023). Encouraging the audience to set high goals, creating confidence to accomplish them, and contrasting different scenarios are also commonly applied tactics used by charismatic leaders (Antonakis et al., 2016). Likewise, matching messages to the characteristics of the audience is a successful technique used in persuasive climate communication (Scharmer & Snyder, 2021). CLTs work in a similar way by appealing to the values and emotions of the listeners (Antonakis et al., 2016). Addressing people's morals has also been proven to be a promising technique in increasing pro-environmental attitudes in conservative groups (Wolsko, 2017) or intentions for mitigation behaviors (Kalch et al., 2021) and is aligned with the usage of moral conviction by charismatic leaders. CLTs combine successful and comparable strategies that have been identified and examined in persuasion studies on climate change.

Studying the effect of CLTs used by an environmental leader on the processing of inconsistent climate change information can offer new insights into effective climate communication. Charismatic leaders have the capability of actively promoting pro-social behavior (Grabo & van Vugt, 2016). In a similar vein, those leaders should possess the ability to promote pro-environmental attitudes and behaviors in their followers. Two recent studies provide correlational evidence for this practical capacity. Charismatic leadership (assessed by employees' perceptions) predicted employees' environmental commitment (Tuan, 2019) and high transformational leadership was positively related to pro-environmental behaviors (Graves et al., 2013). The authors argue that these leaders may be effective in promoting environmental behaviors because they inspire, emphasize the collective, and articulate strong environmental visions (Graves et al., 2013; Tuan, 2019). At the same time, the climate change crisis makes people more susceptible to charismatic leaders because they are able to coordinate large groups of followers quickly when facing a crisis (Grabo et al., 2017).

1.3. Contribution to the Literature

The studies reported here contribute to the literature in different ways. First, we study leadership behaviors in the context of climate communication. For this purpose, we focus on charismatic leadership behavior because CLTs

are frequently applied by public leaders, their effectiveness in increasing different performance behaviors has been proven in various research studies and contexts (e.g., Ernst et al., 2022; Meslec et al., 2020), and CLTs combine persuasive strategies that have been previously investigated in isolation in the field of environmental psychology (Kalch et al., 2021; Kronrod et al., 2023; Scharmer & Snyder, 2021; Wolsko, 2017). To create a leader-follower relationship in an experimental setting, it is necessary for the participants and leader to operate within a relevant framework. The leader we presented in our studies is engaged within the environmental movement (CEO of an environmental organization), which is *less* relevant to people who consider themselves *not concerned* with the environment or do *not* believe in climate change. Therefore, we only recruited participants *concerned* with the environment, who believed in climate change. This facilitated the emergence of a leader-follower relationship in the environmental context and enabled the leader to appeal to the emotions and values of the participants in our studies (Antonakis et al., 2016). Second, we add a cognitive layer to research on climate communication and the workings of charismatic leadership by studying how people process environmental messages inconsistent with a charismatic leader's proclaimed environmental mission. There is evidence that the use of CLTs leads to less recognition of environmental information provided by a leader in a video speech, illustrating how CLTs can influence the processing of climate facts (Engelbert et al., 2023). Yet, we do not understand how exactly charismatic leadership affects the processing of climate change information, specifically when the information is not in line with the leader's proclaimed environmentalism. We accordingly focus on how people process messages from a leader and assess reading times for written environmental messages consistent or inconsistent with the leader's proclaimed environmentalism, and response times and evaluations (convincingness) of messages. Third, our research introduces new ways to study persuasive climate communication by considering the characteristics of an information source (i.e., leadership behavior). Learning more about the cognitive mechanisms behind the interplay of leader charisma and pro- vs. contra-environmentalism messages can help to understand public climate communication better. We elaborate on future interdisciplinary research perspectives to study effective environmental communication by combining leadership and environmental psychology research. Our approach takes into account human cognition, leadership, individual factors (e.g., environmental concern), and message consistency.

1.4. Hypotheses and Summary Study 1

Study 1 was preregistered on the OSF (<https://osf.io/hy4vz/>). We expected participants to initially process text messages from a charismatic leader fast and quickly because, based on the charismatic signals, they should judge information coming from such a leader as reliable, valuable, and grounded in knowledge and competence. Yet, because participants should anticipate the leader to be a valuable, trustworthy source of information, inconsistent

message parts should especially draw participants' attention. The logic is that inconsistencies – i.e., content that contradicts the leader's pro-environmentalism – are in contrast with 1) the leader's communicated values, 2) participants' own values, 3) and the leader's signaled leadership qualities (via the usage of CLTs). Thus, we predicted an interaction effect of leader charisma and inconsistent messages such that the use of CLTs would lead to faster processing of consistent messages but would amplify the attention-capturing mechanisms of inconsistent information. *Hypothesis 1* states that *participants show shorter total reading times for pro (consistent) compared to contra (inconsistent) environmentalism passages and longer reading times for contra compared to pro passages in the charismatic compared to the neutral leader condition*. We expected that reading times for particularly inconsistent (contra-environmentalism) statements implemented in messages, re-reading times for complete messages, scanning behavior (indicative of fast reading) and counts for re-viewing sentences (moving back in a text message) would be affected in the same way.

Hypothesis 2: We predicted that participants show shorter total reading times for pro (consistent) compared to contra (inconsistent) target sentences and longer reading times for contra compared to pro target sentences in the charismatic compared to the neutral leader condition.

Hypothesis 3: We predicted that participants show shorter second and N-pass reading times for sentences in pro (consistent) compared to contra (inconsistent) environmentalism passages but longer second and N-pass reading times for sentences in contra compared to pro passages in the charismatic compared to the neutral leader condition.

Hypothesis 4: We expected that participants show greater scan rates for pro compared to contra-environmentalism passages and lower scan rates for contra compared to pro passages in the charismatic compared to the neutral leader condition.

Hypothesis 5: We predicted that participants demonstrate fewer re-reading of sentences in pro (consistent) compared to contra (inconsistent) environmentalism passages and more re-reading of sentences in contra compared to pro passages in the charismatic compared to the neutral leader condition.

Additionally, we expected that participants would rate text messages as more convincing and faster in the charismatic than in the neutral leader condition because the charisma signals are indicative of the leader's outstanding leadership qualities. Messages from such a leader should be evaluated more favorably (i.e., be more convincing), and people should need less time to assess the quality because they rely on easy-to-understand, peripheral cues (CLTs) communicated by the leader.

Hypothesis 6: We predicted that participants are convinced more by passages in the charismatic compared to the neutral leader condition.

Hypothesis 7: We predicted that participants rate the convincingness of passages faster in the charismatic compared to the neutral leader condition.

2. Method Study 1

2.1. Ethics

The study was approved by The Scientific and Ethical Review Board at the Vrije Universiteit Amsterdam and complies with the ethical guidelines of the faculty.

2.2. Design

We used a 2 (leader: charismatic vs. neutral) x 2 (message inconsistency: pro vs. contra-environmentalism) within-subjects repeated measures design for the present study. This decision was based on the following methodological considerations and in line with common practices in cognitive psychology research. Reading times are affected by many individual factors (e.g., age, eye-sight, reading speed, educational level, familiarity with the medium, etc.; e.g., Chen et al., 2014; Paterson et al., 2020). While it is possible to control for some of these factors (e.g., age and educational level), a high variance in reading times typically remains across individuals. Within-subject designs prevent such confounds that otherwise can drive the differences between conditions and allow for control of inter-subject variances in the data. Repetitive exposure to a leader and text messages from the leader (e.g., social media posts, emails, or text messages) are also common on social media platforms or in work settings (e.g., multiple work meetings throughout a day; email contact, etc.) – thus, repeated message exposure enhanced the ecological validity of our study.

Participants were randomly assigned to one of 16 blocks (4 text lists x 2 leader conditions x 2 message conditions). The different blocks were used to counterbalance pro- and contra-environmentalism sentences to text messages to avoid systematic biases of the surrounding information on the processing of environmental statements by assigning different stimuli lists (containing written messages) to participants and to counterbalance the first condition presented to the participants. The stimuli lists were captured by two variables (list and filler) in the preregistered statistical models. Because they did not affect the influence of the experimental variables, we report these models only in the supplementary materials. For the remaining stimuli sequence, text messages were randomly assigned to a video, and the order of the videos was further randomized across participants.

2.3. Material

2.3.1. Charismatic Leadership Tactics

We manipulated CLTs using 20 short clips (7-18 seconds) of a male actor who talks about climate change in a charismatic or neutral way (10 charismatic, 10 neutral videos). The clips were edited from videos used and validated in previous research (Engelbert et al., 2023). Two independent

coders coded the speeches on the presence of CLTs and reconciled any difference in their coding responses (Engelbert et al., 2023). For the present studies, the videos were cut into shorter video segments in which the leader speaks about his environmental vision. The final video segments contain a variety of CLTs in the charismatic leader condition and no CLTs in the neutral condition. The reconciled codings of the speeches are available in the online supplementary material and demonstrate that there are objectively more CLTs present in the charismatic compared to the neutral videos.

2.3.2. Message Inconsistency: Pro- and Contra-Environmentalism Statements

We created 40 texts containing information on climate change. The texts contained between five to ten sentences. Target statements were created to be pro- (“*That so many people demonstrate for more and better sustainable approaches is **helpful**.*”, “*Some companies ignore governmental laws to protect the environment, which is **illegal**.*”) or contra-environmentalism (“*That so many people demonstrate for more and better sustainable approaches is **illegal**.*”, “*Some companies ignore governmental laws to protect the environment, which is **helpful**.*”). Minimizing the influence of confounding factors between the leader conditions required us to only manipulate the consistency of information in a small part of the text message, i.e., the last word in the target statements. Target sentences were counterbalanced across text passages. Additionally, the last word in the target sentence was used in a pro- and contra statement to further reduce confounds related to the emotional valence of the disambiguating words. The position of the target sentence was varied between texts to mask the experimental manipulation. Sentences for each passage were adapted from texts on climate change (e.g., The Royal Society, 2021c, 2021a, 2021b; The Royal Society & The Academy of Medical Science, 2021). Counterbalancing leader conditions and the allocation of text passages across participants was implemented by creating four stimuli lists (captured by in the covariates list and filler; online supplementary material) that were evenly assigned to participants. Lastly, we used two modalities (video vs. text) for the charisma and inconsistency manipulation, respectively, in line with the standards applied in leadership (leader videos to manipulate charisma; e.g., Antonakis et al., 2022; Ernst et al., 2022; Meslec et al., 2020) and cognitive research (text inconsistencies).

2.4. Sample

The sample size was determined based on a pilot eye-tracking lab study ($N = 11$) using the same design and procedures but assessing eye fixations on text messages instead of using an online reading paradigm. During the pilot study, the amount of time participants fixated on a certain point on the computer screen that displayed the text messages was recorded. We calculated the sum of these fixation times per text passage as an indication of the time participants spent reading. We fitted a linear mixed effects model

with the independent variables charisma, message inconsistency, their interaction term, and a random intercept for text messages and subject on total reading times for text messages. Using the estimated coefficients for the experimental variables and random intercepts, we simulated data for $N = 400$ participants and 20 text messages. We estimated the sample size for the present study to detect an interaction effect of leader charisma and message inconsistency on total reading times for texts by comparing the full model with a model that did not include the interaction term. The power analysis showed a power of $> 90\%$ for $N = 268$ to detect an interaction effect of charisma and message inconsistency for the interaction effect detected in the pilot study. The power analysis script is available in the online supplementary material.

The total fixation times recorded in the pilot study accurately reflect the time that participants actually looked at the text. These measures require participants to come to the lab and are generally time-consuming. Thus, while the measurements derived from the eye-tracking pilot study provided us with a precise estimation of reading times for text passages originating from the environmental leader, we decided to conduct the full experimental study in an online setting, using a sentence-by-sentence reading paradigm (see, e.g., Just et al., 1982; van der Schoot et al., 2012). This methodological decision enabled us to test our hypotheses in a larger sample.

Via Prolific, we only admitted participants who a) believed in climate change, b) were concerned or very concerned with the environment, c) were native/fluent English speakers, d) were located in the UK, e) had the UK nationality and f) an approval rate of $\geq 95\%$ for previous participations. We validated the prescreen questions in our study. Participants who responded inconsistently with the prescreening could not continue. Participants were asked to only participate if they were not dyslexic and could use a desktop environment.

Three hundred twenty-two participants completed the study via the research platform Prolific. Twenty-nine participants were excluded because they reported technical problems, 13 of the remaining participants reported being older than 65 years (not in line with ethical approval of the study). One additional participant failed the attention check (i.e., rating an attention passage as “*Convincing*”), and another participant did not watch any of the videos completely (viewing times more than 3s shorter than the complete video duration). Individual blocks where participants did not watch the videos completely were also excluded from data analyses. Participants received monetary compensation (£3.30) for completing the study. On average, participation took 34.05 minutes ($SD = 12.17$). The final sample consisted of 278 participants (female = 138, male = 138, other = 2, $M_{age} = 37.78$, $SD_{age} = 12.02$, Table 1). One-hundred twenty-two participants reported to be *concerned*, and 156 participants to be *very concerned* with the environment.

2.5. Procedure

The reading task was programmed using jspsych (de Leeuw, 2015) and the survey tool Qualtrics. Text was presented in black letters on white background. After giving informed consent, participants answered demographical questions and proceeded with completing a practice block to familiarize them with the task procedure. Participants then completed 20 experimental blocks and one attention check block in randomized order. The leader was introduced as the CEO of an environmental company, and text passages were described as fragments of a speech that the leader gave at an international climate conference. Each block started with a leader video, followed by reading one text message and rating the text on its convincingness (Figure 1). We used a self-paced reading and anomaly detection paradigm (Keating & Jegerski, 2015). While reading, participants only saw one sentence at a time (Figure 1). The other sentences were masked with dashes (moving-window method; Just et al., 1982; van der Schoot et al., 2012). Participants used two buttons to move to the next or previous sentence. The time a sentence was displayed on the screen was recorded. When participants reached the end of a passage, the text and masked sentences disappeared, and the rating question appeared on the screen (*Please rate the convincingness of the passage.*; 1 = *Not at all convincing*, 5 = *Very convincing*). At the end of the task, participants watched two separate video sequences containing all short charismatic and neutral leader clips, respectively. After each of these two videos, participants rated the leader on a) how frequently he made use of any of the verbal CLTs (mean sum score for all ratings; *metaphors or similes*; *rhetoical questions, stories or anecdotes, contrasts, lists, moral conviction, sentiments to the collective, setting high/ambitious goals or creating confidence that goals can be achieved*; 1 = *Never*, 5 = *A lot*); b) how well the speaker used gestures, facial expressions and tone of voice (single item measure; 1 = *Poor*, 5 = *Excellent*); and c) on a set of five items (*charismatic, inspiring, likable, enthusiastic, warm*; 1 = *Strongly disagree*, 5 = *Strongly agree*; Grabo & van Vugt, 2016). Finally, participants received a debriefing.

2.6. Data Analysis

We analyzed data in R (R Core Team, 2024). For participant exclusion criteria, see section 2.4. Viewing times were measured per sentence in milliseconds from sentence presentation until the participant clicked to view the next or previous sentence. We calculated the total reading time per message by summing up the viewing times for all sentences per participant and text. We computed re-reading times per participant and text by summing up the viewing times for all sentences excluding first viewing times for the respective sentence. Scanning of text messages was computed as the words that participants read per second (wps) by dividing their total reading time by the number of words in the message. Hewitt and colleagues (2007) determined a cutoff score of wps demonstrating scanning, which is indicative of reading behavior that is likely to present skimming over the text quickly. In particular, they argue that comprehension

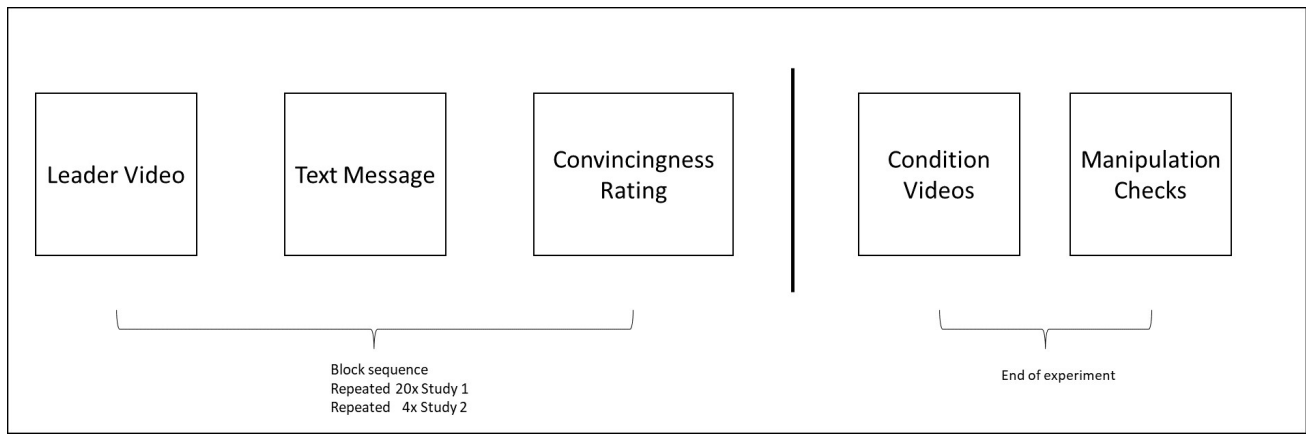


Figure 1. Experimental Procedure Study 1 and Study 2

Note. Single block sequence (video – text message – rating) and rating of all videos at the end of the study.

is likely to start suffering at reading rates of 6 wps or even lower. We applied a less conservative cutoff and preregistered a reading speed of > 8 wps as scanning and a reading speed of < 8 wps as no scanning. We further counted how often participants moved back in a text message to see a previous sentence (i.e., pressing the back button). We report the analyses without outlier removal. Data analyses with outlier removal (± 3 SD) largely corroborate the main analysis and are reported in the online supplementary material.

Statistical Models. For all dependent measures, we computed (generalized) linear mixed effects models with the independent factors charisma and message inconsistency, their interaction term, the covariates participant gender and environmental concern, the progress in the experiment (block) and the length of the text message (number of characters in text). Initially, we preregistered to include the following covariates in the models: a) valence – describing the valence rating for the last word in the target sentence, which creates an inconsistency in the text message taken from Warriner et al. (2013), and b) the list and filler variables – describing the stimuli list used to counterbalance the allocation of target sentences to a text message and the leader condition among participants. These preregistered covariates did not influence any of the effects of the experimental manipulations. To increase the simplicity of the results reported here, we report models without these additional covariates in the main text and the full models in the online supplementary material.

We further included participant gender and environmental concern in the statistical models reported in the main text to increase the comparability of our studies with other studies on charismatic leadership that usually include participant gender to control for differences in perceptions of leader behavior. To control for nuances in environmental concern that – according to the definition of charisma as a signal – may lead to differences in the effectiveness of the charismatic signal – we also included the covariate environmental concern. These covariates were preregistered for the models testing participants' perceptions of the leader.

Other Deviations From the Preregistration. Residuals in the mixed models for reading time data were positively skewed. Therefore, the reading time data was log-transformed. We also excluded participants who reported technical problems during the study because their data was likely influenced by aspects unrelated to the experimental conditions.

3. Results and Discussion Study 1

3.1. Charisma Perception

All models testing how participants perceived the leader in the charismatic and neutral condition included the (pre-registered) covariates of participant gender and environmental concern. The charisma score (mean of 5-point Likert scale ratings for attributes *charismatic*, *warm*, *likable*, *enthusiastic*, *inspiring*) was higher in the charismatic than the neutral leader condition ($\beta = 0.90$, $SE = 0.06$, $t(277) = 14.01$, $p < .001$, $R^2 = .43$, Cronbach's alpha = 0.87). The non-verbal charisma rating (single 5-point Likert scale rating for the use of *gestures*, *facial expressions*, and *animated tone of voice*) was higher in the charismatic compared to the neutral condition ($\beta = 0.87$, $SE = 0.07$, $t(277) = 12.90$, $p < .001$, $R^2 = .37$). The verbal charisma ratings (mean of nine verbal CLTs rated on 5-point Likert scale) were also significantly higher in the charismatic than the neutral condition ($\beta = 1.07$, $SE = 0.06$, $t(277) = 18.11$, $p < .001$, $R^2 = .52$, Cronbach's alpha = 0.82, [Table 1](#)).

3.2. Dependent Measures

Reading Times. There was no interaction effect ($\beta = 0.02$, $p = .520$), or main effect of the charismatic ($\beta = 0.02$, $p = .300$) or the message inconsistency ($\beta = 0.11$, $p = .066$) manipulation on (log-transformed) total reading times ([Table 2](#)). We also failed to detect an interaction effect of leader charisma and message inconsistency on (log-transformed) reading times for target sentences ($\beta = -0.02$, $p = .698$, [Table 2](#)). Charisma had no effect ($\beta = 0.00$, $p = .878$), but message inconsistency significantly influenced how long participants spent reading the target sentence ($\beta = 0.37$, $p =$

Table 1. Descriptive Statistics Study 1

	Charisma	Neutral		
Charisma ratings				
Charismatic attributes	4.15 (0.68)	3.30 (0.97)		
Verbal charismatic tactics	3.63 (0.52)	2.82 (0.75)		
Non-verbal charismatic tactics	4.27 (0.81)	3.33 (1.11)		
	Consistent	Inconsistent	Consistent	Inconsistent
Processing metrics				
Total reading time (s)	29.70 (46.14)	33.20 (51.65)	28.73 (17.60)	31.07 (22.79)
Target sentence reading time (s)	3.82 (4.12)	5.08 (4.30)	3.78 (3.66)	5.21 (5.66)
Re-reading time (s)	10.42 (13.02)	15.19 (70.77)	11.54 (15.96)	11.29 (14.29)
Re-reading count ^a	0.46 (1.81)	0.95 (2.29)	0.46 (1.86)	1.05 (2.81)
Scanrate	0.04 (0.13)	0.04 (0.14)	0.04 (0.15)	0.04 (0.14)
Convincingness response time (s)	4.00 (3.97)	4.01 (3.97)	3.93 (3.04)	4.55 (11.15)
Convincingness rating	3.96 (0.90)	2.97 (1.19)	3.89 (0.95)	2.99 (1.19)

Note. Means and standard deviations in parentheses of dependent measures. Charismatic attributes were computed as the mean sum score for the 5-point Likert scale ratings of *charismatic, warm, likable, enthusiastic, inspiring*. Verbal and non-verbal tactics were rated separately on each of the verbal tactics and one item for the use of non-verbal tactics. Scanrate describes whether participants read more than 8 words per second, values closer to 0 reflect no tendency to scan the text.

^a Most participants did not move back in the text passage to re-read a sentence.

.002). Reading times for contra-environmentalism target sentences were longer ($M = 5.15$, $SD = 5.03$, $n = 2465$) compared to pro-environmentalism target sentences ($M = 3.80$, $SD = 3.89$, $n = 2432$, [Figure 2A](#)).

Re-Reading Time and Count. There was no interaction effect of the experimental variables ($\beta = 0.20$, $p = .110$) nor a main effect of charisma ($\beta = -0.03$, $p = .625$) on (log-transformed) re-reading times. Message inconsistency significantly influenced re-reading times ($\beta = 0.14$, $p = .036$). We failed to find an interaction effect of the experimental manipulations ($IRR = 0.92$, $p = .631$) or a main effect of the charisma condition ($IRR = 0.91$, $p = .286$) on the number of times participants moved back to a previously read sentence. Message inconsistency significantly influenced the re-reading count ($IRR = 2.72$, $p < .001$, [Table 3](#)). Participants moved back more often in text messages containing a contra-environmentalism ($M = 1.00$, $SD = 2.57$, $n = 2465$) compared to a pro-environmentalism target statement ($M = 0.46$, $SD = 1.84$, $n = 2432$).

Scan Rate. There were no interaction or main effects of leader charisma and message inconsistency on scan rates for texts (interaction: $\beta = -0.01$, $p = .843$; charisma: $\beta = -0.03$, $p = .401$; message inconsistency: $\beta = -0.01$, $p = .711$).

Convincingness Rating and Rating Time. We failed to detect an interaction effect of leader charisma and message inconsistency on convincingness ratings ($\beta = -0.08$, $p = .083$). Charisma did not influence ratings ($\beta = 0.01$, $p = .609$), but message inconsistency significantly influenced how convincing messages were perceived ($\beta = -0.80$, $p < .001$, [Table 4](#)). Participants rated messages containing a contra-environmentalism target statement less convincing ($M = 2.98$, $SD = 1.19$, $n = 2465$) than texts with a pro-environmentalism target sentence ($M = 3.92$, $SD = 0.92$, $n = 2432$). There were no interaction or main effects of the ex-

perimental manipulations on (the inverse of the) response times for ratings ([Table 4](#)).

3.3. Exploratory Analyses

In an exploratory analysis, we regressed the convincingness ratings for text messages on ratings for verbal and non-verbal charismatic tactics and charismatic attributes of the speaker. The ratings were collected at the end of the study for each leader condition separately. Charisma ratings were significantly associated with convincingness ratings for text passages ([Table 5](#)). Higher/lower charisma ratings and perceptions were associated with higher/lower convincingness ratings, respectively.

3.4. Discussion Study 1

In Study 1, we found no support for our preregistered hypotheses predicting an interaction effect of leader charisma and message inconsistency on reading times for environmental information. The results show that the charismatic signals did not amplify participants' attention to conflicting (contra-environmentalism) information coming from an environmental leader. The persistent effects of message inconsistencies on reading times and the convincingness of information serve as a proof-of-concept for our experiment. That is, the results are in line with the well-established effect of inconsistent information on increased processing times in cognitive psychology (e.g., Rinck et al., 2003). The manipulation checks also confirm that the leader condition worked as predicted in terms of affecting subjective perceptions of the leader's charisma.

An exploratory analysis showed an association between subjective charisma perceptions and the convincingness of environmental messages, with higher charisma ratings be-

Table 2. Mixed Effects Models Study 1 for Reading Times

Predictor	DV: Total Reading Time		DV: Target Sentence Reading Time	
	1	2	3	4
Intercept	-0.07*** (0.09)	-0.06*** (0.09)	-0.24* (0.11)	-0.25* (0.11)
Charisma	0.02 (0.02)	0.01 (0.03)	0.00 (0.02)	0.01 (0.03)
Message	0.11† (0.06)	0.10 (0.06)	0.37** (0.12)	0.38** (0.12)
Block	-0.00 (0.01)	-0.00 (0.01)	0.01 (0.01)	0.01 (0.01)
Length message	0.10** (0.03)	0.10** (0.03)	0.03 (0.06)	0.03 (0.06)
Gender [male]	-0.02 (0.09)	-0.02 (0.09)	0.04 (0.07)	0.04 (0.07)
Gender [other]	0.33 (0.53)	0.33 (0.53)	0.28 (0.44)	0.28 (0.44)
Concern	-0.00 (0.09)	-0.00 (0.09)	0.06 (0.07)	0.06 (0.07)
Charisma x Message		0.02 (0.04)		-0.02 (0.04)
Random Effects				
σ^2	0.13	0.13	0.25	0.25
τ_{00} Subject	0.16	0.16	0.18	0.18
Message	0.01	0.01	0.07	0.07
ICC	0.56	0.56	0.50	0.50
N Subject	278	278	278	278
Message	40	40	40	40
Observations	4897	4897	4897	4897
Marginal R ²	0.01	0.01	0.04	0.04
Conditional R ²	0.57	0.57	0.52	0.52
AIC	5014.201	5021.683	8118.58	8125.674

Note. The table shows standardized estimates and standard errors in parentheses. Charisma was coded as 0 = neutral, 1 = charismatic. Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Length message is the number of characters in a text message. Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*).

†p < .10, *p < .05, **p < .01, ***p < .001.

ing associated with higher convincingness and lower charisma perceptions related to lower message convincingness. The result indicates that how charismatic signals are perceived may influence the evaluation and perception of messages from the leader. This exploratory result needs to be interpreted with caution due to its correlational nature. Given that charismatic evaluations were only reported at the end of the study, we can exclude the possibility that the activity of rating the leader's behavior influenced text message evaluations during the study. On the contrary, we cannot exclude the possibility that text ratings affected the charisma evaluations at the end of the study. However, it is unlikely that participants remembered which text was presented in which leader condition, thereby rendering this alternative interpretation less likely.

4. Hypotheses and Summary Study 2

The study was preregistered on the OSF (<https://osf.io/hy4vz/>). The objective of Study 2 was three-fold. First, we aimed to increase the effectiveness of the charisma manipulation and participants' engagement and motivation to complete the task with sufficient effort and attention. For these purposes, we reduced the total number of leader videos and messages. Second, we aimed to replicate the effect of message inconsistency (i.e., pro- vs. contra-environmentalism) on reading times and convincingness evaluations.

Hypothesis 1: Participants will spend more time reading inconsistent text passages (containing a contra-environmentalism statement) compared to consistent text passages (containing a pro-environmentalism statement).

Table 3. Mixed Effects Models Study 1 for Re-reading Sentences

Predictor	DV: Re-reading Time		DV: Re-reading Count	
	1	2	3	4
Intercept	-0.13*** (0.10)	-0.05*** (0.11)	0.14*** (0.03)	0.13*** (0.03)
Charisma	-0.03 (0.06)	-0.17 (0.11)	0.91 (0.08)	0.96 (0.13)
Message	0.14* (0.06)	0.03 (0.09)	2.72*** (0.43)	2.84*** (0.52)
Block	0.01 (0.03)	0.01 (0.03)	1.04 (0.05)	1.04 (0.05)
Length message	0.03 (0.03)	0.03 (0.03)	1.05 (0.08)	1.05 (0.08)
Gender [male]	-0.01 (0.09)	-0.01 (0.09)	-	-
Gender [other]	0.88* (0.43)	0.88* (0.44)	-	-
Concern	-0.04 (0.09)	-0.04 (0.09)	1.32 (0.26)	1.32 (0.26)
Charisma x Message		0.20 (0.13)		0.92 (0.16)
Random Effects				
σ^2	0.43	0.43	2.28	2.29
τ_{00} Subject	0.15	0.15	1.93	1.93
Message	0.00	0.00	0.17	0.17
ICC	0.26	0.26	0.48	0.48
N Subject	219	219	278	278
Message	40	40	40	40
Observations	888	888	4897	4897
Marginal R ²	0.02	0.02	0.06	0.06
Conditional R ²	0.27	0.27	0.51	0.51
AIC	2001.232	2003.453	8427.659	8429.428

Note. The table shows standardized estimates (re-reading time), incidence rate ratios (re-reading count) and standard errors in parentheses. Charisma was coded as 0 = neutral, 1 = charismatic. Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Length message is the number of characters in a text message. Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*). For re-reading count, the model did not converge when including participant gender. Thus, we report the model without the covariate.

*p<.05, ***p<.001.

Hypothesis 2: Participants will spend more time reading contra-environmentalism statements compared to pro-environmentalism statements.

Hypothesis 3: Participants will rate the convincingness of consistent text passages (containing a pro-environmentalism statement) higher compared to inconsistent text passages (containing a contra-environmentalism statement).

Third, we explored the effects of charisma on processing times further using this shortened experimental procedure. In Study 1, we failed to detect an interaction effect of charisma and message inconsistency on processing times. In Study 2, we focused on detecting a main effect of

charisma on processing messages -irrespective of message inconsistency – in line with theories on increased attention to charismatic leaders (prestige-bias; Price & van Vugt, 2014) and generally increased attention to high-status individuals (e.g., Gerpott et al., 2018).

Hypothesis 4: Participants will spend more time reading text passages that follow a charismatic leader video compared to a neutral leader video.

Hypothesis 5: Participants will spend more time reading target sentences (pro or contra environmentalism) in text passages that follow a charismatic leader video compared to a neutral leader video.

Table 4. Mixed Effects Models Study 1 for Rating and Rating Times

Predictor	DV: Rating		DV: Rating Time	
	1	2	3	4
Intercept	0.36*** (0.08)	0.34*** (0.08)	-0.05*** (0.07)	-0.06*** (0.07)
Charisma	0.01 (0.02)	0.05 (0.03)	0.02 (0.02)	0.05 (0.03)
Message	-0.80*** (0.10)	-0.77*** (0.10)	0.02 (0.02)	0.05 (0.03)
Block	0.02† (0.01)	0.02† (0.01)	0.01 (0.01)	0.01 (0.01)
Length message	0.08† (0.05)	0.08† (0.05)	-0.01 (0.01)	-0.01 (0.01)
Gender [male]	-0.04 (0.05)	-0.04 (0.05)	0.06 (0.07)	0.06 (0.07)
Gender [other]	0.08 (0.28)	0.07 (0.28)	0.46 (0.42)	0.46 (0.42)
Concern	0.11* (0.05)	0.11* (0.05)	0.02 (0.07)	0.02 (0.07)
Charisma x Message		-0.08† (0.05)		-0.06 (0.05)
Random Effects				
σ^2	0.86	0.86	0.01	0.01
τ_{00} Subject	0.16	0.16	0.00	0.00
Message	0.12	0.12	0.00	0.00
ICC	0.24	0.24	0.30	0.30
N Subject	278	278	278	278
Message	40	40	40	40
Observations	4897	4987	4897	4897
Marginal R ²	0.17	0.17	0.00	0.00
Conditional R ²	0.37	0.37	0.30	0.30
AIC	13727.323	13730.347	-8817.543	-8808.493

Note. The table shows standardized estimates and standard errors in parentheses. Charisma was coded as 0 = neutral, 1 = charismatic. Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Length message is the number of characters in a text message. Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*).

†p < .10, *p < .05, ***p < .001.

Lastly, we expected an interaction effect of the charisma and the text inconsistency manipulation based on the non-significant trend found in the data of Study 1.

Hypothesis 6: Participants will rate the convincingness of consistent text passages (containing a pro-environmentalism statement) higher when they follow a charismatic compared to a neutral leader video. In contrast, participants will rate the convincingness of an inconsistent passage (containing a contra-environmentalism statement) lower when following a charismatic compared to a neutral leader video.

We further expected that because participants would rely more on peripheral information when judging messages – i.e., the charismatic signals – this would affect how fast they rate text messages.

Hypothesis 7: Participants will rate the convincingness of text passages faster when they follow a charismatic compared to a neutral leader video.

We also preregistered confirmatory analyses to test for an absence of the interaction effect of our experimental manipulations.

5. Method Study 2

The design, materials, procedure and analyses were identical to Study 1. In Study 2, participants only watched four leader videos and read four text messages (Figure 1). To reduce technical problems, we did not include the option for participants to move back in a text message to view a previous sentence and re-reading was not measured in

Table 5. Exploratory Mixed Models Study 1 with DV Convincingness Rating

	IV: Verbal Ratings	IV: Non-verbal Ratings	IV: Charisma Perception
	1	2	3
Intercept	0.36*** (0.08)	0.36*** (0.08)	0.36*** (0.08)
Charisma rating	0.04* (0.01)	0.05** (0.01)	0.05* (0.01)
Message	-0.80*** (0.10)	-0.80*** (0.10)	-0.80*** (0.10)
Block	0.02 (0.01)	0.02 (0.01)	0.02 (0.01)
Length message	0.08 (0.05)	0.08 (0.05)	0.08 (0.05)
Gender [male]	-0.04 (0.05)	-0.04 (0.05)	-0.04 (0.05)
Gender [other]	0.10 (0.28)	0.08 (0.28)	0.11 (0.28)
Concern	0.11† (0.05)	0.11 (0.05)	0.10 (0.05)
Random Effects			0.35
σ^2	0.86	0.86	0.86
τ_{00} Subject	0.15	0.15	0.15
Message	0.12	0.12	0.12
ICC	0.24	0.24	0.24
N Subject	278	278	278
Message	40	40	40
Observations	4897	4897	4897
Marginal R ²	0.17	0.18	0.18
Conditional R ²	0.37	0.37	0.37

Note. The table shows standardized estimates and standard errors in parentheses. Charisma ratings: Ratings for verbal tactics (Model 1), ratings for non-verbal tactics (Model 2), ratings for charismatic attributes (Model 3). Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Length message is the number of characters in a text message. Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*).

†p < .10, *p < .05, **p < .001, ***p < .001.

Study 2. The experiment was programmed using the survey-builder platform Qualtrics.

5.1. Material

5.1.1. Charismatic Leadership Tactics

We selected two charismatic and two neutral leader videos from Study 1.

5.1.2. Message Inconsistency: Pro- and Contra-Environmentalism Statements

We refined eight text messages from Study 1 and matched them on the number of sentences (7), words (85-89), and characters (583-591). From Study 1, we selected two target sentence pairs that showed a strong effect of message inconsistency on reading times (increased reading times for contra- vs. pro-environmentalism sentences).

The eight target sentences were matched on the number of words (13-14) and characters (75-86), the frequency of the last word in the sentence (10-100 frequency per million words; van Heuven et al., 2014), the position of the sentence in the text passage (4th sentence) and the spillover regions following the target sentence in the text passage (*We need...*). The last word in each target sentence - which creates the inconsistency in a text message - and the text messages were counterbalanced.

5.2. Sample

The goal of Study 2 was to examine the effects of charisma in a study with less workload compared to Study 1. The estimated coefficient for the charisma manipulation in Study 1 was smaller than the estimates based on the sample size calculation for Study 1. Thus, we computed a new power analysis to determine the sample size and simulated data based on estimates for the experimental manip-

ulations from the first four blocks of Study 1. We fitted a linear mixed effects model on the data for the total reading times of these blocks with the independent variables charisma and message inconsistency and a random intercept for subjects (the variance for the random intercept for text messages was nearly 0 in the fitted model and was, therefore, not included). We simulated data for $N = 400$ participants and compared the model with the charisma predictor with the model without the charisma predictor. Results of the power analysis revealed a power $> 90\%$ for a total sample size of $N = 356$ to detect a main effect of leader charisma on total reading times for messages. To account for inattentive participants and technical problems, we aimed to recruit 400 participants in total.

401 participants completed the study via the research platform Prolific. Two participants were excluded because they reported technical problems. From the remaining data set, eight participants failed the attention video check (indicating whether the video in the practice block played music), and an additional participant was excluded because they were older than 65 years (not in line with ethical approval for the study). Participants received a monetary compensation (£1) for completing the study. On average, participation took 11.12 minutes ($SD = 5.08$). The final sample consisted of 390 participants (female = 193, male = 194, other = 3, $M_{age} = 40.19$, $SD_{age} = 12.04$, Table 6). Two-hundred-eight participants reported to be *concerned*, and 182 to be *very concerned* with the environment.

5.3. Data Analysis

Statistical Models. For all dependent measures, we computed (generalized) linear mixed effects models with the independent factors charisma and message inconsistency, their interaction term, and the covariates participant gender and environmental concern, and progress in the experiment (block).

Deviations From Preregistration. Data from participants who indicated to be older than 65 years (not in line with ethical approval for the study) were not used in the analyses reported here. Due to a programming error, participants who completed studies using similar charisma manipulations conducted by the researchers (preregistered as exclusion criteria) were able to participate in the study. We conducted a robustness check and analyzed the data excluding participants who completed or started - but not completed - previous studies ($n = 36$). Results corroborate the main analyses. Thus, we report analysis with all participants in the main text.

Residuals for statistical models testing effects on reading times were positively skewed. We, therefore, log-transformed the reading time data. The preregistered covariate accounting for counterbalancing the allocation of text messages and surrounding information for target sentences (list) did not influence the effects of the experimental manipulations. To increase the simplicity of the results reported here, we report models without this covariate in the main text and the full models in the online supplementary material. We further included participant gender and environmental concern in the statistical models to increase

the comparability of our studies with previous research on charismatic leadership in which participant gender is frequently included to account for differences in leader perceptions between male and female participants. Environmental concern was further included because, according to the definition of charisma as a signal, differences in values between followers and leaders may cause differences in the effectiveness of the charismatic signal. Specifically, charismatic leaders appeal to followers' values through their signals (i.e., CLTs).

6. Results and Discussion Study 2

6.1. Charisma Perception

All models testing how participants perceived the leader in the charismatic and neutral condition included the (pre-registered) covariates of participant gender and environmental concern. The mean charisma score was higher in the charismatic than the neutral leader condition ($\beta = 0.88$, $SE = 0.05$, $t(389) = 17.61$, $p < .001$, $R^2 = .052$, Cronbach's alpha = 0.88). The non-verbal ($\beta = 0.91$, $SE = 0.05$, $t(389) = 17.56$, $p < .001$, $R^2 = .48$) and verbal charisma ratings ($\beta = 0.82$, $SE = 0.05$, $t(389) = 17.52$, $p < .001$, $R^2 = .57$, Cronbach's alpha = 0.83) were also significantly higher in the charismatic than the neutral leader condition (Table 6).

6.2. Dependent Measures

Reading Times. There was no interaction effect of leader charisma and message inconsistency on (log-transformed) total reading times for texts ($\beta = 0.01$, $p = .909$, Table 7). Charisma had no effect ($\beta = 0.02$, $p = .431$), but message inconsistency significantly influenced total reading times ($\beta = 0.18$, $p = .004$, Table 7). Participants showed longer reading times for messages containing a contra-environmentalism statement ($M = 28.67$, $SD = 18.68$, $n = 780$) compared to consistent messages with a pro-environmentalism target sentence ($M = 26.52$, $SD = 22.45$, $n = 780$). There was no interaction effect of leader charisma and message inconsistency on (log-transformed) reading times for target sentences ($\beta = 0.02$, $p = .830$, Table 7). Charisma had no main effect ($\beta = -0.01$, $p = .739$), but message inconsistency significantly influenced how long participants spent reading the target sentence ($\beta = 0.47$, $p = .017$, Figure 2B, Table 7). Participants showed longer reading times for contra-environmentalism ($M = 6.41$, $SD = 8.77$, $n = 780$) compared to pro-environmentalism target sentences ($M = 4.48$, $SD = 14.21$, $n = 780$).

Convincingness Rating and Rating Time. There was a significant interaction effect of leader charisma and message inconsistency on convincingness ratings ($\beta = 0.17$, $p = .028$, Table 8, Figure 3). Contrary to our prediction, post-hoc pairwise comparisons – controlled for multiple comparisons with a Bonferroni correction – showed that participants rated inconsistent text messages in the charismatic condition as more convincing ($M = 3.41$, $SD = 1.14$, $n = 390$) than in the neutral condition ($M = 3.25$, $SD = 1.10$, $n = 390$; $b = -0.16$, $t(1161) = -2.777$, $p = .034$).

There was no interaction effect of leader charisma and message inconsistency on (log-transformed) rating times (β

Table 6. Descriptive Statistics Study 2

	Charisma	Neutral		
<i>Charisma ratings</i>				
Charismatic attributes	4.01 (0.61)	3.27 (0.87)		
Verbal charismatic tactics	2.95 (0.51)	2.42 (0.67)		
Non-verbal charismatic tactics	4.20 (0.72)	3.27 (1.06)		
	Consistent	Inconsistent	Consistent	Inconsistent
<i>Processing metrics</i>				
Total reading time (s)	25.97 (12.17)	28.63 (17.66)	27.07 (29.33)	28.70 (19.67)
Target sentence reading time (s)	3.98 (2.03)	6.10 (4.40)	4.99 (19.99)	6.73 (11.60)
Convincingness response time (s)	3.61 (3.13)	3.87 (4.66)	3.72 (5.09)	3.91 (3.04)
Convincingness rating	4.05 (0.83)	3.41 (1.14)	4.06 (0.80)	3.25 (1.10)

Note. Means and standard deviations in parentheses of dependent measures. Charismatic attributes were computed as the mean sum score for the 5-point Likert scale ratings of *charismatic, warm, likable, enthusiastic, inspiring*. Verbal and non-verbal tactics were rated separately on each of the verbal tactics and one item for the use of non-verbal tactics.

= -0.03, $p = .658$, Table 8). Charisma had no main effect ($\beta = -0.00$, $p = .890$), but message inconsistency significantly influenced response times ($\beta = 0.15$, $p = .004$). Participants took longer rating messages containing a contra-environmentalism target sentence ($M = 3.89$, $SD = 3.94$, $n = 780$) compared to a pro-environmentalism target sentence ($M = 3.66$, $SD = 4.22$, $n = 780$).

6.3. Exploratory Analyses

Convincingness Ratings. In an exploratory analysis, we regressed the convincingness ratings for text messages on ratings for verbal and non-verbal charismatic tactics and charismatic attributes of the speaker. These ratings were collected at the end of the study for each leader condition separately. We found a significant relationship between charisma ratings for the speaker and message convincingness (Table 9). Corroborating the exploratory findings of Study 1, higher/lower charisma ratings and perceptions were associated with higher/lower convincingness ratings, respectively.

6.4. Discussion Study 2

To increase the effectiveness of the charisma manipulation and decrease participants' workload, the number of stimuli was shortened to four experimental blocks in Study 2 (i.e., four videos and four texts). Across all measures and (confirmative and exploratory) analyses, results showed an effect of message inconsistency on increased reading times for target sentences and decreased convincingness ratings. However, we failed to detect an effect of leader charisma on processing times for written environmental messages. In line with Study 1, the data does not provide support for our preregistered hypotheses predicting an effect of leader charisma on increased/decreased processing times for inconsistent/consistent messages, respectively. We replicated the effects of message inconsistency on increased processing times from Study 1. Participants processed contra-environmentalism information more carefully, indicated by

longer reading times for messages and target sentences. The findings show that the leader's charisma did not amplify the attention-capturing capacities of conflicting (i.e., contra) environmental information. The results showed an interaction effect of leader charisma and message inconsistency on convincingness ratings. The effect was contrary to our prediction. The effect of contra-environmentalism messages on convincingness ratings was smaller in the charismatic condition. Participants were significantly more convinced of contra-environmentalism messages in the charismatic compared to the neutral leader condition. Information – even when it contains statements inconsistent with the leader's environmental viewpoint – may, therefore, be perceived as more convincing when leaders previously signaled outstanding leadership qualities by using CLTs. Charisma is a costly signal because not every individual is capable of producing it (Antonakis et al., 2016). Charismatic signals send by the leader communicate the intention to guide the followers toward accomplishing a shared goal while at the same time signaling the leader's ability to do so. Thus, people may perceive information to be of higher quality – i.e., more convincing – when it is coming from an individual who signals exceptional leadership qualities. Participants may also have weighted consistent and inconsistent parts within the same text message (i.e., the inconsistent, contra-environmentalism statement vs. surrounding consistent environmental information) differently depending on the preceding charismatic or neutral behavior of the leader. Given that surrounding information did not conflict with the leader's environmental standpoint, charismatic behavior may have resulted in participants focusing on these message parts more instead of the inconsistent sentence when they evaluated the complete message. Anecdotal evidence that leader charisma guides attention towards different parts of information has been found in a study in which participants remembered less factual environmental statements from a speech in which a leader demonstrated CLTs (Engelbert et al., 2023). Such *selective attention* mechanisms in evaluating information need to be further examined, for example, by measuring

Table 7. Mixed Effects Models Study 2 for Reading Times

Predictor	DV: Total Reading Time		DV: Target Sentence Reading Time	
	1	2	3	4
Intercept	-0.12*** (0.09)	-0.11*** (0.09)	-0.24*** (0.15)	-0.24*** (0.15)
Charisma	0.02 (0.03)	0.02 (0.04)	-0.01 (0.04)	-0.02 (0.05)
Message	0.18** (0.06)	0.18* (0.07)	0.47* (0.20)	0.46* (0.20)
Block	-0.14*** (0.01)	-0.14*** (0.01)	-0.09*** (0.02)	-0.09*** (0.02)
Gender [male]	0.07 (0.09)	0.07 (0.09)	0.05 (0.07)	0.05 (0.07)
Gender [other]	-0.59 (0.49)	-0.59 (0.49)	-0.71† (0.42)	-0.71† (0.42)
Concern	-0.03 (0.09)	-0.03 (0.09)	-0.01 (0.07)	-0.01 (0.07)
Charisma x Message		0.01 (0.06)		0.02 (0.07)
Random Effects				
σ^2	0.07	0.07	0.21	0.21
τ_{00} Subject	0.14	0.14	0.18	0.18
Message	0.00	0.00	0.03	0.03
ICC	0.66	0.66	0.50	0.50
N Subject	390	390	390	390
Message	8	8	8	8
N Observations	1560	1560	1560	1560
Marginal R ²	0.03	0.03	0.07	0.07
Conditional R ²	0.67	0.67	0.53	0.53
AIC	1187.262	1194.644	2658.801	2665.038

Note. The table shows standardized estimates and standard errors in parentheses. Charisma was coded as 0 = neutral, 1 = charismatic. Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-4). Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*).

†p < .10, *p < .05, **p < .001, ***p < .001.

participants' evaluations for different sections within the same environmental message. It is also possible that people are more forgiving of inconsistent information when it originates from a leader who demonstrated charismatic leadership behavior. In particular, these charismatic leaders hold special positions within a group, and followers view them as knowledgeable, competent, and trustworthy (cf., prestige-bias; Price & van Vugt, 2014).

7. General Discussion

The value of charismatic leadership for persuasive environmental messages has not been investigated so far and the cognitive mechanisms involved in leadership processes for climate communication remain largely unexplored. We set out to assess the effects of charismatic leadership, inconsistent messages, and their influence on reading behavior and evaluations of information in two online studies. We examined the workings of CLTs in two ways: 1) by look-

ing at the effect of the experimentally manipulated leader conditions (pre-registered) and 2) by assessing the association between subjective perceptions of leader charisma and the persuasiveness of environmental text messages (exploratory), which differed in their consistency (i.e., pro- vs. contra-environmentalism). In both studies, we found no support for a set of preregistered hypotheses predicting an effect of leader charisma on processing times for inconsistent information. Results showed robust effects of message inconsistencies: inconsistent messages (contra-environmentalism) from an environmental leader increased reading times and decreased convincingness ratings for textual information. We also found an interaction effect of charisma and inconsistencies on message convincingness (Study 2) and an unpredicted association between participants' subjective perceptions of the leader's charisma and how convincing environmental messages were.

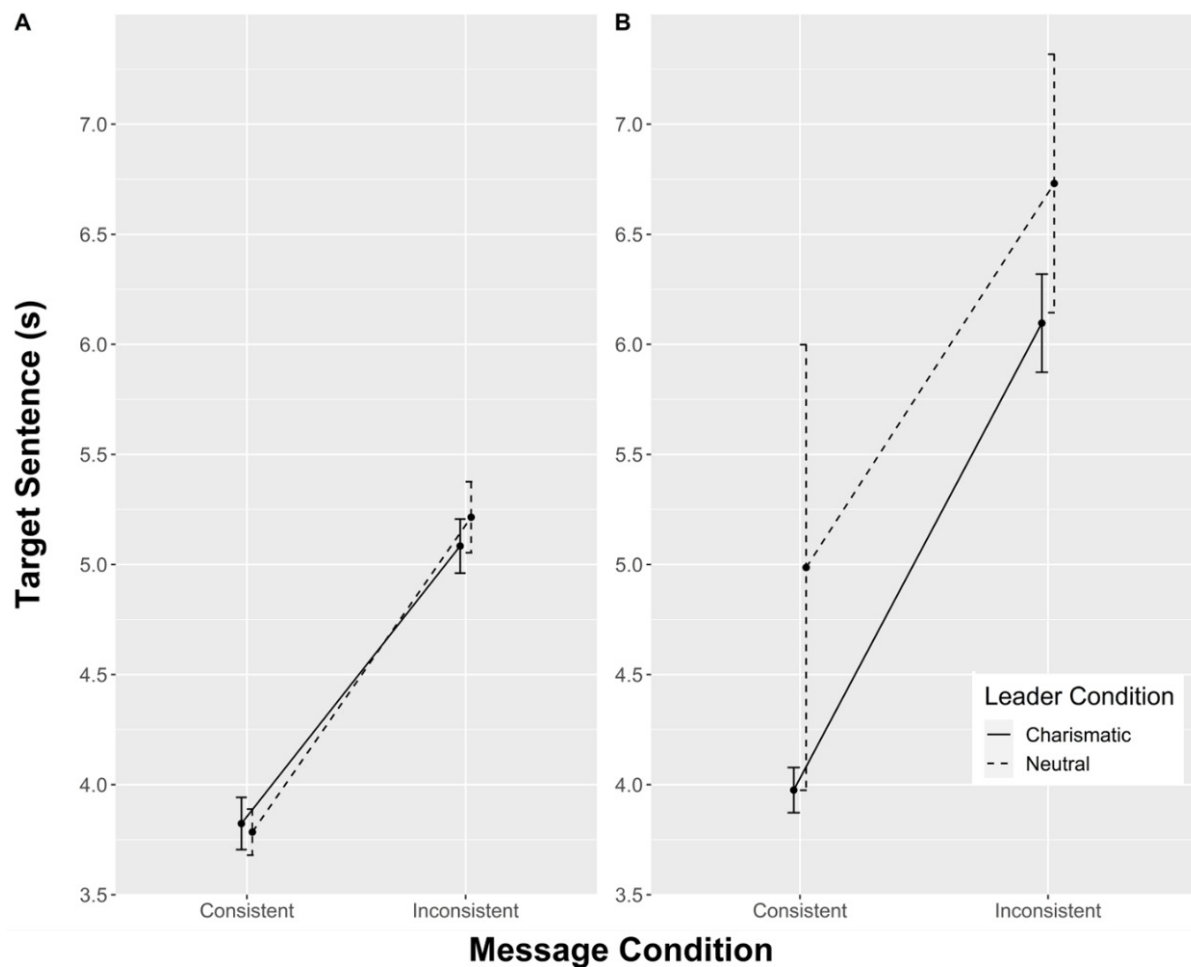


Figure 2. Average Reading Times for Target Sentences in Study 1 and Study 2

Note. Average reading times for target sentences Study 1 (A) and Study 2 (B). Error bars represent standard errors. The higher variance in the neutral condition in Study 2 is due to two extreme values of two different participants in the neutral and charismatic conditions, respectively. Excluding outliers (reading times < 1 second and ± 3 SD of the grand mean; preregistered for Study 2) from the analyses corroborate the main analyses and are reported in the online supplementary material (<https://osf.io/hy4vz/>).

7.1.1. Leader Charisma

In our studies, we examined the effect of charisma on processing consistent and inconsistent messages. We found no evidence of an effect of the experimental charisma conditions on reading times for consistent or inconsistent messages. There are several study limitations that we need to consider. First, the separate modalities in which leader behavior (video) and inconsistencies (written messages) were presented match real-world occurrences of leader behavior and messages (e.g., repetitive exposure to short videos and texts posted on social media). However, the discrepancy in the presentation of the stimuli potentially led to a rather loose connection between the charismatic behavior in the video and the contra-environmentalism information in the text messages. Thus, the charismatic behavior could not exert a direct effect on how contradictory information in the written messages from the leader was processed. The observation that message inconsistency reliably affected reading times indicates that our experimental manipulation was effective when presented within the same modality. As such, future studies on reading times should also

consider manipulating charisma directly, e.g., by adding verbal tactics to the written passages.

Second, effects of charismatic leader behavior may be limited in an online environment (Ernst et al., 2022). An online context in which people can only observe but not interact with the leader naturally prohibits various social behaviors (such as making eye contact that is reciprocated by the leader). A lack of this social dimension restricts the extent to which the charismatic effect can unfold and limits the control over the quality of the presentation of the stimuli (e.g., differences in audio and visual quality, internet connection etc.). Third, the same actor was used across the charismatic and neutral conditions to exclude the influence of person-specific effects in the two leader conditions and establish a leader-follower relationship. Followers usually encounter leaders repetitively and even the most charismatic leaders are not always behaving that way. However, we are aware that the repetitive exposure to CLTs demonstrated by the same person limited their effectiveness in our experiments.

Lastly, all participants believed in climate change and were *concerned* or *very concerned* with the environment. While such sample characteristics helped us to create a re-

Table 8. Mixed Effects Models Study 2 for Convincingness Rating and Rating time

Predictor	DV: Rating		DV: Rating Time	
	1	2	3	4
Intercept	0.28*** (0.12)	0.32*** (0.12)	-0.05*** (0.07)	-0.06*** (0.07)
Charisma	0.07† (0.04)	-0.02 (0.06)	-0.00 (0.04)	0.01 (0.05)
Message	-0.70*** (0.14)	-0.78*** (0.15)	0.15** (0.05)	0.16** (0.06)
Block	-0.07*** (0.02)	-0.07*** (0.02)	-0.35*** (0.02)	-0.35*** (0.02)
Gender [male]	-0.05 (0.06)	-0.05 (0.06)	0.03 (0.07)	0.03 (0.07)
Gender [other]	0.12 (0.37)	0.12 (0.37)	-0.12 (0.41)	-0.12 (0.41)
Concern	0.13† (0.06)	0.13† (0.06)	-0.07 (0.07)	-0.07 (0.07)
Charisma x Message		0.17* (0.08)		-0.03 (0.07)
Random Effects				
σ^2	0.64	0.64	0.14	0.14
τ_{00} Subject	0.27	0.27	0.10	0.10
Message	0.04	0.04	0.00	0.00
ICC	0.33	0.33	0.43	0.43
N Subject	390	390	390	390
Message	8	8	8	8
N Observations	1560	1560	1560	1560
Marginal R ²	0.13	0.13	0.13	0.13
Conditional R ²	0.42	0.42	0.51	0.51
AIC	4181.961	4182.331	1910.386	1916.925

Note. The table shows standardized estimates and standard errors in parentheses. Charisma was coded as 0 = neutral, 1 = charismatic. Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = *Concerned*, 1 = *Very concerned*).

†p < .10, *p < .05, **p < .001, ***p < .001.

alistic leader-follower scenario and enabled the leader to appeal to the emotions and values of the participants, the charismatic leader did not need to convince participants of the importance of the climate crisis. It is likely that accounting for variations in environmental concern will lead to more insights into the effect of environmental message inconsistencies and charismatic leader behavior on processing and evaluating climate change information. Especially charismatic leader behavior may capture the attention of those more who are unsure about their concern with the environment, have different personality types (e.g., a high openness to experience), or differ in their general belief strength as compared to the tested samples. However, this taps into different research questions about individual characteristics and potential moderators of the charismatic effect and was not the focus of the present studies.

Another explanation for why we failed to detect effects of charismatic signals on processing times in the present

study may be due to the motivation of participants. Those who are already *concerned* with the environment likely focus their attention on informational elements different from those who are *not concerned* with the environment. In particular, according to the Elaboration Likelihood Model (Petty & Briñol, 2011; Petty & Cacioppo, 1986), people will carefully process the *message content* when they are motivated but attend more to peripheral characteristics of the *message source* (e.g., charismatic signals) when they are less motivated. Consequently, it may have been the case that because we only recruited participants concerned with the environment, they were highly motivated to engage in activities related to environmentalism and, therefore, primarily paid attention to the *message content* instead of the charismatic signals. However, this explanation contrasts the current literature on charismatic leadership, which postulates that charismatic signals will only be effective if the audience shares the leader's values (Antonakis

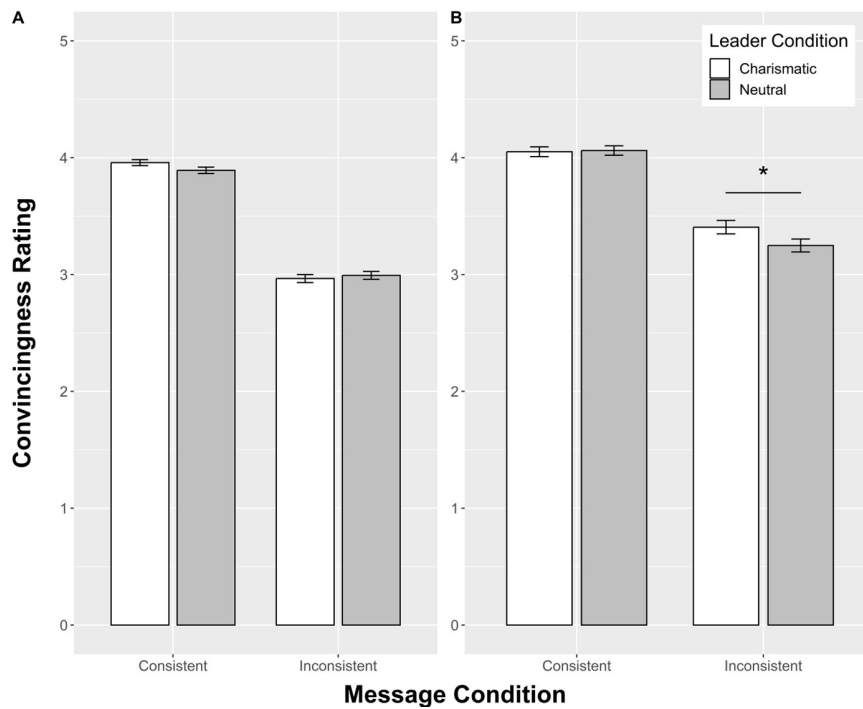


Figure 3. Average Convincingness Ratings for Messages

Note. Average convincingness ratings Study 1 (A) and Study 2 (B). Error bars represent standard errors.

et al., 2016). In sum, we think that, if anything, our highly engaged study sample should have been more affected by the charismatic signals based on the current literature on charismatic leadership (for a review, see Antonakis et al., 2016).

7.1.2. Exploratory Findings Leader Charisma

Subjective charisma reports were associated with the convincingness of written environmental messages. Based on these exploratory findings, leader charisma likely influences subjective perceptions of information (more persuasive for higher and less persuasive for lower charisma perceptions of the leader). Additionally, in Study 2, contra-environmental information was rated more convincing when it followed charismatic leader behavior. However, we failed to detect such an effect in Study 1, which instead showed a (non-significant) trend in the opposite direction. Subjective perceptions of the charisma signals may explain these inconsistent findings. Participants may have adjusted their evaluations for information based on the observations of the leader preceding the written information. Importantly, we cannot establish a causal relationship between the subjective perceptions of the leader's charisma and convincingness ratings in the present studies. It is, however, unlikely that text messages influenced the rating of the different leader videos at the end of the study because participants would have needed to remember which texts were presented in which condition. Additionally, the same number of pro vs. contra-environmentalism target sentences were presented in the charismatic and neutral leader conditions.

7.1.3. Pro- and Contra-Environmentalism

The finding that participants spent more time reading contra-environmentalism target sentences compared to pro-environmentalism statements is in line with literature on processing inconsistent information in other contexts (e.g., Rinck et al., 2003). The robust findings for increased processing times of inconsistent information in our studies validate that our experimental paradigm could detect the processing of conflicting information (cf., elaborative processing of inconsistent information; Richter & Maier, 2017). The effects further imply that individuals who are (very) concerned with the environment notice and process contra-environmentalism information more effortfully than pro-environmental information, regardless of the leadership behavior demonstrated by the information source. At the current state, we have no empirical evidence that the null findings for an interaction effect of leader charisma and message inconsistencies hold for different populations who differ in their concern with the environment and, therefore, may be more susceptible to charismatic influence.

7.2. Other Limitations and Future Directions

Future studies should explore whether individual characteristics influence a possible effect of charisma on cognitive processes and whether leader charisma has an effect on other outcomes relevant to the climate crisis, such as pro-environmental intentions and behaviors. Especially, including a measure of pro-environmental behaviors will provide more insights into more practical outcomes of

Table 9. Exploratory Mixed Models Study 2 with DV Convincingness Rating

	IV: Verbal Ratings	IV: Non-verbal Ratings	IV: Charisma Perception
	1	2	3
Intercept	0.32*** (0.11)	0.31*** (0.11)	0.31*** (0.11)
Charisma rating	0.14*** (0.02)	0.12*** (0.02)	0.16*** (0.02)
Message	-0.70*** (0.14)	-0.70*** (0.14)	-0.70*** (0.14)
Block	-0.07** (0.02)	-0.07** (0.02)	-0.06** (0.02)
Gender [male]	-0.05 (0.06)	-0.04 (0.06)	-0.04 (0.06)
Gender [other]	0.13 (0.35)	0.14 (0.36)	0.15 (0.35)
Concern	0.11 (0.06)	0.12 (0.06)	0.12 (0.06)
Random Effects			
σ^2	0.64	0.64	0.65
τ_{00} Subject	0.24	0.25	0.23
Message	0.04	0.04	0.04
ICC	0.31	0.31	0.30
N Subject	390	390	390
Message	8	8	8
N Observations	1560	1560	1560
Marginal R ²	0.15	0.15	0.16
Conditional R ²	0.41	0.41	0.41

Note. The table shows standardized estimates and standard errors in parentheses. Charisma ratings: Ratings for verbal tactics (Model 1), ratings for non-verbal tactics (Model 2), ratings for charismatic attributes (Model 3). Message was coded as 0 = consistent, 1 = inconsistent. Block corresponds to the progress in the experiment, i.e., the block number (1-20). Participant gender was coded as 0 = female, 1 = male, 1 = other. Concern is participants' environmental concern (0 = Concerned, 1 = Very concerned).

p<.001, *p<.001.

charismatic leader signaling in a climate context. It is further necessary to explore in more detail whether the exploratory and null findings hold for individuals who are *not concerned* with the environment, are *skeptical* or do *not believe* in a changing climate. To validate the relationship between leader charisma and the convincingness of environmental messages, the leader's charisma should be assessed per video clip before rating the convincingness of the text messages, preferably by a separate experimental sample. We hope our findings inspire others to pursue this line of research to understand the workings and underlying mechanisms of the power of charismatic leadership in different societal movements.

7.3. Practical Implications

Our studies show that perceived charisma is associated with the convincingness of climate change information. Further assessment of this correlation is necessary to understand whether training public speakers, local spokespersons and leaders of environmental groups in applying CLTs could be useful in strengthening their impact and con-

vincing the public of information they share about climate change and actions. In addition, participants noticed inconsistent environmental messages and processed them accordingly with more effort, regardless of how the leader behaved. Thus, public speakers are advised to carefully check their statements to prevent detrimental effects of inconsistent information on the persuasiveness of their environmental messages.

8. Conclusion

Our work addresses the role of charismatic leadership tactics (CLTs) and inconsistent messages in processing and evaluating climate change information. We set initial steps to combine cognitive, organizational, and environmental psychology in exploring the information processing mechanisms and leadership aspects involved in how people process and evaluate climate change information. Participants invested more effort in processing contra- than pro-environmentalism messages – regardless of a leader's behavior. While leader charisma did not affect how messages were processed, there was an association between subjec-

tive perceptions of the leader and the convincingness of environmental messages.

Approved the submitted version for publication: LH, MvE, JT, MvV

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Data Accessibility Statement

Stimuli, data, analysis scripts and results for robustness checks and additional analyses can be found on this paper's project page on the Open Science Framework [<https://osf.io/hy4vz/>].

Contributions

Contributed to conception and design: LH, MvE, JT, MvV
Contributed to acquisition of data: LH
Contributed to analysis and interpretation of data: LH, MvE, JT, MvV
Drafted and/or revised the article: LH, MvE, JT, MvV

Competing Interests

The authors have no conflicts of interest to declare.

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