Instrumental Goal Activation Increases Online Petition Support Across Languages

David M. Markowitz¹

¹School of Journalism and Communication, University of Oregon, Eugene, OR USA

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The data and code are available on the Open Science Framework:

https://osf.io/dyq79/?view_only=d52f596be0834891876cbf87f0d7988d

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Abstract

Research on processing fluency and instrumental goal activation suggests people often perceive complex information positively when effort in a task is valued. The current paper evaluates this idea in five online petition samples (total $N = 1,047,655$ petitions and over 200 million words), assessing how the linguistic fluency of a petition associates with support. Consistent with prior work, petitions with lower rates of lexical fluency (fewer common words) associated with more signatures and an increased probability of petitions making a concrete change than those with higher rates of lexical fluency (more common words). Exploratory results suggest other forms of linguistic complexity also associated with petition support: petitions with more analytic writing (e.g., more formal and complex writing patterns) and with less structural fluency (less readable writing) received more signatures than those with less analytic writing and more structural fluency. Controlling for the political leaning of the petition writers as inferred by their language patterns revealed consistent effects. Crucially, the lexical fluency results were maintained across 8 languages as well. Various types of linguistic complexity are therefore instrumental to get people to support online causes. Contributions to fluency theory and the psychology of giving are discussed.

Keywords: linguistic fluency, instrumental goal activation, automated text analysis, online petitions

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People often use their feelings to evaluate and judge information they consume. Information presented in a simple manner, at least for relatively effortless tasks, is often perceived positively versus information that is presented in a complex manner because simplicity feels better to most people (Schwarz, 2004, 2012). For example, simple and common words (Markowitz et al., 2021; Oppenheimer, 2006), visually easy-to-perceive texts (Reber & Schwarz, 1999), and familiar stimuli (Zajonc, 1968) are typically preferred over complex and uncommon words, visually difficult-to-perceive texts, and less familiar stimuli. However, evidence suggests complexity can also lead to positive judgments of a target when effort is instrumental toward achieving a goal (Labroo & Kim, 2009; Markowitz & Shulman, 2021). Complexity is therefore a contextual cue, and in an increasingly complex world (Norman, 2010), it is crucial to understand how complexity links to consequential behaviors to inform theories of information processing.

The current work draws on processing fluency theory (Alter & Oppenheimer, 2009; Oppenheimer, 2008) and evidence supporting the instrumentality heuristic (Labroo & Kim, 2009) to evaluate how linguistic fluency and complexity relate to support for online petitions. This work is timely and important because petitions are a key organizing mechanism to publicize issues and motivate change in society. For example, governments must respond to petitions and debate issues in court if they gain enough supporters (UK Government and Parliament, 2022). Online petition writers use language as a vehicle to communicate the urgency and necessity of a cause and therefore, words are fundamental to the decision-making process for this setting (e.g., Should I support this cause or not?). To date, online petitions have rarely been evaluated from a psychological perspective to understand how word patterns associate with support. The present research addresses this opportunity and evaluates how different forms of linguistic fluency —

lexical fluency (e.g., the ease/difficulty associated with the commonness of the language used), analytic writing fluency (e.g., the ease/difficulty associated with how one's message is communicated), and structural fluency (e.g., the ease/difficulty associated with message comprehension based on sentence and word length) — relate to support for online petitions across a diversity of samples and languages.

It is psychologically important to investigate how the language of online petitions links to support for several reasons. First, prosociality research argues that people who engage in self-giving (e.g., “contributions that, through transfer of ownership or physical contact, come to represent the essence of the self;” Koo & Fishbach, 2016, p. 339) tend to feel differently about the giving experience than people who engage in other forms of giving of equal value. Koo and Fishbach (2016; Study 4) gave participants the opportunity to donate a part of the self (e.g., donate blood) or donate money that had the same value as ascribed by participants. Those who engaged in self-giving (e.g., would donate blood) felt more generous, more committed to the cause, and were more likely to suggest they would contribute to the cause's future than those who would donate money. Those who also signed their name on a petition (versus signing anonymously) tended to feel more generous, committed to the cause, and suggested they would contribute to the cause's future (Study 5). Therefore, psychological experiences of giving are not universal and instead, they are contingent on *what* people give and the degree to which the giving act connects to the self. In other words, people are psychologically discerning about what they give to others and how much the act triggers their self-concept, which can have downstream consequences for one's appraisal of the giving experience and behavior. Signing a petition can prime a person's identity (e.g., “this signature is who I am”) (e.g., Kettle & Häubl, 2011), and contributions therefore feel different when a donation mechanism more actively prompts one's

self-identity (online petitions) compared to when it less actively prompts one's self-identity (e.g., online charitable giving; Markowitz & Shulman, 2021).

Second, online petitions are important because they are psychologically distinct from a related setting, charitable giving, based on publicness requirements. Petitions typically require a public signature, whereas most charitable giving sites allow donors to be anonymous. This, in turn, might make donors feel safer and more private than petitions signers because their donations can be publicly unassociated with their identity. Petition supporters may also be more inclined to think deeply about the petition, scrutinize the cause, and attempt to infer the writer's motivations because of impression management or reputational concerns, such as not wanting their name to be publicly associated with a problematic cause or publicly wanting to be seen as someone who values a petition that is effortful and worthwhile. Indeed, people often want to be seen as valuing and expending effort in public (Ariely et al., 2009), especially when self-presentation concerns might be involved (Duygu et al., 2019). Together, online petitions are psychologically impactful in ways that perhaps charitable giving sites are not. The current work seeks to identify how people can infer effort from the language in online petitions and how various forms of linguistic complexity link to signatures, an idea rooted in processing fluency and instrumental goal activation research.

Processing Fluency and The Instrumentality Heuristic

The suggestion that simple stimuli are preferred to complex stimuli for relatively effortless tasks is supported by feelings-as-information theory (Schwarz, 2012). Simple stimuli (e.g., words, images) that feel familiar and psychologically manageable are preferred to complex stimuli because they are often easier to understand and process. A long history of processing fluency research extends this argument to multiple aspects of fluency. Chief among them is

lexical fluency (Alter & Oppenheimer, 2009), which considers the ease/difficulty of certain words in everyday speech. Common words, or those that are typically short, easy-to-understand, and familiar to most people, are preferred to jargon or specialized terminology. A host of experimental and field study evidence suggests people make positive assessments of simple compared to complex words in relatively effortless tasks (see Alter & Oppenheimer, 2009; Oppenheimer, 2008; Shulman & Bullock, 2019). For example, people tend to judge companies with common language in their values statements as more moral, warmer, and more trustworthy than companies with uncommon language in their values statements (Markowitz et al., 2021). The authors of academic abstracts with simple words (compared to complex synonyms of the same word) are perceived as more intelligent as well (Oppenheimer, 2006). Recent evidence also suggests common words associate positively with online behavior such as engaging with a Twitter post (Markowitz & Shulman, 2021). Therefore, effortless tasks are often perceived positively when information is presented in a simple (common) versus complex (uncommon) manner because simplicity tends to subjectively feel better to most people (Oppenheimer, 2008).

However, in settings where effort is valued, or when people believe that individuals are attempting to achieve a valuable goal, complexity can associate with positive outcomes. This phenomenon is called *the instrumentality heuristic* (Labroo & Kim, 2009), where difficult-to-process images or words often lead to feelings of effort, which if appropriate and instrumental to goal attainment, are appraised positively (Labroo & Kim, 2009; Markowitz & Shulman, 2021). For example, Labroo and Kim (2009) presented participants with a blurry or clear charity campaign image and when primed with an accessible instrumental goal (“be a kinder person”) instead of a neutral goal, people preferred the blurry and visually complex stimulus over the clear and visually simple stimulus (and they gave more money to the charity as well). The authors

argued that the difficulty associated with perceiving the blurry stimulus was “attributed to the instrumentality of the means,” which in turn increased its favorability (Labroo & Kim, 2009, p. 128). In other words, effort and complexity can be positive attributes when they are essential to goal attainment. Crucially, this effect has been extended in field studies by evaluating language: charitable giving campaigns with fewer common words tended to receive more money from supporters and grants whose abstracts contained fewer common words and a more complex structure (e.g., more words per sentence) tended to receive more funding as well (Markowitz, 2019; Markowitz & Shulman, 2021). Writers across settings, including charitable giving campaigns, grants, and presently with online petitions, must describe why their causes are meaningful and worthy of support. Therefore, according to fluency theory and the instrumentality heuristic, potential petition signers should perceive signals of effort (e.g., complex language, such as the words used or a text’s length) favorably because writing a petition and recruiting supporters for one’s cause is a difficult undertaking and essential to the task.

Together, prior evidence argues that the relationship between processing fluency and language is contingent on the degree to which effort is instrumental for goal pursuit and valued in a particular setting. Fluency and complexity are therefore context-dependent (Briñol et al., 2006; Galak & Nelson, 2011; Labroo & Kim, 2009; Lowrey, 1998, 2006; Markowitz & Shulman, 2021; Shulman & Bullock, 2020). When effort is not valued, and goal-pursuit is not salient, simple language is preferred and appraised positively. When effort is valued, and goal-pursuit is salient and instrumental to the task (e.g., trying to achieve something difficult or challenging), complex language is preferred and appraised positively.

Fluency in Many Forms: A Psychology of Language Perspective

In linguistic fluency research, most studies evaluate the difficulty associated with

processing simple/common words compared to complex/uncommon words. Recall, such *lexical fluency* effects suggest people prefer simple and everyday common words (e.g., *job*) over complex alternatives (e.g., *occupation*) when goal-pursuit is not salient and this general finding has received robust support (Alter & Oppenheimer, 2009; Markowitz et al., 2021; Markowitz & Shulman, 2021; Oppenheimer, 2006, 2008; Shulman & Bullock, 2019). However, there are complementary linguistic fluency concepts that have not been thoroughly investigated in prior research, but can also expand our psychological understanding of how consuming different types of linguistic information can impact information processing in effortful tasks. These concepts — (a) *analytic writing fluency*, operationalized by an analytical and formal writing style, and (b) *structural fluency*, operationalized by text readability — are evaluated in the current paper to understand how distinct forms of linguistic fluency, instrumental goal activation, and online petition support are linked.

Analytic writing fluency. Analytic writing fluency is defined as the ease/difficulty associated with *how* a message is communicated. This concept considers the rate of style words in a person's communication output, which are pervasive in English (Baayen et al., 1995; Tausczik & Pennebaker, 2010), and reflect the manner in which they communicate instead of what they communicate about (Chung & Pennebaker, 2007; Pennebaker, 2011). Words such as pronouns (e.g., *I, me, myself*), articles (e.g., *a, the*), and prepositions (e.g., *above, below*) are examples of style words, which connect to many social and psychological processes including interpersonal interest and group cohesion (Ireland et al., 2011), personality (Yarkoni, 2010), social status (Kacewicz et al., 2014; Markowitz, 2018), and psychological distress (Cohn et al., 2004; Markowitz, 2022; Seraj et al., 2021).

A recent advancement in psychology of language research is the creation of a single

dimension called analytic writing, which “can be applied to any type of text” (Pennebaker et al., 2014, p. 6), to indicate the formal, impersonal, and complex nature of a person’s communication patterns. Analytic writing is a bipolar continuum derived from a large sample of university admissions essays. Students with higher grades at the end of college wrote with high rates of articles and prepositions (e.g., which indicate complex writing) and low rates of storytelling words (e.g., pronouns, conjunctions, negations) than those with lower grades at the end of college. Analytic writing has also been connected to other important social and psychological dynamics in the field, including persuasion (Markowitz, 2020), cultural trends in political speech (Jordan et al., 2019), and gender (Meier et al., 2020). To consider how the ease/difficulty of a text’s writing style links to online petition support and reflects new ways of understanding fluency in relation to the instrumentality heuristic, the analytic writing index was evaluated.

Structural fluency. While prior work has considered syntactic fluency in processing fluency research¹ (e.g., the ease/difficulty associated with the word order in a sentence), a related but new concept called structural fluency specifically indicates the ease/difficulty of processing words and sentences based on their length (e.g., longer words and sentences are more difficult to comprehend and less fluent than shorter words and sentences, on average) (Schuster et al., 2016). In the current study, structural fluency is operationalized by readability, namely the Flesch Reading Ease metric (Flesch, 1948). Prior work has used readability indices to identify deception and obfuscation (Humpherys et al., 2011; Li, 2008; Markowitz et al., 2021; Markowitz &

¹ To describe syntactic fluency, Alter and Oppenheimer (2009) give the example of “the cat sat on the mat” (fluent) versus “on the mat sat the cat” (disfluent). The disfluent example has a more challenging word order and is therefore more difficult to process than the fluent example. Structural fluency, however, is not concerned with word order, but the ease/difficulty associated with processing words and sentences of different lengths. As expected, since the prior examples have the same words but are arranged differently, they have the same structural fluency (Flesch Reading Ease = 116.15). Comparatively, the phrase “the happy feline sat on the mat” contains more words than the other phrases and *feline* is longer than *cat*, making it less readable and more difficult to process (Flesch Reading Ease = 90.96). Therefore, syntactic fluency and structural fluency are complementary, but conceptually distinct.

Hancock, 2016), the communication styles of male and female scientists in online settings (Hubner & Bond, 2021), and the helpfulness of online reviews (Fang et al., 2016). Readability is therefore an important indicator to evaluate the link between language and psychological dynamics, which is why it is evaluated as a key measure of structural fluency under conditions of instrumental goal activation.

The Current Paper

The current paper connects processing fluency theory and the instrumentality heuristic to evaluate how lexical fluency, analytic writing fluency, and structural fluency relate to online petition support. For online petitions, effort should be associated with value because writing online petitions and recruiting supporters are challenging tasks. Petition creators must develop a coherent and compelling narrative, trying to convince potential signers about the stakes of their cause, and why it is worthwhile. Failing to communicate this need or the effort required to achieve the petition's goal is problematic (e.g., wasted resources, the cause not being supported). More people should support petitions that are written in a complex versus simple manner because the effort associated with such complexity should be perceived as instrumental to gaining petition support and facilitating change (Labroo & Kim, 2009). In other words, in a setting where one's online behavior is publicly recorded, "what is produced without effort [should be] less valued and appreciated" than what is produced with effort (Bazarova, 2012, p. 829). Against this backdrop, the following prediction was preregistered for lexical fluency:

H₁: On average, online petitions with less lexical fluency (fewer common words) will have more supporters and reach a victory compared to petitions with more lexical fluency (more common words).

In addition to the prior preregistered hypothesis, analytic writing fluency (via an analytic

writing index) and structural fluency (via readability) were evaluated as well. Predictions for these language dimensions were not preregistered, but instead were considered exploratory, because this is one of the first papers to evaluate the connection between fluency theory and goal instrumentality for such concepts. Based on the underlying logic of this piece via linguistic fluency and goal instrumentality, though, higher rates of linguistic complexity in various forms (e.g., fewer common words, more analytic writing, less readable writing) should independently associate with greater support for online petitions. This multi-dimensional investigation is theoretically important because the evaluation of different linguistic fluency concepts in the same study is often rare (e.g., Alter & Oppenheimer, 2006, 2008; Markowitz & Shulman, 2021), and a simultaneous comparison of concepts can help to understand those that link the strongest to online behavior under conditions of instrumental goal activation. This comparison of complementary, yet distinct fluency concepts is also psychologically important because each concept represents a different psychological pathway for linguistic fluency to link to behavior. People often use their feelings to make decisions based on the fluency of a target and thus, comparing linguistic fluency effects allows one to identify the language properties with strongest connections to attitudes, beliefs, and moods when processing information (Schwarz, 2010, 2015).

Cross-linguistic fluency effects. Finally, this paper aims to evaluate the relationship between fluency, instrumental goal activation, and word patterns across languages by drawing on cultural psychology research, which broadly suggests one's cultural context shapes how people communicate and their thinking style (Henrich et al., 2010; Markus & Kitayama, 1991). For example, prior work has observed that people from individualistic cultures tend to think more analytically than people from collectivistic cultures (Henrich et al., 2010; Ji et al., 2004; Nisbett et al., 2001), though this pattern has scarcely been evaluated at the language level, in the field, or

under conditions of instrumental goal activation. A cross-cultural and cross-linguistic investigation is theoretically important because such evidence might offer a rich psychological story about how people from different cultural backgrounds value effort that is instrumental to goal attainment, how different people use their feelings to make judgments about goal-related information, and how such inferences are made through language patterns in a limited-cue environment such as online petitions (e.g., people who mainly rely on text to make their support decision). Links between fluency, instrumental goal activation, and language were exploratory because the types of languages in each dataset were not known *a priori*.

Method

Online petitions were gathered from five public databases in early February 2022. Three samples written in English were collected from GoPetition.com (henceforth referred to as GoPetition)², MoveOn.org (henceforth referred to as MoveOn)³, and UK Government and Parliament Petitions (henceforth referred to as UK Petitions)⁴. Two samples collected petitions across languages from Petitions.net (henceforth referred to as Global Petitions)⁵ and Change.org (henceforth referred to as Change).⁶

Several types of data were collected from each site, including the text description of the petition, the number of supporters (signatures) for the petition, and in some cases, the status of the petition (e.g., victorious or not). For example, creators of Change petitions self-determined if their campaign was victorious after making a “concrete change.” For UK Petitions, only petitions with more than 10,000 supporters receive a reply for the UK government. Therefore, for UK

² <https://www.gopetition.com/>

³ <https://front.moveon.org/>

⁴ <https://petition.parliament.uk/>

⁵ <https://www.petitions.net/>

⁶ <https://www.change.org/>

Petitions, a victorious petition was determined by the author as one with more than 10,000 supporters at the time of data collection. GoPetition, MoveOn, and Global Petitions did not have a victory label and therefore, analyses related to petition status were not performed.⁷

An initial collection of 52,792 petitions were obtained from GoPetition, 57,056 petitions were obtained from MoveOn, 129,200 petitions were obtained from UK Petitions, 46,067 were obtained from Global Petitions, and 1,069,938 petitions were obtained from Change. Several preprocessing steps were performed to reach the final sample for each dataset, however. Consistent with best practices for automated text analysis (Boyd, 2017; Markowitz, 2021b), petitions with less than 25 words were excluded to prevent small word counts from overrepresenting linguistic categories. Second, the language of each petition was determined automatically to ensure only English texts were retrieved in GoPetition, MoveOn, and UK Petitions samples, and to determine the languages present in Global Petitions and Change samples (Ooms, 2020). Languages were retained in the Global Petitions sample if they appeared in at least 1,200 cases and if they could be analyzed with a validated LIWC dictionary (see below). A broader set of non-English languages were analyzed in the Change sample to increase the generalizability of the languages represented and to examine how linguistic fluency in different cultural contexts associates with petition support when goal instrumentality is salient. Further, the top 5 most frequent languages and associated petitions were retained in the Change sample. The final list of languages across samples includes English (Pennebaker et al., 2022), Brazilian Portuguese (Carvalho et al., 2019), Dutch (Boot et al., 2017), German (Meier et al., 2018), Romanian (Dudău & Sava, 2020), French (Piolat et al., 2011), Italian (Agosti & Rellini, 2007), and Spanish (Ramírez-Esparza et al., 2007).

⁷ The victory analyses produced results that were consistent with the analyses evaluating the number of petition signatures. These results are reported in the supplement out of space considerations.

Descriptive statistics for the final number of petitions across samples are represented in Table 1. For UK Petitions, only 1.15% of petitions were victorious (1311/114424) and for Change petitions, only 3.25% of petitions were victorious (27204/836736). Reproducibility files (e.g., data, code) and preregistrations are available on the Open Science Framework: https://osf.io/dyq79/?view_only=d52f596be0834891876cbf87f0d7988d. Raw texts were removed from these files to preserve the anonymity of the writers and those in the petition.

Automated Text Analysis

Texts were processed with Linguistic Inquiry and Word Count (LIWC) (Pennebaker et al., 2022). LIWC is an automated text analysis tool that counts words as a percentage of the total word count per text. For example, the phrase “We want equal pay” contains four words and identifies a range of categories in LIWC’s internal dictionary of social (e.g., words related to friends), psychological (e.g., words related to emotion or cognition), and part of speech dimensions (e.g., pronouns). That is, words such as “we” are first-person plural pronouns (collective references) and comprise 25% of the total word count; “pay” is a money word, also 25% of the word count. LIWC created a linguistic profile for each petition, and all language dimensions were drawn from the LIWC-22 dictionary unless stated otherwise.

Measures

Lexical fluency was operationalized by the rate of common words and specifically measured by the LIWC-22 dictionary category (for support, see: Groom & Pennebaker, 2002; Markowitz, 2019, 2021a; Markowitz et al., 2021; Markowitz & Hancock, 2016; Markowitz & Shulman, 2021; Tausczik & Pennebaker, 2010), which helped to test the preregistered prediction that low rates of common words will associate with an increase in petition signatures and victorious petitions. High rates of common words are derived from high scores on the LIWC

dictionary category, which contains “over 12,000 words, word stems, phrases, and select emoticons” reflecting everyday common terms in written and spoken communication (Boyd et al., 2022, p. 5; Boyd & Schwartz, 2021; Tausczik & Pennebaker, 2010).

Two exploratory fluency concepts and their associated language dimensions were evaluated as well: analytic writing fluency (via an analytic writing index) and structural fluency (via readability). Analytic writing fluency was evaluated with an analytic writing index, specifically a composite variable of seven function word categories in LIWC (Pennebaker et al., 2014).⁸ High scores indicate formal and complex writing compared to low scores, which indicate dynamic and simple writing. High rates of analytic writing, then, are comparatively more complex and less fluent than low rates of analytic writing (for evidence that connects analytic thinking/processing and disfluency, see Alter, 2013; Alter et al., 2007, 2013).

Readability was evaluated with the Flesch Reading Ease scale (Flesch, 1948) and calculated by the *quanteda.textstats* package in R (Benoit et al., 2021). This metric considers the number of words per sentence, total sentences, and syllables in an English passage; complex texts contain longer (and more) sentences and syllables than simple texts. Less readable writing (low scores on the Flesch Reading Ease scale) suggests more complex communication patterns than more readable writing (high scores on the Flesch Reading Ease scale).⁹

For analytic writing and readability, only English texts were considered in the Global Petitions and Change samples due to validity concerns with calculating these dimensions across languages. Descriptive statistics for these variables are in the supplement.

Results

⁸ Analytic writing = [articles + prepositions - pronouns - auxiliary verbs - adverb - conjunctions - negations] from LIWC scores (Jordan et al., 2019).

⁹ Please see the online supplement for the full Flesch Reading Ease formula.

The number of signatures in each sample were not normally distributed. Therefore, the data were analyzed with Spearman's rho (ρ) correlations. Using the *lme4* and *lmerTest* packages in R (Bates et al., 2015; Kuznetsova et al., 2020), exploratory linear mixed models also evaluated the link between common words and petition support controlling for language type as a random intercept, with the number of petition signatures natural log-transformed.

GoPetition, MoveOn, and UK Petitions

The relationship between common words and petition signatures was negative and statistically significant for the GoPetition ($\rho = -.139, p < .001$; 95% CI $[-.148, -.131]^{10}$), MoveOn ($\rho = -.177, p < .001$; 95% CI $[-.187, -.168]$), and UK Petitions samples ($\rho = -.006, p = .028$; 95% CI $[-.012, -0.0006]$).

Global Petitions and Change

The relationship between common words and petition signatures was negative and statistically significant for the Global Petitions ($\rho = -.212, p < .001$; 95% CI $[-.231, -.193]$) and Change samples ($\rho = -.189, p < .001$; 95% CI $[-.192, -.188]$). For English texts and texts from other languages, common words were associated negatively with petition support (see Figure 1).

Taken together, H_1 was supported across all samples, as low rates of lexical fluency (fewer common words) were associated with more online petition support.

The linear mixed model results revealed a pattern consistent with the bivariate correlations for the Global Petitions sample ($B = -3.166\text{e-}02, SE = 2.069\text{e-}03, t = -15.30, p < .001, R^2\text{c} = 0.23$)¹¹ and the Change sample ($B = -4.681\text{e-}02, SE = 2.890\text{e-}04, t = -161.99, p < .001, R^2\text{c} = 0.13$). Full model outputs and results treating language type as a fixed effect are also available

¹⁰ All 95% Confidence Intervals (CIs) for petition samples were bootstrapped with 5,000 replicates. For the Change sample, CIs were bootstrapped with 1,000 replicates due to its size and computing power limitations.

¹¹ $R^2\text{c}$ = variance explained by the fixed and random effects in R (Bartoń, 2020).

in the online supplement.

Robustness Checks

The number of cases in each sample were large and therefore, it is important to assess the prior relationships at different robustness thresholds. A random selection of cases at three thresholds were drawn (e.g., 25%, 50%, 75% of cases in each sample). The evidence in Table 2 suggests all effects were directionally consistent and replicated at the different robustness thresholds except for those in the UK Petitions sample at the 25% and 50% levels. Overall, the lexical fluency results are robust to sample size.

Exploratory Language Analyses

Analytic writing fluency. Petitions with more analytic writing tended to receive more petition signatures for the GoPetitions ($\rho = .100, p < .001$; 95% CI [.091, .109]), MoveOn ($\rho = .121, p < .001$; 95% CI [.111, .131]), UK Petitions ($\rho = .016, p < .001$; 95% CI [.010, .022]), Global Petitions ($\rho = .199, p < .001$; 95% CI [.168, .230]), and Change samples ($\rho = .224, p < .001$; 95% CI [.221, .226]). Therefore, across samples, petitions with more analytic and complex writing tend to receive more online support than petitions with less analytic and complex writing.

Structural fluency. Petitions with less readable writing tend to have more signatures for the GoPetition ($\rho = -.099, p < .001$; 95% CI [-.108, -.089]), MoveOn ($\rho = -.122, p < .001$; 95% CI [-.132, -.112]), Global Petitions ($\rho = -.199, p < .001$; 95% CI [-.232, -.167]), and Change samples ($\rho = -.258, p < .001$; 95% CI [-.259, -.255]). The effect was not statistically significant in the UK Petitions sample ($\rho = -.002, p = .591$; 95% CI [-.007, .004]).

Are common words, analytic writing, and readability independent predictors of online petition support? Multiple regression models reported in Table 3 suggest the three dimensions of linguistic complexity independently associate with signatures across nearly all samples. Local

effect sizes (Cohen's f^2) also suggest common words and analytic writing largely had the strongest connection to petition support across samples (Table 3). In general, however, the effect sizes were small. Taken together, the lexical fluency, analytic writing fluency, and structural fluency effects provide independent and converging evidence that linguistic complexity associates with an increase in online petition support in a setting where effort is valued.

Alternative Explanations and Additional Analyses

Online duration. An alternative explanation for the prior effects is that older petitions (e.g., those that have spent more time online) might naturally receive more support than younger petitions (e.g., those that have spent less time online). To investigate this alternative explanation directly in the Change sample (the sample with the most cases and extractable start dates), the petition start date was subtracted from the data pull date and a partial correlation of language patterns and petition supporters, controlling for the date difference, was computed. The results were consistent with the simple bivariate correlations, where petition support increased as common words decreased ($\rho = -.188, p < .001$) petition support increased as analytic writing increased for English-only petitions ($\rho = .223, p < .001$), and petition support increased as readability decreased for English-only petitions as well ($\rho = -.258, p < .001$). Therefore, the amount of time a petition exists online does not considerably influence the link between language patterns and petition support.

Political ideology. A second alternative explanation is that some petitions may originate from left-wing or right-wing writers, and the requests in each campaign might therefore be appreciably different depending on ideology. While the political leaning of each campaign's demands is difficult to assess computationally, the political leaning of each petition writer can be approximated by their language patterns using a *mind-body* index (Robinson et al., 2017). The

work by Robinson and colleagues (2017) suggests left-wing and liberal individuals tend to score higher on cognitive and mind-related concepts than right-wing and conservative individuals (see Cacioppo et al., 1996; Crowson, 2009); right-wing and conservative individuals tend to score higher on body-related concepts than left-wing and liberal individuals (see Haidt & Graham, 2009; Jost et al., 2003). Certain language patterns can therefore indicate political ideology and for the average petition writer, controlling for ideology (e.g., liberalism or left-leaning ideology) likely captures the essence of controlling for their ideological demands (e.g., support for gun control) because of the tight link between these concepts. After accounting for political ideology of the writers via the *mind-body* index, all reported bivariate correlations were maintained except for UK petitions. Please see the supplement for supporting information and detailed results.

Effort validation and comparison to a control corpus. Finally, a central aspect of this paper suggests online petitions are a setting where the effort associated with linguistic complexity signals goal instrumentality and complexity is therefore favored. However, the assumption that people perceive writing online petitions as more effortful and valuable than other forms of online communication needs validation, and the opposite pattern of linguistic effects should also be observed in a setting without presumed instrumental goal activation. Drawing on the settings evaluated by Markowitz and Shulman (2021), a preregistered within-subjects study conducted on CloudResearch ($N = 250$; Litman et al., 2017)¹² had participants rate the amount of effort they believe the average journalist puts in to write a Tweet and the amount of effort the average person puts in to write an online petition in random order. Participants also rated how much value each online communication act provides to the writer. All judgments were made on 7-point Likert-type scales (1: No [effort/value] at all, 7: An enormous amount of

¹² An *a priori* power analysis (Cohen's $d = 0.20$, $\alpha = .05$, two-tailed) powered at 80% recommended 199 participants for this within-subjects study. The study was slightly oversampled to ensure enough participants were recruited.

[effort/value]]. Descriptions about what each online activity involves and why people perform them were provided for possibly unfamiliar participants.

A paired samples *t*-test revealed that people perceived writing an online petition ($M = 4.49$, $SD = 1.29$) as more effortful than writing a Tweet ($M = 2.76$, $SD = 1.29$), $t(249) = 18.38$, $p < .001$, Cohen's $d = 1.16$ (95% CI [1.00, 1.32]). Further, people perceived writing an online petition ($M = 3.95$, $SD = 1.63$) as more valuable to the writer than writing a Tweet ($M = 3.45$, $SD = 1.39$), $t(249) = 4.89$, $p < .001$, Cohen's $d = 0.31$ (95% CI [0.18, 0.44]). Effort and value were positively correlated for Tweets ($r = .626$, $p < .001$; 95% CI [0.544, 0.696]) and online petitions as well ($r = .470$, $p < .001$; 95% CI [0.368, 0.562]). Together, these findings support key assumptions of the current empirical package and prior work (Markowitz & Shulman, 2021). Backend details for this within-subjects study are offered in the supplement.

Next, a field study attempted to demonstrate how in a setting where instrumental goals are comparatively and presumably less salient than online petitions (e.g., on Twitter), the opposite linguistic effects occur (e.g., more common words, low rates of analytic writing, and more readable writing should be favored). A list of the most followed news Twitter feeds was collected, and 3 feeds were randomly selected for analysis (CNN Breaking News, National Geographic, Reuters). At most, 100,000 of the most recent Tweets from each source were collected using the *academictwitteR* package in R (Barrie et al., 2022) and non-English Tweets were removed prior to analysis (final $N = 218,878$ Tweets across feeds).

Consistent with the prior experimental evidence and the theoretical foundation of this piece, an engagement index of likes and retweets was positively associated with common words ($\rho = .056$, $p < .001$, 95% CI [.051, .059]) and negatively associated with analytic writing ($\rho = -.036$, $p < .001$, 95% CI [-.040, -.032]). However, there was mixed evidence for readability, where

the relationship between engagements and Flesch Reading Ease was unexpectedly negative ($\rho = -.138, p < .001, 95\% \text{ CI } [-.142, -.134]$). In a mixed model controlling for source as a random intercept, the patterns for common words ($B = 1.422\text{e-}02, SE = 4.416\text{e-}04, t = 32.21, p < .001$), analytic writing ($B = -1.363\text{e-}03, SE = 2.682\text{e-}04, t = -5.08, p < .001$), and readability ($B = -4.829\text{e-}03, SE = 2.004\text{e-}04, t = -24.09, p < .001$) were consistent with the bivariate correlations. Overall, most language dimensions received support in the expected direction (e.g., common words, analytic writing), evidence that is complementary to the online petitions data. Backend details for the Twitter study are also in the online supplement.

Discussion

The current paper tested the preregistered prediction that low rates of lexical fluency (few common words) associates with increased support for online petitions and victorious petitions by way of an instrumentality heuristic. This prediction was supported using data from over 1 million online petitions across 8 languages. Generally, when effort is associated with value, people tend to prefer complexity (versus simplicity) across various linguistic fluency dimensions. Petitions with fewer common words, more analytic writing, and a less readable structure receive more supporters and make a concrete change (see supplement) than petitions with more common words, less analytic writing, and a more readable structure.

There are several empirical contributions of this paper worth highlighting. First, this work replicates prior research by evaluating how linguistic complexity associates with outcomes beyond money (e.g., petition support). Second, this work identified how different forms of linguistic complexity associate with petition signatures, offering new psychological pathways for psychologists and petition writers to understand the relationship between fluency, language, goals, and support. Finally, the results suggest complexity associates with more signatures, but

also the probability of a petition being victorious (see the online supplement). Although victory data were only available in two samples, this evidence is crucial because it suggests words link to action and change, not just the magnitude of support.

Alongside these contributions, in a control corpus of news Tweets, engagements were positively associated with common words, negatively associated with analytic writing, and in a surprising result, negatively associated with readability as well. Why did this readability effect emerge? Prior work suggests longer (e.g., less readable) eBay auctions tend to receive more and higher bids than shorter eBay auctions (Flanagin, 2007) and longer online reviews are perceived as more practical and useful than reviews with fewer words (Cheng & Ho, 2015). While low levels of text readability typically hinder one's comprehension and understanding of information, this form of complexity might serve as a heuristic to signal one's effort in both high *and* low motivation settings (see Kruger et al., 2004). It is possible that as the length of a piece increases (its readability decreases), the presumed time it took for someone to create the difficult-to-read communication is perceived as effortful and therefore associated with positive feelings across contexts with various motivation levels. This contention should be explored experimentally.

Theoretical Contributions

There are several theoretical contributions of this paper that deserve greater discussion. Below, key questions are raised to signal how the current work develops psychological theory.

How does this research inform and extend fluency theory? A seminal review by Alter and Oppenheimer (2009) suggests linguistic fluency is a multifaceted concept and consists of *phonemic fluency* (e.g., the ease/difficulty associated with pronouncing certain words), *lexical fluency* (e.g., the ease/difficulty associated with using some words over other alternatives), *syntactic fluency* (e.g., the ease/difficulty associated with the wording order in a sentence), and

orthographic fluency (e.g., the ease/difficulty of translating symbols to meaning). Therefore, a key theoretical contribution of this work is the extension their taxonomy to include *analytic writing fluency*, or the ease/difficulty of how a message is communicated. Analytic writing fluency is comprised of style words, which are foundational to identify social and psychological processes (Boyd & Pennebaker, 2015; Boyd & Schwartz, 2021; Chung & Pennebaker, 2007), but have not been commonly evaluated in fluency scholarship (though, see Markowitz et al., 2021). Therefore, the current work formalizes the analytic writing fluency concept, demonstrating that style words can indicate effort, and people rely on them when making decisions about supporting online petitions. Instead of relying on linguistic content (e.g., nouns, verbs) to evaluate processing fluency effects, which is common in traditional fluency research (Alter & Oppenheimer, 2009; Oppenheimer, 2006), the analytic writing fluency results argue for the use of different (and multiple) linguistic concepts to reveal how people communicate complexity or simplicity. Such a multi-dimensional analysis helps to assess the precision (e.g., the degree to which certain fluency dimensions are strongly or weakly associated with an outcome) and robustness (e.g., the degree to which certain linguistic dimensions reveal processing fluency effects across settings) of fluency concepts that link with behavior in the field, pushing fluency theory forward by comparing concepts to understand their utility.

Relatedly, the local effect size analyses (Table 3) are novel and theoretically informative because they reveal how lexical fluency and analytic writing fluency largely had the strongest associations with petition support across samples. These findings are psychologically important because they indicate how people might infer more effort from certain word types (e.g., uncommon words, analytic writing) compared to others, and that the structure of one's communication may be less diagnostic of effort. Perhaps, lexical fluency and analytic writing

fluency evoke one's feelings system more than structural fluency, and this occurs because the processing of individual words can cue event-based knowledge faster than structure (McRae & Matsuki, 2009). That is, "knowledge of various aspects of events is computed immediately from words, and used as quickly as possible for understanding language," which suggests feelings and impressions are perhaps activated faster when processing words and their meaning compared to length (McRae & Matsuki, 2009, p. 1418). Therefore, lexical complexity elicits a different feeling in people than lexical simplicity (Alter, 2013; Labroo & Kim, 2009; Markowitz & Shulman, 2021), and lexical complexity elicits a different (more immediate) feeling in people than structural complexity. The latter contention is reasonable, given that different forms of fluency are indeed activated in related, though distinct, regions of the brain (Amunts et al., 2004; Costafreda et al., 2006). Altogether, this work is psychologically impactful because it suggests different fluency concepts may have a primacy or rank in information processing, which in turn can differentially impact feelings and behavior.

It is important to highlight how these results inform fluency theory in relation to goal instrumentality as well. Recent experimental work has considered the connections between language patterns and processing fluency across various goal-related settings (Shulman et al., 2021), suggesting that "processing fluency is a heuristic that people use to make judgments about whether information is familiar" (p. 548). The present study builds on this foundation by also suggesting linguistic fluency and goal instrumentality are *context-contingent heuristics*, emphasizing that a universal and one-size-fits-all view of linguistic fluency effects (e.g., simpler language is always preferred) inaccurately describe how these concepts connect (Labroo & Kim, 2009; Markowitz, 2019; Markowitz & Shulman, 2021). When the difficulty of processing language increases, this affects the perceived instrumentality of the means, and complexity leads

to positive behavioral outcomes (e.g., an increase in online petition support). Future work should extend the present research to investigate other context-contingent heuristics, beyond goal instrumentality, as possible moderators for the link between processing fluency, language, and online behavior. For example, linguistic fluency effects may also be moderated by emotion (e.g., the affect heuristic) (Slovic et al., 2002), the perceived expertise or credibility of the writer (e.g., the credibility heuristic) (Sundar, 2008), and the perception that time is running out for change (e.g., the scarcity heuristic) (Cialdini, 2006). Heuristics are common and powerful cognitive shortcuts that impact information processing, and this work demonstrates the importance of evaluating moderators of fluency effects for predicting behavior in the field.

Are cross-linguistic fluency effects consistent? Another theoretical contribution relates to the converging cross-cultural evidence that suggests when goal instrumentality is salient, various forms of linguistic complexity associate with online petition support. As noted, while fluency and complexity are context-contingent, few studies have demonstrated how fluency, complexity, and goal instrumentality are related for different languages and cultural contexts. Indeed, culture is an important contextual element of how language is produced and interpreted (Applegate & Delia, 1980; Burleson, 2009; Markus & Kitayama, 2010), and the present results articulate how disfluency in many forms (fewer common words, more analytic writing, less readability) associates with petition support across languages from mostly Western countries that are, on average, characterized by independent (versus interdependent) self-construals (Markus & Hamedani, 2019; Markus & Kitayama, 1991).

Perhaps collecting online petitions from people in countries that are typically high on interdependent self-construals may demonstrate amplified effects, as such individuals tend to view social relationships and connections with others as more central to the self than those high

on independent self-construals. When people see a member of one's culture asking for help, those in an interdependent cultural context may feel compelled to respond with support (Vaidyanathan et al., 2013), though relationship goals and concerns may moderate such effects (Kim et al., 2008). Therefore, this work is theoretically impactful for cultural psychology because it demonstrates that among languages and countries typically characterized by Western, independent self-construals, people systematically intuit that others are trying to achieve something of value through words and linguistic complexity is rewarded.

How does this research inform scholarship on giving? Charitable giving research has observed that one's motivational focus moderates financial donations to close or distant others (Touré-Tillery & Fishbach, 2017). People tend to donate more money to close (versus distant) others if they are motivated to make a prosocial impact and help others (e.g., an other-focused motivation) versus signaling support. Therefore, in general, one's motivation for giving represents a key psychological dimension to understand charitable giving tendencies (Bekkers & Wiepking, 2011; Bénabou & Tirole, 2006; Duncan, 2004). The current work extends this theoretical foundation by suggesting that potential petition supporters can infer a writer's effort and goals from language patterns alone, without meeting or interacting with them. Petitions received more signatures if they were linguistically complex versus simple, evidence that suggests the writer was trying to achieve an instrumental goal or something of value (Labroo & Kim, 2009; Markowitz & Shulman, 2021; Shulman et al., 2021). Such findings add to psychology of giving research by suggesting one's motivations for giving can be both *intrapersonal and internal* (e.g., people can be personally motivated to help others; Touré-Tillery & Fishbach, 2017) and *interpersonal, instrumental, and inferential* (e.g., people can infer that others are attempting to achieve something worthwhile and be motivated to reward this effort

with support) via language to impact giving behavior. Future scholarship should use this evidence as a springboard to continue observing how language patterns are a vehicle to infer psychological dynamics (e.g., goal instrumentality) in others, and subsequently link to meaningful behavioral outcomes (e.g., Markowitz et al., 2022).

Practical Implications

Persuasion research often finds that certain influence techniques can increase the probability that people will support future requests. An early study asked people in an apartment complex to sign a petition advocating that a recreation center be constructed for people with disabilities. Weeks later, residents were asked to donate money to the recreation center, including those who did not sign the petition. Over 90% of people who were asked to sign the petition also donated, whereas just over 50% of people who were not asked to sign the petition also donated (Schwarzwald et al., 1983). Petition signing was the residents' foot-in-the-door (e.g., a moderate, initial request with the hope of people complying with a larger, future request) (Cialdini, 2006; Cialdini & Trost, 1998), which facilitated a future commitment because the smaller ask (e.g., signing the petition) was consistent with the larger ask (e.g., money) (Cialdini & Goldstein, 2004). The evidence in the current paper suggests people may commit more resources to charitable giving if it is reasonably consistent with a smaller ask, or an initial online petition. To the degree that such causes are complementary, online petitions may be a helpful on-ramp or pre-condition to enhance charitable giving. Petition and donation websites are often contained on separate online platforms, but they should work together to increase collective action.

Limitations and Future Directions

There are several limitations of this research that should be resolved in the future. First, the links presented in the current paper are not direct cause and effect; experiments should

complement the trends reported here to evaluate the causal nature of these findings. Second, the predictive utility of these findings is unclear. That is, the degree to which various measures of complexity can identify petitions that receive high or low numbers of supporters, or those that are victorious from those that fail, should be examined in future research with more sophisticated natural language processing techniques. Third, the effect sizes in the current paper are small, but consistent with those reported in other research (Kern et al., 2014; Kramer et al., 2014; Markowitz, 2022; Seraj et al., 2021). Crucially, the robustness checks suggested that even at smaller sample thresholds, most relationships were consistent in size.

Finally, one possible explanation for the results is that complex petitions receive more followers because they are promoting a better or more relatable cause that can attract more people. The size of the current datasets and the empirical aims of this paper (e.g., using a computational approach to understand online petitions linguistically) prevented such an analysis from appearing in the paper, and any systematic effect of inherent value would likely suppress the effects instead of amplifying them. However, future work might select a random sample of petitions and have judges rate the inherent value of a petition to assess this contention directly.

A second practical issue relates to the bandwagon effect. Markowitz and Shulman (2021) observed that the negative relationship between common words and charitable giving was maintained after controlling for campaign supporters, which suggests possible bandwagon effects are unlikely to eliminate the instrumental goal activation effects presented here. Future studies should consider lagged analyses to evaluate how support unfolds over time with words.

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951 **Table 1**952 *Descriptive Statistics Across Samples*

Sample	<i>N</i>	Words	Signatures (log-transformed)		Word count		Common words		Languages
			<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i> (%)	<i>SD</i> (%)	
GoPetition	48,082	11,628,512	2.84	2.17	241.85	264.49	81.69	6.82	English
MoveOn	38,508	6,876,766	4.79	2.10	178.58	155.25	84.11	6.64	English
UK Petitions	114,424	9,399,218	2.55	1.77	82.14	39.06	86.81	6.41	English
Global Petitions	9,905	2,805,002	5.60	2.00	283.19	386.08	76.50	10.08	English, Dutch, German, Portuguese, Romanian
Change	836,736	189,216,672	4.69	2.13	226.14	265.73	80.25	12.09	English, French, Italian, Portuguese, Spanish

953 *Note.* For the number of petition signatures, when true zero values existed in the data, a constant was added via the formula $\ln(Y+1)$

954 to prevent an abundance of undefined values.

955 **Table 2**956 *Correlations Between Common Words and Signatures: Robustness Checks Across Samples*

Sample	25% of sample	50% of sample	75% of sample
GoPetition	-.143***	-.138***	-.138***
MoveOn	-.177***	-.181***	-.178***
UK Petitions	-.0004	-.006	-.007 [†]
Global Petitions	-.210***	-.214***	-.207***
Change	-.189***	-.191***	-.190***

957 *Note.* Correlations were calculated using Spearman's rho. [†] = $p < .06$. *** $p < .001$.

958 **Table 3**959 *Multiple Regression Models Across Samples*

Sample	Language dimension	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	Cohen's f^2	R^2
GoPetition	Common words	-0.0314	0.0015	-20.74	< .001	.009	0.026
	Analytic writing	0.0099	0.0005	19.24	< .001	.008	
	Readability	-0.0012	0.0005	-2.55	.011	.0001	
MoveOn	Common words	-0.0381	0.0017	-22.30	< .001	.013	0.035
	Analytic writing	0.0095	0.0006	16.07	< .001	.007	
	Readability	-0.0040	0.0006	-6.19	< .001	.0009	
UK Petitions	Common words	-0.0085	0.0009	-9.88	< .001	.0009	0.004
	Analytic writing	0.0036	0.0002	14.50	< .001	.002	
	Readability	0.0002	0.0003	0.96	.338	8.0e-6	
Global Petitions	Common words	-0.0240	0.0046	-5.27	< .001	.008	0.055
	Analytic writing	0.0122	0.0014	8.66	< .001	.021	
	Readability	-0.0029	0.0010	-2.75	.006	.002	
Change	Common words	-0.0175	0.0004	-40.62	< .001	.003	0.066
	Analytic writing	0.0150	0.0001	131.78	< .001	.029	
	Readability	-0.0048	0.0001	-72.88	< .001	.009	

960 *Note.* Only English texts were used for these analyses across samples and their petitions. The
961 dependent variable was the number of petition supporters and was natural log-transformed using
962 the formula $\ln(Y+1)$ when true zero values existed in the sample. Common words and analytic
963 writing are LIWC variables and readability was measured using the Flesch Reading Ease scale.
964 Cohen's f^2 is a measure of local effect size and was calculated using the *sensmakr* package in *R*
965 (Cinelli & Hazlett, 2020). Effect sizes ≤ 0.02 are considered small effect sizes and those ≤ 0.15
966 are considered medium effect sizes.

967 **Figure 1**

968 *Spearman's Rho Correlations Between Signatures and Common Words Across Languages*

969 *Note.* Error bars are bootstrapped 95% Confidence Intervals ($n = 5,000$ replicates for the Global
 970 Petitions sample; $n = 1,000$ replicates for the Change sample).