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MARK MY WORDS: THE LINGUISTIC COMPLEXITY OF THE JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY ABSTRACTS AND SUBSEQUENT CITATIONS

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Through language, scientific communication can positively impact the progression and advancement of science. Given the value of scientific communication, it is important to explore what factors might be associated with influential scientific communication. Surprisingly, relatively little research has examined the linguistic properties of influential scientific communication. In effort to overcome this gap in the literature, I used integrative complexity, a well-validated linguistic variable, to assess the relation between article abstracts and subsequent number of citations from one of the most highly-cited social psychology journals (Journal of Personality and Social Psychology). In an analysis of over 1.4 million words from 9,884 abstracts, results reveal that elaborative complexity predicts number of citations, whereas dialectical complexity does not. These findings are further highlighted by the predictive power of defensive complexity (elaborative-dialectical complexity). In other words, complexity used to multifacetedly defend a singular perspective, absent of complexity used to evaluate alternative perspectives, is predictive of subsequent citations of articles from the *Journal of Personality and Social Psychology*. I conclude by discussing implications for the construct of integrative complexity, limitations of the current findings, and directions for future research.

Keywords: scientific communication, integrative complexity, elaborative complexity, linguistic complexity, citations, Journal of Personality and Social Psychology

Whether confessing your undying love for someone, convincing someone your favorite television show is better than their favorite show, or avidly discussing politics at a family holiday dinner, language holds an important role in our everyday lives. Life would be limited without the tool of language, as most social interactions depend on it (Eysenck & Brysbaert, 2018). Language can be used to profess love, but it can also be used to motivate individuals to wage war. Indeed, language plays an important role in human life.

The power of language is no less important in the realm of scientific communication. Much like in everyday life, in science, language can be used to develop ideas or block them (Ford & Peat, 1988), convey and communicate ideas and thoughts (Ford & Peat, 1988; Gogoi, 2013), and to learn, understand, and advance knowledge (Ford & Peat, 1988; Muralidhar, 1991). Through language, scientific communication can positively impact the progression and advancement of science. Thus, given the value of scientific communication, it would be advantageous to explore what factors might be associated with influential scientific communication. In the present study, I examined integrative complexity, a well-validated linguistic variable, to assess the relation between the linguistic properties of article abstracts and subsequent number of citations from one of the most highly-cited social psychology journals (Journal of Personality and Social Psychology).

Below, I elaborate on why understanding scientific communication matters, and subsequently, I discuss previous research that has examined the influence of various elements (e.g., journal characteristics, number of authors) of scientific communication on number of citations. Then, I examine the complexity of language as an important construct for better understanding communication influence, and I further discuss whether we might expect

linguistic complexity to produce more or less scientific influence. Lastly, I proceed to the current study.

Why Scientific Communication Matters

One of the most fundamental aspects of scientific communication is the publication of research results (American Psychological Association, 2020; Roberts et al., 2003). The publication of research advances the progression of scientific pursuits, development (Dipboye, 2006), and knowledge (Henly & Dougherty, 2009). Published research establishes intellectual property that may be used by means of the proper endorsement of the creator of the intellectual property (Franck, 1999), and the proper endorsement of intellectual property is through citation (Dowling, 2014; Franck, 1999). Essentially, a citation is an indication of acknowledgment of published research, which is scientific communication.

The fundamental importance of citations can vary through scientific disciplines; however, in most scientific circles, citations are often an indication of scientific influence (Aksnes, 2005). For many scientific scholars, their citation score has been used to measure their scientific reputation. Citation scores can affect funding opportunities, salary supplementation, hiring, job promotion, and tenure (e.g., Adler & Harzing, 2009; Carpenter et al., 2014; Dowling, 2014; Merton, 1968; Webber, 2012). However, the measurement of scientific influence through number of citations is not without controversy, with some advocating against its use (e.g., Aksnes et al., 2019; MacRoberts & MacRoberts, 1989; Seglen, 1997; Weingart, 2005; Wouters, 1999). Despite some controversy, citation statistics are overwhelmingly used as a measure of scientific influence. Thus, to better understand scientific influence, it is imperative to understand what factors contribute to increased citations.

Prior Research on Scientific Communication

No research that I know of has evaluated the specific linguistic factors examined in the present study concerning the influence of scientific communication on subsequent number of citations. However, ample research has examined other factors that affect the number of citations in scientific communication. For example, evidence suggests that publishing in open access journals (Antelman, 2004; Chua et al., 2017; Eysenbach, 2006; Gargouri et al., 2010; Hafeez et al., 2019; Hajjem et al., 2005; Lawrence, 2001; MacCallum & Parthasarathy, 2006; Niyazov et al., 2016; Sahu et al., 2005) and open-access high-impact journals (Metcalfe, 2005, 2006; Rowlands et al., 2004; van Teijlingen & Hundley, 2002) can increase citations (cf. Craig et al., 2007; Gaulé & Maystre, 2011). Additionally, aside from journal access, some evidence suggests that the prestige and impact factor of the journal boosts subsequent citations (Callaham et al., 2002; Dhawan & Gupta, 2005; Judge et al., 2007; Larivière & Gingras, 2010; Mingers & Xu, 2010; Peng & Zhu, 2012; Vanclay, 2013).

When it comes to the published journal article itself, research indicates that articles with multiple authors are cited more than single-author articles (Aksnes, 2003; Annalingam et al., 2014; Borsuk et al., 2009; Çakır et al., 2019; Cotropia & Petherbridge, 2013; Crane, 1972; Falagas & Alexiou, 2008; Figg et al., 2006; Fox et al., 2016; Gazni & Didegah, 2011; Goffman & Warren, 1980; Guilera et al., 2010; Hsu & Huang, 2011; Ibáñez et al., 2013; Katz & Martin, 1997; Lawani, 1986; Leimu & Koricheva, 2005; Nabout et al., 2015; Padial et al., 2010; Sin, 2011; Tahamtan et al., 2016; Wuchty et al., 2007). To this end, Diamond (1985) suggests that citations from multi-authored papers compared to single-authored papers are monetarily worth more to authors' salaries and earning potential for Berkley mathematicians. Similarly, internationally co-authored articles are frequently more cited than single-country papers (Aksnes, 2003; Annalingam et al., 2014; Costas et al., 2010; Dhawan & Gupta, 2005; Hsu & Ho, 2014;

Ibáñez et al., 2013; Inzelt et al., 2009; Jabbour et al., 2013; Lancho-Barrantes et al., 2012; Nomaler et al., 2013; Pislyakov & Shukshina, 2014; Royle et al., 2013; Sin, 2011; Smith et al., 2014).

Further, ample evidence suggests that other factors affect number of citations as well, such as the length of the paper (Antoniou et al., 2015; Ayres & Vars, 2000; Bornmann & Daniel, 2007, 2010; Bornmann & Williams, 2013; Falagas et al., 2013; Fox et al., 2016; Frosch et al., 2010; Gargouri et al., 2010; Lee et al., 2010; Perneger, 2004; van Wesel et al., 2014; Xie et al., 2019), the author's academic rank (Ayres & Vars, 2000; Biscaro & Giupponi, 2014; Bjarnason & Sigfusdottir, 2002; Pagel & Hudetz, 2011), sharing research data (Ale-Ebrahim et al., 2013; Piwowar et al., 2007; Sears, 2011), and characteristics of the article's title (Farshad et al., 2013; Hafeez et al., 2019; Hanssen & Jørgensen, 2014; Shekhani et al., 2017; van Wesel et al., 2014).

Linguistic Analyses and Scientific Influence

Up to this point, research on scientific communication has focused largely on factors that are not directly related to linguistic properties of words *in* scientific communication. While it is important to explore these influential nonlinguistic factors in scientific communication, it is also advantageous to explore the large set of work that analyzes the linguistic properties of words themselves. For the purposes of the current paper, it is important to examine this large body of research that analyzes linguistic properties of words because that exploration is closely related to the current investigation of scientific communication.

Indeed, evidence in other research endeavors demonstrates the power of understanding the linguistic properties of language. More generally, the influence of words has been assessed through various linguistic properties (e.g., use of pronouns, trace of negative emotions), which has been predictive of outcomes in multiple domains, such as cultural stereotypes (Lewis &

Lupyan, 2019), high performance (Pennebaker et al., 2014), mental health behaviors (O'Dea et al., 2017; Rezaii et al., 2019), funding success (Larrimore et al., 2011; Netzer et al., 2019; Westerlund et al., 2019), political affiliation (Robinson et al., 2014; Sterling et al., 2020), social status (Kacewicz et al., 2014), and understanding personality (Boyd & Pennebaker, 2017). For example, Larrimore et al. (2011) analyzed 200,000 loan requests from Prosper.com and found that both verbosity and expression of certainty positively correlated with funding success. On the other hand, linguistic characteristics can also predict defaulting on a loan: After analyzing 18,000 loan requests from Prosper.com, Netzer et al. (2019) found that loan defaulters are more likely to include language related to their family, religion, hardship, and short-term focused words in their loan applications. Moreover, these linguistic characteristics are predictive of loan defaults for upwards of three years (Netzer et al., 2019). Additionally, analyzing the short-text project summaries on Kickstarter, a crowdfunding platform, can be predictive of successful versus non-successful projects (i.e., in terms of raised funds; Westerlund et al., 2019).

Through understanding language patterns, clues to outcomes in various research areas can emerge. For example, language patterns can provide indication of future monetary funding or lack thereof (Larrimore et al., 2011; Netzer et al., 2019; Westerlund et al., 2019), or even the emergence of mental health behaviors (O'Dea et al., 2017; Rezaii et al., 2019). Collectively, this information is indicative of the importance of understanding language patterns. Language patterns can also be revealing of other outcomes, such as ones related to science.

Prior Research on the Influence of Language on Science

Although no known work examines the influence of linguistic properties by way of natural language processing (i.e., computer algorithms that analyze language) on number of citations (the focus of the present study), research indicates that the language of an article

influences subsequent citations. As Di Bitetti and Ferreras (2017) suggest, English appears to be the dominant language used in scientific communication. For example, Diekhoff et al. (2013) examined 168 multi-language medical journals and found that the English articles published in the multi-language medical journals were associated with greater international recognition in the form of increased citations and journal impact factor. Thus, despite the journals publishing articles in multiple languages, the articles cited in English received more citations. Similarly, in other scientific disciplines, English language articles are cited more frequently than non-English articles as well, such as in dental literature (Poomkottayil et al., 2011), medical bibliographic databases (Winkmann et al., 2002), and natural sciences (Di Bitetti & Ferreras, 2017). Across scientific disciplines, it appears that English-language articles are published at higher rates than non-English-language articles, Lira et al. (2013) even suggests that Brazilian authors should utilize the English-language in future articles to increase citations in Brazilian ophthalmology journals. Despite many authors citing a disparity that exists among number of citations of English-language papers compared to non-English-language papers (see, Seglen, 1998), others have found that language has no effect on subsequent number of citations (e.g., Borsuk et al., 2009; Nomaler et al., 2013; Padial et al., 2010). Although there is evidence on both sides, taken as a whole, the evidence suggests that the language of an article can impact subsequent citations — the language of an article matters.

Given the increased breadth of information available to the modern scholar, the abstract of scientific articles is likely very important. Indeed, some research has isolated factors related to article abstracts that affect subsequent citations. For instance, in the field of Radiology, a comparison of six radiology journals revealed a positive relation between abstract word count and abstract character count and subsequent citations (Shekhani et al., 2017). Similarly, Falagas

et al. (2013) and Weinberger et al. (2015) also found that abstract word count was positively related to subsequent citations. Furthermore, van Wesel et al. (2014) found that some abstract characteristics, such as length of sentences, number of sentences, and readability were related to subsequent citations for various subject categories (e.g., Sociology, Applied Physics). Additionally, in the field of psychiatry, having longer and structured abstracts (i.e., Objective, Materials and Methods, etc.) increased subsequent citations (Hafeez et al., 2019). Interestingly, however, in the field of dermatology, structured abstracts are related to a lower number of citations (Kim et al., 2020). Ultimately, this research is indicative of the important part abstracts play in the role of acquiring citations and the spread of scientific communication in many different professional disciplines.

There is additional evidence exploring the linguistic patterns of abstract content on scientific outcomes. Markowitz (2019) analyzed the writing style of grant abstracts from the National Science Foundation (NSF), and abstracts that contain fewer common words, written with verbal certainty and narrative forms of writing style, and abstracts longer than the average abstract (i.e., 378 words) received more funding from the NSF (i.e., $372 per one-word increase). Similarly, linguistic patterns have been indicative of other scientific endeavors. Connor and Mauranen (1999) used some linguistic properties (e.g., discourse markers, consequently, firstly, however, etc.) to identify ten rhetorical moves (e.g., goals, benefits, importance claim) that constituted as successful elements of 34 grant proposals from European Union research grant applications from primarily Finish research teams. Furthermore, Rhodes et al. (2019) found that subtle linguistic cues of portraying science in terms of action (e.g., “Let’s do science!”) versus identity (e.g., “Let’s be scientists!”) increased girls’ engagement and persistence in science.

Filling in the Gap in Previous Research

Although some research examines the effect of various factors on subsequent citations (e.g., author number, journal access), little research exists on understanding the influence of the *linguistic style* of scientific communication (by way of natural language processing) on subsequent citations. I help fill in this gap in research in two ways: (1) I investigate the relation between the linguistic properties of the Journal of Personality and Social Psychology (JPSP) abstracts and subsequent citations. Research has not yet examined the linguistic characteristics of abstracts by way of natural language processing on subsequent citations. This current study acts as an initial, novel investigation of this potential relation. (2) For these JPSP abstracts, I investigate a well-validated linguistic variable that has illustrated the relation of linguistic complexity (and simplicity) in different contexts (e.g., Zubrod et al., 2021). Specifically, I use the well-validated measurement Automated Integrative Complexity (Conway et al., 2014, 2020; Houck et al., 2014) to investigate the relation between the linguistic complexity of JPSP abstracts and subsequent article citations. Thus, the current study merges two academic literatures by examining the influence of linguistic complexity as a marker of scientific influence.

Why Use Abstracts?

One of the premier ways to interact with scientific communication is reading the abstract of an article. An abstract is a condensed version of the full-text document (Cross & Oppenheim, 2006). Thus, it is important that abstracts are an accurate representation of the contents of their document (Rowley, 1988). Abstracts help authors locate and find the right article (Weinberger et al., 2015) through a number of different ways. For instance, abstracts can help the reader decide if the full-text document is of actual interest (Cross & Oppenheim, 2006), and a well-written abstract can help illustrate the argument of the full-text document (Swales, 1990). Thus, abstracts

play an important role in the advancement of scientific communication and it is important to understand what makes them influential. To address this concern, I use integrative complexity to investigate the linguistic elements of JPSP abstracts and subsequent citations.

The Complexity of Language

Collectively, the above research illustrates the influence of linguistic characteristics on both scientific and non-scientific outcomes. I now narrow my focus to discuss the specific linguistic variable that is the focus of this paper: The complexity of language.

Linguistic complexity involves multi-dimensional thinking. Consider the following examples: “Paul Newman was more than just a pretty face” and “Paul Newman was a great actor with famous blue eyes, but independent of being an actor, he was a humanitarian with various foundations that still continue to donate 100% of its profits to charity.” The first statement is rather simple, it contains one idea about Paul Newman. On the other hand, the second statement is more complex, containing two distinct ideas about Paul Newman. Further, consider the statement: “Paul Newman was a great actor with famous blue eyes, but independent of being an actor, he was a humanitarian with various foundations that still continue to donate 100% of its profits to charity; it’s the combination of his acting ability and humanitarian legacy that makes Newman one of a kind in Hollywood.” This statement is even more complex — it still contains two distinct ideas (acting ability and humanitarianism); however, it also interrelates those two distinct ideas about Paul Newman. Thus, as described in more detail below, statements can be scored for the degree that they contain multiple, interrelated dimensions.

Does linguistic complexity matter? Research broadly suggests that the complexity of language has important theoretical consequences. For example, work reveals that complexity matters in various domains, such as terrorism (e.g., Conway & Conway, 2011; Conway et al.,

2011; Houck et al., 2017; Suedfeld & Leighton, 2002), war and conflict (e.g., Salvati & Houck, 2019; Suedfeld & Bluck, 1988; Suedfeld & Jhangiani, 2009; Suedfeld et al., 1977), and even popular culture (e.g., McCullough, 2019ab, 2020; McCullough & Conway, 2019). Further, one of the most common applications of complexity of language is in political psychology research (Békés & Suedfeld, 2019). For example, regarding trends of U.S. presidents, both Joe Biden and Donald Trump are rhetorically simple when compared to the typical president; however, in part, this is explained by an ongoing historical decline in complexity among Presidents that begin in 1960 (Conway & Zubrod, 2022). These results are consistent with other research that suggests political/cultural decreases in complexity are part of a larger long-term trend (e.g., Jordan et al., 2019).

Complexity has been used to study other domain areas as well. As mentioned previously, for example, Conway et al. (2011) examined the integrative complexity of texts from two ideologically similar terrorist and non-terrorist groups. Terrorist groups' relative to non-terrorist groups' rhetoric were consistently less complex (Conway et al., 2011). This pattern is also found in other studies: Low complexity was associated with extremist and violent terrorist groups (e.g., Houck et al., 2017; Smith et al., 2008). Relatedly, Putra et al. (2018) found there were theoretically expected increases in complexity from Indonesian convicted terrorists' dialogue. In regard to popular culture, when comparing the linguistic differences between fictional and real-life characters, fictional characters are less complex than their real-life counterparts (McCullough & Conway, 2018b). Linguistic complexity has allowed researchers to understand the nuances that are associated with popular culture.

Collectively, these research findings indicate the practical value of linguistic complexity across diverse research domains. The rest of the paper examines, in more detail, the specific application of complexity used in the present project: integrative complexity.

Integrative Complexity

There are several ways to measure complex language, but I focus on one popular and commonly used measurement of complexity: integrative complexity. The current instantiation of integrative complexity was designed by Peter Suedfeld's lab (Suedfeld et al., 1977). Integrative complexity assesses the underlying structure of open-ended statements rather than the content of the statement. Scoring the structure rather than the content of a statement, characterizes the processes that involve thought, making decisions, and interrelation (Suedfeld, 2010). Integrative complexity directly scores participant output (Baker-Brown et al., 1992; Suedfeld et al., 1977); thus, it eludes biases that are often associated with self-report measures of cognitive style (e.g., Jost et al., 2003). Integrative complexity is a linguistic variable that measures the complexity of human thought based on the degree of simplicity (i.e., one dimensional, black-and-white thinking) versus complexity (i.e., multidimensional thinking that considers multiple perspectives) of spoken or written communication measured on a one-to-seven scale. The score is determined by the degree of differentiation and integration that is communicated (Baker-Brown et al., 1992). Statements without differentiation and integration are one-dimensional and only recognize a singular perspective (resulting in a score of 1). Differentiation refers to the ability to distinguish and recognize multiple perspectives present in a statement (resulting in a score of 3). Differentiation is the first step of integration; integration occurs when multiple perspectives are recognized and these differentiated perspectives are synthesized into an overarching context (resulting in a score of 5 or higher, depending on the degree of the hierarchical integration of

perspectives; Baker-Brown et al., 1992). Higher numbers on the resulting 1-7 scale thus represent greater linguistic complexity, whereas lower numbers represent linguistic simplicity (Baker-Brown et al., 1992). Although integrative complexity cannot account for every facet of complex thought (no measure can), it does account for attributes of complex thought, differentiation and integration, which are important components for complex communication (Houck & Conway, 2019). Thus, integrative complexity has high construct validity as a measurement of complex thought (see, Conway et al., 2014; Houck & Conway, 2019). For instance, evidence suggests that integrative complexity is a valid indication of private cognition (e.g., Suedfeld, 2010; Suedfeld & Bluck, 1988; Suedfeld & Rank, 1976; Tetlock & Tyler, 1996).

Furthermore, as illustrated in several studies, the theoretical conception of integrative complexity as an information processing variable stems from the exploration of the interaction between complexity and environment (Suedfeld & Tetlock, 1977). For instance, Suedfeld and Rank (1976) found that successful revolutionary leaders adapted their complexity to post-revolutionary movement environmental demands. Pre-takeover, successful leaders displayed low levels of complexity, and once in power after revolutionary victory, exhibited a higher degree of complexity, whereas unsuccessful leaders exhibited no such adjustment. In another study, Suedfeld and Tetlock (1977) found that complexity played a role in the resolution of international crises by examining the diplomatic communication surrounding crises that resulted in war and crises that were settled in peace. Diplomatic communication was significantly lower in complexity presiding crises that resulted in war compared to crises that were settled peacefully (Suedfeld & Tetlock, 1977). Similarly, in UN General Assembly speeches, Suedfeld et al. (1977) found there were significant drops in complexity preceding the outbreak of war whereas there were increases in complexity during peacetime. To further examine the theoretical nature of

integrative complexity as an information processing variable, Suedfeld and Bluck (1988) investigated changes in complexity prior to surprise attacks from nine international crises throughout the 20th century. Attackers exhibited a decrease in complexity three months to two to four weeks before the surprise attacks (despite opposing groups publicly stating they wanted to reach reconciliation). On the other hand, preceding the attacks, the attacked nations exhibited an increase in complexity (in efforts of reconciliation), but decreased in complexity to the level of the attackers after the surprise attack. As demonstrated in these studies, there is an interaction between complexity and environment. For instance, it appears high-level information processing is reflected in complexity when trying to lead and achieve peace. Complexity is often a necessary component for problem-solving qualities, such as flexibility, open-mindedness, thoughtfulness, and the identification of solutions (Suedfeld & Bluck, 1988; Suedfeld & Rank, 1976; Suedfeld et al., 1977). Furthermore, the evident decrease in complexity due to environmental stress has been found in laboratory simulations (e.g., Schroder et al., 1967; Streufert & Streufert, 1978; Suedfeld, 1979). From this early validation evidence, it is clear that information processing changes as a result of environmental circumstances.

Collectively, this previous work is evidence of integrative complexity as a marker of information processing. Moreover, extensive evidence highlights the long and notable history of integrative complexity as a theoretically sound and predictive construct in many domain areas (see, Andrews Fearon & Boyd-MacMillan, 2016; Conway & Conway, 2011; Conway et al., 2001, 2011, 2012, 2016ab, 2017, 2018; Houck & Conway, 2019; Houck et al., 2018; Smith et al., 2008; Suedfeld, 2010; Suedfeld & Jhangiani, 2009; Suedfeld & Rank, 1976; Suedfeld et al., 1977; Tetlock, 1981, 1983, 1984, 1985; Thoemmes & Conway, 2007). The traditional scoring method for integrative complexity relies on materials to be scored by trained human coders.

More recently, however, a computerized framework, Automated Integrative Complexity (AutoIC; Conway et al., 2014; Houck et al., 2014), was developed and validated by integrative complexity experts to rapidly code integrative complexity based on the same guidelines and scoring system outlined by Baker-Brown et al. (1992). In AutoIC's original validity paper, there was an average correlation of r = .46 between AutoIC and human-scored integrative complexity paragraphs (Conway et al., 2014). Correspondence with human-scored paragraphs is the key component in assessing the validity of natural language processing systems (Conway et al., 2020; Houck et al., 2014; Tetlock et al., 2014). AutoIC is a thoroughly validated measurement of integrative complexity that shows higher computer-to-human reliability than other available measures of integrative complexity (Conway et al., 2014, 2020; Houck et al., 2014). For instance, the most recent validity paper on AutoIC provided five new validity tests that suggests that AutoIC is valid scoring system for integrative complexity across several political and social psychological contexts (e.g., health, leadership, ideology; Conway et al., 2020). Further, Houck et al. (2014) suggests that one of the markers of theoretical validity is the predictive ability of a measurement in research. Ample evidence suggests that AutoIC produces both predictive and theoretically interpretable findings that parallel expectations from human-scored integrative complexity (see, Conway et al., 2011, 2017; Houck et al., 2017, 2018; McCullough, 2019abc; McCullough & Conway, 2018ab, 2019; Prinsloo, 2016; Putra et al., 2018; Zubrod et al., 2021).

Additional work regarding integrative complexity, constructed using the Multiple Complexity Model (MCM), suggests that there are two subtypes of integrative complexity: elaborative and dialectical complexity (Conway et al., 2008). The MCM was intended to complement the integrative complexity construct by differentiating the potential routes through which complex thinking can occur. Elaborative complexity refers to a complex argument that

illustrates a singular perspective. For instance, “roller coasters are not fun. While waiting in line, I feel fearfully anxious to get on, and once I get off, I am nauseous for days” (adapted from Zubrod et al., 2021). As evidence of elaborative complexity, this statement contains two differentiated elements that are used to negatively support the argument that roller coasters are not fun. Dialectical complexity refers to a complex argument that recognizes the tension of multiple competing perspectives. For instance, “I both dislike and like riding roller coasters. I get very scared when I’m waiting in line, but I love facing my fears, I feel liberated afterwards” (adapted from Zubrod et al., 2021). As evidence of dialectical complexity, both negative and positive elements are used to describe the topic. Using AutoIC, the MCM is integrated into the integrative complexity construct, and the two subtypes of integrative complexity are scored on the same one-to-seven scale (Conway et al., 2008; Houck et al., 2014). Ultimately, under this classification, three scores are generated when assessing complexity using AutoIC: integrative complexity, elaborative complexity, and dialectical complexity (Conway et al., 2008). Evidence suggests there are differences in the linguistic usage of elaborative and dialectical complexity in different contexts, such as trial outcomes (Zubrod et al., 2021), differentiating political winners and losers (Conway et al., 2012), lying (Conway et al., 2008; Repke et al., 2018), and suspects describing their interrogator (Salvati & Houck, 2019).

Will Linguistically Complex or Simple Scientific Communication be More Influential on Number of Citations?

Integrative complexity research has been applied to a wide array of research areas, such as trial outcomes (Zubrod et al., 2021), terrorism (Conway et al., 2011; Houck et al., 2017), election outcomes (Tetlock, 1981; Thoemmes & Conway, 2007), the film industry (McCullough, 2019a; McCullough & Conway, 2018a), popular culture (McCullough, 2019bc; McCullough &

Conway, 2018b), and personal health (Conway et al., 2017; Davidson et al., 2007). Despite integrative complexity research encompassing numerous topics, no integrative complexity research that I know of has examined the linguistic style of scientific communication in relation to subsequent citations. However, some of these previous areas of research provide support for the idea that to be effective in different contexts linguistic complexity and simplicity can be strategically manipulated. For example, to be more influential to their constituents, some evidence suggests that conservative politicians strategically manipulate their rhetoric to be more simplistic in line with their constituents' preference (Houck & Conway, 2019). Thus, prior integrative complexity research possibly offers some insight into understanding if linguistically complex versus simple scientific communication would be more influential on subsequent citations. I discuss those possibilities below.

Reasons Why Complex Scientific Communication Might be More Influential

First, there are reasons to think that more complex communication might increase scientific influence. For instance, linguistic complexity is viewed as an indication of high ability (see, Zubrod et al., 2021), and linguistically complex arguments sometimes indicate the ability to potentially persuade audiences (see, Repke et al., 2018; Zubrod et al., 2021). Furthermore, a more complex and detailed abstract could give readers more available information (Suedfeld, 1992) about the full-text document, enticing them to read the full-text document and subsequently cite the article. Thus, it appears that elements of linguistic complexity might coincide with the potential influence of scientific communication.

And indeed, ample integrative complexity research indicates higher complexity is influential in various outcomes. In a recent study, Zubrod et al. (2021) found that higher levels of integrative complexity in opening and closing statements led to a significant increase in famous

trial wins, especially for prosecuting attorneys. Thus, it appears that the use of linguistic complexity was influential on winning outcomes for prosecuting attorneys in famous trials. Evidence also suggests that linguistic complexity can be influential for political leaders. Suedfeld and Rank (1976) examined the long-term success of leaders (e.g., Patrick Henry, Leon Trotsky) before and after a revolutionary movement (e.g., U.S. Revolution, Russian Revolution). Prior to the revolutionary movement, successful revolutionary leaders displayed low levels of integrative complexity; however, after the success of the movement successful leaders exhibited a higher degree of integrative complexity. Comparatively, unsuccessful revolutionary leaders either had high levels of complexity pre-revolutionary movement or had low levels of complexity both pre- and post-revolutionary movement (Suedfeld & Rank, 1976). Based on these results, it is possible that successful leaders changed their rhetoric to be more complex to account for their changing and demanding environment once taking power.

Moreover, Conway et al. (2012, Study 2) gave participants both complex and simple political rhetoric (i.e., at party conventions, presidential debates, and other rhetoric said on the campaign trail) from Barack Obama and John McCain during the 2008 Presidential Election. Although complexity levels had no effect on favorability for Obama; for McCain, people were more likely to vote for him when he spoke complexly on foreign topics (Conway et al., 2012). As the authors allude to, complexity might compensate for a perceived weakness of a candidate, which makes their rhetoric on that topic more influential (e.g., McCain on foreign policy).

Complexity can also be influential concerning aspects of peace. In times of peace, opposing groups increasingly use more complexity in their communication. For instance, UN General Assembly speeches concerning the Middle East were considerably low preceding the outbreak of war, but during times of peace there were considerable increases in complexity,

especially for Israel and the United States (Suedfeld et al., 1977). Perhaps, linguistic complexity is a key influential component in the relation between opposing groups to persuade the other side to a peaceful outcome.

Complexity can also shed light on aspects of personality in professional settings that are associated with success. To explore the personality characteristics associated with either integratively complex or simple individuals, Tetlock et al. (1993) scored the integrative complexity and motive imagery of Master of Business Administration (MBA) candidates from an in-depth, three-day assessment. During the assessment period, the MBA candidates completed self-report personality inventories, picture story exercises (PSE, e.g., Thematic Apperception Test), and simulation exercises. In addition, the candidates were observed by personality and managerial assessors. Integratively complex MBA candidates scored higher on elements of openness and creativity and lower on elements of social compliance and conscientiousness. Further, to personality assessors, they appeared to be more narcissistic and antagonistic, whereas to managerial assessors they emerged as higher on self-objectivity and initiative. On the semiprojective task, complex candidates relative to simple candidates scored higher on power motivation. Comparatively, integratively simple candidates were viewed as warm, giving, orderly, deliberate, self-controlled, and socially compliant (Tetlock et al., 1993). A similar study compared the complexity and personality characteristics of scientists on topics related to research and teaching. To explore the role of integrative complexity in academia regarding teaching and research, Feist (1994) assessed objective ratings of productivity (i.e., number of publications and citations), peer ratings of prominence, observer ratings of integrative complexity (i.e., assessed by 10 semi-structured interview questions), and observer ratings of personality. The results suggested that scientists who think complexly about research were seen as more hostile and

exploitative but were rated as more prominent by peers and had their work frequently cited. Scientists who think complexly about teaching were seen as warm and gregarious, but are not well cited (Feist, 1994). Taken as a whole, these studies suggest that, while complexity produces association with both positive and negative traits, on balance there are more positive *influence-based* traits (e.g., more citations, higher power motivation) related to complex versus simple professional individuals.

Work in other domains also suggests complexity can lead to more influence. For example, McCullough (2020) compared the integrative complexity of popular and unpopular fanfiction (based on readership and quality) of three fanfiction categories (i.e., Anime/Manga, Live-Action TV, and Videogames) from *Archive of Our Own* (a community-based fanfiction-hosting website). The results suggested that popular fanfiction had higher levels of complexity than unpopular fanfiction (McCullough, 2020). In the world of fanfiction, influential fanfiction is associated with high integrative complexity.

None of these research endeavors directly relate to linguistic complexity in scientific communication. They do, however, provide evidence that in some contexts high linguistic complexity is associated with various markers of influence (such as attitude change and popularity).

Reasons Why Simple Scientific Communication Might be More Influential

> Most of the fundamental ideas of science are simple and can usually be expressed in a language comprehensible to everyone.
>
> —Albert Einstein

Reasons also exist for why simple language might sometimes be more influential. For example, linguistically simple rhetoric is quite easier to understand than complex rhetoric; thus,

it might be more valuable for JPSP abstracts to be simple to communicate the larger message of the full-text document. Furthermore, if an abstract is simplistic, this could help readers make a simple and quick decision to read or not read the full-text document since the abstract was easy to comprehend, whereas a more complex abstract could lead readers to focus on unnecessary information and waste precious time to digest content information (Suedfeld, 1992). Thus, a simple abstract could draw in readers to read the full-text document and subsequently cite the article. It appears that elements of linguistic simplicity might coincide with the potential influence of scientific communication.

Integrative complexity research indicates simplicity is influential in various outcomes. Thoemmes and Conway (2007) were the first to examine the linguistic complexity of all U.S. Presidents (up to George W. Bush). To do so, the first four State of the Union speeches delivered by each president were scored for integrative complexity. The results suggested that presidents' integrative complexity was higher at the beginning of their first term, but complexity decreased in their fourth year in office. More importantly for the present purpose, for presidents who won reelection, this pattern was more prominent compared to presidents who pursued reelection but lost (Thoemmes & Conway, 2007). Other work also reveals that decreases in complexity late in the election season led to more successful political outcomes (Conway et al., 2012, Study 1; Tetlock, 1981).

In addition, increasingly low levels of complexity are effective for influential terrorist propaganda. For example, Houck et al. (2017) compared the integrative complexity of The Islamic State of Iraq and the Levant (ISIL) and its predecessor, Al-Qaeda. Statements that were released to the public from both organizations from 2004-2014 were collected from the Global Terrorism Research Project and scored for integrative complexity. Overall, ISIL demonstrated

lower complexity than Al Qaeda. Al Qaeda's complexity stayed relatively stable overtime; however, ISIL became increasingly less complex throughout the time frame (Houck et al., 2017). Interestingly, from 2004-2014, ISIL's organization significantly grew in size and power—accumulating more recruitments, monetary resources, territorial control, and arms power—relative to Al Qaeda (Houck et al., 2017). Thus, as Houck et al. (2017) argue, this suggests that ISIL's more simple propaganda might have been more influential than Al Qaeda's more complex propaganda.

Simplistic language is also related to positive health outcomes, such as quitting smoking (Conway et al., 2017) and mental health (Davidson et al., 2007). Conway et al. (2017) compared the complexity levels of Motivational Interviewing (MI) sessions that were successful (client quit smoking) and unsuccessful (client did not quit smoking) from transcribed MI sessions from a previous study. Overall, for clients who tried to quit smoking and failed, both counselors and clients used high levels of integrative complexity within their MI sessions compared to successful client quitters. Perhaps, the use of complexity in MI sessions led to unsuccessful quitting smoking attempts. Additional work examines the influence of integrative complexity within therapy sessions. Patients with borderline personality disorder assigned to Cognitive Behavioral Treatment (CBT) from a previous randomized control study had completed measures of psychopathy at baseline and six-month intervals (up to 24 months). Throughout this 24-month time frame, therapy sessions were scored for integrative complexity for both the patients and therapists. At baseline, for patients, higher levels of complexity were associated with depression and anxiety, and throughout the sessions, as a patient's outcome becomes increasingly poor (i.e., suicide attempts), therapists used higher levels of complexity during sessions (Davidson et al., 2007). In these health contexts, it is possible that high levels of complexity from the counselors

and therapists lead to the poor health outcomes, which would suggest that linguistic *simplicity* is associated with more positive health outcomes.

Additionally, there is some evidence to suggest that simple rhetoric is linked to quality in popular culture domains. The film industry is one huge component of popular culture generating immense societal interest. An important marker of film quality and influence is often determined by an Academy Award (i.e., Oscar) win or loss. McCullough and Conway (2018a, Study 1) compared the integrative complexity of Oscar winning and losing Best Picture and Best Original Screenplay films from 1990 to 2015. In the second study, this investigation was widened to examine winners and losers from two other categories from the Oscars (i.e., Best Director and Best Cinematography), and winning and losing films from other award shows (i.e., Golden Globes and People's Choice Awards) were examined as well (McCullough & Conway, 2018a). Overall, in both studies, award winning films had lower levels of complexity (McCullough & Conway, 2018a, Study 1 and 2) – i.e., it appears that lower levels of linguistic complexity in film dialogue are predictive of award-winning films.

In another popular culture domain, McCullough (2019c) examined the relation between video game quality and integrative complexity. The dialogue of winning and losing video games at the Spike Video Game Awards from three categories (i.e., Best Shooter, Best Role Playing Game, and Best Action/Adventure) were scored for integrative complexity. When all three categories were collapsed, winning games were lower in complexity than losing games (McCullough, 2019c). In some popular culture domains, it appears that linguistic *simplicity* is linked to high quality.

None of these research endeavors directly relates to linguistic simplicity in scientific communication. Collectively, however, this work provides evidence that in some contexts

linguistic simplicity is associated with markers of influence such as popularity and positive outcomes.

A Multiple Complexity Model Perspective

Since there are different ways that complex thinking can occur, integrative complexity might not solely explain the relation between JPSP abstracts and subsequent citations. Thus, as previously discussed, the two subtypes of complexity from the Multiple Complexity Model might shed light on this relation. Abstracts likely contain elements of both elaborative and dialectical complexity, but it is unknown which is more likely to be effective for scientific communication. It is possible that JPSP abstracts have higher levels of elaborative complexity (i.e., complexity used to illustrate a singular perspective) to highlight and emphasize the results and findings of a given article. On the other hand, JPSP abstracts may have higher levels of dialectical complexity (i.e., complexity that recognizes the tension of multiple competing perspectives) to holistically present the information and context of a given article.

Regardless, these two subtypes of complexity *may* play a role in the relation between scientific communication and citations. There is some limited previous evidence from integrative complexity research that suggests that elaborative and dialectical complexity can be differentially influential. For instance, using AutoIC, Zubrod et al. (2021) found that higher levels of integrative complexity led to a significant increase in famous trial wins. However, those researchers also found that this effect was driven by elaborative forms of complexity (and not dialectical forms of complexity). Additional evidence suggests that elaborative complexity is indicative in differentiating between political winners and losers. When Conway et al. (2012) compared the complexity of the 2004 U.S. Democratic primaries' two winners (John Kerry and John Edwards) to other unsuccessful democratic nominees throughout the 10 primary debates, the winners exhibited more elaborative complexity compared to the unsuccessful democratic

nominees. Interestingly, however, leading up to the election, winners demonstrated a significant drop in elaborative complexity compared to the losers (Conway et al., 2012). Thus, some work suggests elaborative and dialectical complexity might *differentially* affect markers of influence.

Expectations

Collectively, this evidence does not provide a clear picture of what to expect in the present study. On the one hand, evidence suggests that the use of linguistic complexity or simplicity in scientific communication could possibly lead to increased citations: prior work suggests that in contexts likely to be thoughtful and critical, the use of complexity is associated with popularity and success (McCullough et al., 2022; Zubrod et al., 2021), and this may be especially true for elaborative complexity (Zubrod et al., 2021). On the other hand, however, integrative *simplicity* is predictive of award-winning films (McCullough & Conway, 2018a), associated with award-winning video games (McCullough, 2019c), and even associated with positive health outcomes (Conway et al., 2017; Davidson et al., 2007). These results indicate that linguistic simplicity can also be influential in various contexts. As a result of both the potentially competing forces for the influence of complexity and the lack of literature regarding linguistic style by way of natural language processing influencing number of citations, I have no certain directional predictions for the results of the study related to the relation between linguistic complexity and simplicity with number of citations. However, more broadly, I do hypothesize that there will be a relation between each type of complexity (integrative complexity, elaborative complexity, and dialectical complexity) and number of citations.

Method

Overview of Design

In the current study, I examined the predictive power of linguistic complexity of JPSP abstracts on subsequent citations. The independent variables are integrative complexity, elaborative complexity, and dialectical complexity, and I controlled for abstract word count, word count density[1] and the month and year of the article's release. The dependent variable is the number of citations for each article. I conducted a series of hierarchical multiple linear regressions that modeled the relation between the response variable, number of citations, and each of the three predictor variables (integrative, elaborative, and dialectical complexity) while controlling for abstract word count, word count density, and the month and year of each article's release.

I follow previous language research norms relevant to power and report the descriptive information relevant to that issue (e.g., Black et al., 2011; Markowitz, 2019; Mazzi, 2010; Zubrod et al., 2021). The current study consists of 1,475,864 words and 24,259 paragraphs, drawn from 9,884 JPSP abstracts.

Selection of Abstracts from the Journal of Personality and Social Psychology

Using institutional license access, I obtained Journal of Personality and Social Psychology abstracts through the ProQuest platform. I obtained abstracts from the first issue of JPSP, released in January 1965, to the July 2020 issue of JPSP. This range is large enough to be representative of both "classic" citation papers and newer papers with time for variability in citations to be meaningful. Within this selection range, several abstracts were omitted due to being incomplete and not applicable to analyses. For instance, retracted articles, articles that did

[1] Through the AutoIC framework, I scored the abstracts at the document-level of analysis. Since the word count of each abstract varied (JPSP's word limit for abstracts changed throughout the years), I created a density variable to take in account the possible variation of the number of words in each abstract analyzed through AutoIC.

not have an abstract, and abstracts labeled as “Erratums,” “Addendums,” and “Corrections” were excluded from analyses. Based on these selection criteria, the final data set contained a sample of 9,884 JPSP abstracts, with 1,475,864 total words.

Descriptive Statistics for Abstract-Related Control Variables

To ensure that I examined the effect of complexity on the number of citations, I controlled for potential covariate variables: abstract word count, word count density, and the month and year of each article’s release. Abstract word count was generated by AutoIC (*M* = 149.32 words, *SD* = 41.54 words; Q1 = 121 words, *Mdn* = 141 words, Q3 = 172 words), and word count density was created by dividing the word count of each abstract by the total number of 75-word chunks for each abstract generated by AutoIC (*M* = 61.26 words, *SD* = 7.77 words; Q1 = 56 words, *Mdn* = 61.25 words, Q3 = 67.25 words). The month and year of each article’s release was manually recorded for each abstract. December (n = 897) and the year 1986 (n = 281) had the highest number of abstracts.

Citation Retrieval

To acquire the number of citations for each article, I utilized the ProQuest Platform using institutional license access. The ProQuest Platform houses American Psychological Association databases, such as PsycINFO and PsycArticles. As a result, the citation scores from the ProQuest Platform are identical to the PsycINFO and PsycArticles citation scores. Citation counts from these databases (e.g., PsycINFO) are generally conservative compared to other metrics (e.g., Google Scholar; García-Pérez, 2010), and have been used to gather citation metrics in previous studies (e.g., Byrnes, 2007; Joy, 2006; Malouff et al., 2010). In these databases, however, some articles have missing citations (García-Pérez, 2010; Rousseau, 2007). When citation numbers were missing, I substituted the missing numbers with citation scores from Web of Science (n =

424), a metric deemed relatively similar to the ProQuest databases (García-Pérez, 2010). To assess the validity of Web of Science, additional Web of Science citations (n = 494) were collected and compared with corresponding ProQuest citations, r = .96 (Web of Science: M = 130.74, SD = 278.54; ProQuest: M = 130.56, SD = 290.29). For the purpose of the present study, the ProQuest databases and Web of Science are deemed scientifically-accepted sources to retrieve JPSP article citation metrics. In total, 9,868 abstracts had corresponding citation numbers completed, there were 16 total missing citations (i.e., from all databases).[2] The average number of citations for each abstract was 156.09 (SD = 584.99 citations; Q1 = 18 citations, Mdn = 57 citations, Q3 = 153 citations).

Automated Integrative Complexity

Each abstract was assigned a score for integrative complexity, elaborative complexity, and dialectical complexity by AutoIC. Created by integrative complexity experts, AutoIC (Conway et al., 2014; Houck et al., 2014) was designed with the goal to automate the popularized human-scored construct of integrative complexity. Similar to the original human-scored integrative complexity, AutoIC utilizes the same one-to-seven scale, and a score is given based on the degree of differentiation (distinguish and recognize multiple perspectives) and integration (the recognition of the interaction of differentiated dimensions). Higher scores indicate greater linguistic complexity, and lower numbers represent linguistic simplicity. Additionally, AutoIC scores elaborative (the recognition of a singular perspective) and dialectical complexity (the recognition of tension between competing perspectives; Conway et al., 2008). Thus, AutoIC generates three separate scores: (1) integrative complexity score, (2)

[2] Citations from the ProQuest database were manually collected from 10/13/21-10/25/21 and citations from Web of Science were manually collected from 10/30/21-11/13/21.

elaborative complexity score, and (3) dialectical complexity score (see Appendices A-C for examples of complex and simple abstracts for each score produced by AutoIC).

Overall, AutoIC has consistently demonstrated that it is a well-validated measurement of integrative complexity. AutoIC has replicated human-scored effects in various research disciplines, such as presidential debates and health contexts (Conway et al., 2014). Further, in the original AutoIC validity paper, when compared to human scorers, AutoIC had an overall correlation of r = .82 across data sets, and at the paragraph level, an overall correlation of r = .46 (Conway et al., 2014). Since 2014, additional studies have compared the validity between the human integrative complexity scorers and AutoIC. In a study comparing famous religious and irreligious people, the correlation between human-scored integrative complexity and AutoIC was r = .46 (Houck et al., 2018). Similarly, a study that examined subsets of paragraphs of fictional versus non-fictional characters scored by human integrative complexity coders and AutoIC had a correlation of r = .48 (McCullough & Conway, 2018b). In health contexts, Conway et al. (2020) demonstrates that human scored integrative complexity and AutoIC scoring has a correlation of r = .47 at the paragraph level and r = .70 at the document level. Thus, ample evidence suggests that AutoIC is a valid measure of integrative complexity (see, Conway et al., 2020).

Furthermore, there is a great deal of evidence across several domain areas that suggests AutoIC produces both predictive and theoretically interpretable findings: trial outcomes (Zubrod et al., 2021), terrorism (Conway et al., 2011; Houck et al., 2017), election outcomes (Tetlock, 1981; Thoemmes & Conway, 2007), the film industry (McCullough, 2019a; McCullough & Conway, 2018a), popular culture (McCullough, 2019bc; McCullough & Conway, 2018b), personal health (Conway et al., 2017), decision making (Prinsloo, 2016), social media (McCullough & Conway, 2019), and religion (Houck et al., 2018). Moreover, a more recent

examination of AutoIC's validity illustrates that AutoIC replicates prior human-scored integrative complexity studies in various contexts (e.g., health, ideology, etc.; Conway et al., 2020) and passes a basic validity test (scoring Donald Trump as lower than classic Western philosophy) better than another system (Conway et al., 2020).

There are strategic benefits of using the AutoIC scoring system especially when utilizing large data sets like in the present study. Utilizing AutoIC allowed me to avoid the potential consequences and hardships of human scored integrative complexity documents. Human-scored integrative complexity requires intensive labor for each human-scored document, which also creates a time constraint of producing usable materials. Due to this, human scorers only score a subset of available materials. For example, in replicating a well-known study of U.S. State of the Union speeches, Conway et al. (2020) showed that the original human-scored study scored less than 4% of the available materials, whereas AutoIC scored all of the materials. Thus, utilizing AutoIC allows for the scoring of *all* the available JPSP abstracts, which increases both the power and validity of the current study. In the current study, each JPSP abstract was scored independently at the document-level of analysis (meaning the abstracts were scored based on 75-word chunks of text).

Results

The data were analyzed using a series of hierarchical linear regressions with the statistical software package IBM SPSS Statistics (Version 25). Two-step hierarchical regression analyses were conducted with the number of citations as the dependent variable for each model. At step 1, for each model, I entered the control variables word count, word count density, and month and year of each article's release. At step 2, I entered a single linguistic predictor (i.e., integrative complexity, elaborative complexity, and dialectical complexity). Zero-order intercorrelations

between the multiple regression variables are reported in Table 1 and the regression statistics are in Tables 2, 3, and 4.

Integrative Complexity

There was a significant positive zero-order relation between integrative complexity and number of citations, β = .02, $t(9866) = 2.23$, $p = .025$. However, the strength of this relation decreased and became non-significant when accounting for the control variables, β = .01, $t(9862) = 1.00$, $p = .316$.[3] Regarding the control variables, word count, β = -.06, $t(9862) = -5.85$, $p < .001$, word count density, β = .04, $t(9862) = 3.49$, $p < .001$, and year of each article's release, β = .07, $t(9862) = 7.04$, $p < .001$ did significantly predict number of citations in this analysis. The month of each article's release did not significantly predict the number of citations.

Elaborative and Dialectical Complexity

There was a significant positive relation between elaborative complexity and number of citations both at the zero-order relation, β = .04, $t(9866) = 3.46$, $p = .001$, and when accounting for the control variables, β = .03, $t(9862) = 2.46$, $p = .014$.[4] These findings suggest that as elaborative complexity increases so does number of citations. As illustrated by the unstandardized betas (Table 3 and in Figure 1), for every one-point increase in an abstract's elaborative complexity, there are on average about 25 more citations of the article (see Figure 1 for a visual representation of this finding). Regarding the control variables, word count, β = -.06, $t(9862) = -5.86$, $p < .001$, word count density, β = .04, $t(9862) = 3.32$, $p = .001$, and year of each

[3] For integrative complexity, at step 1, the control variables contributed significantly to the regression model, $R^2 = .0079$, $R^2_{adj} = .0075$, $F(4, 9863) = 19.81$, $p < .001$. At step 2, the overall regression model with the addition of integrative complexity predicted approximately .75% of the variance in the number of citations of JPSP abstracts, $R^2 = .0080$, $R^2_{adj} = .0075$, $F(5, 9862) = 16.05$, $p < .001$.

[4] For elaborative complexity, at step 1, the control variables contributed significantly to the regression model, $R^2 = .0079$, $R^2_{adj} = .0075$, $F(4, 9863) = 19.81$, $p < .001$. At step 2, the overall regression model with the addition of elaborative complexity predicted approximately .80% of the variance in the number of citations of JPSP abstracts, $R^2 = .0085$, $R^2_{adj} = .0080$, $F(5, 9862) = 17.06$, $p < .001$.

article's release, β = .07, $t(9862) = 6.94$, $p < .001$ also significantly predicted number of citations. The month of each article's release did not significantly predict the number of citations.

There was a non-significant positive zero-order relation between dialectical complexity and number of citations, β = .00, $t(9866) = 0.18$, $p = .859$. When accounting for the control variables, the strength of this relation between dialectical complexity and number of citations is also non-significant, although it becomes descriptively slightly negative, β = -.01, $t(9862) = -0.71$, $p = .478$.[5] Regarding the control variables, word count, β = -.06, $t(9862) = -5.92$, $p < .001$, word count density, β = .04, $t(9862) = 3.85$, $p < .001$, and year of each article's release, β = .08, $t(9862) = 7.15$, $p < .001$ did significantly predict number of citations in this analysis. The month of each article's release did not significantly predict the number of citations.

Defensive Complexity

Similar to previous research on elaborative and dialectical complexity (e.g., Conway et al., 2011; Zubrod et al., 2021), I created a "defensive" complexity variable (elaborative – dialectical) to examine the differences between the two subtypes of complexity. High defensive complexity scores (high elaborative/low dialectical) suggest complexity is being used to defend a particular position, likely absent of alternative positions (Conway et al., 2008, 2011). I utilized the same two-step hierarchical regression design using defensive complexity as the predictor variable. First, there was a significant positive relation between defensive complexity and number of citations both at the zero-order relation, β = .03, $t(9866) = 2.91$, $p = .004$, and when accounting for the control variables, β = .03, $t(9862) = 2.82$, $p = .005$.[6] These findings suggest

[5] For dialectical complexity, at step 1, the control variables contributed significantly to the regression model, $R^2 = .0079$, $R^2_{adj} = .0075$, $F(4, 9863) = 19.81$, $p < .001$. At step 2, the overall regression model with the addition of dialectical complexity predicted approximately .75% of the variance in the number of citations of JPSP abstracts, $R^2 = .0080$, $R^2_{adj} = .0075$, $F(5, 9862) = 15.95$, $p < .001$.

[6] For defensive complexity, at step 1, the control variables contributed significantly to the regression model, $R^2 = .0079$, $R^2_{adj} = .0075$, $F(4, 9863) = 19.81$, $p < .001$. At step 2, the overall regression model with the addition of

that as defensive complexity increases so does number of citations. As illustrated by the unstandardized betas (Table 5), for every one-point increase in an abstract's defensive complexity, there are on average about 25 more citations of the article. Regarding the control variables, word count, β = -.07, $t(9862) = -5.91$, $p < .001$, word count density, β = .04, $t(9862) = 3.89$, $p < .001$, and year of each article's release, β = .07, $t(9862) = 7.03$, $p < .001$ also significantly predicted number of citations. The month of each article's release did not significantly predict the number of citations. See Table 5 for the regression statistics.

In all, only elaborative (β = .03, $p = .014$) and defensive (β = .03, $p = .005$) complexity (elaborative-dialectical complexity) provide support for the nondirectional hypothesis, though the effect sizes are small (Cohen's f^2s < 0.01).

Exploratory Analyses

In addition to my primary analyses, I also examined if complexity becomes more or less effective the longer a paper has been published. As seen in Tables 2-5, in each complexity analysis year consistently predicted number of citations for integrative complexity, β = .07, $t(9862) = 7.03$, $p < .00$, β = .08, $t(9862) = 7.15$, elaborative complexity, $p < .001$, β = .07, $t(9862) = 6.94$, $p < .001$, and dialectical complexity, β = .07, $t(9862) = 7.04$, $p < .001$. To better understand the impact of publication year on the relation between complexity and number of citations, I examined if the effect of complexity on number of citations is moderated by year of article publication. For these analyses, I conducted three moderation analyses using the Hayes' PROCESS Macro, Model 1 (Version 3.4; Hayes, 2017), and I used 5,000 bootstraps and 95% confidence intervals. For the three moderation models, integrative complexity, elaborative complexity, and dialectical complexity were the independent variable in each model (i.e., X), the

defensive complexity predicted approximately .82% of the variance in the number of citations of JPSP abstracts, $R^2 = .0087$, $R^2_{adj} = .0082$, $F(5, 9862) = 17.45$, $p < .001$.

dependent variable was number of citations (i.e., Y), and year of article publication was the moderation variable (i.e., W). The interaction effects between year and integrative complexity, B = -0.23, 95% CI [-1.13, 0.67], $t(9864) = -0.51$, $p = .613$, elaborative complexity, B = -0.88, 95% CI [-2.23, 0.47], $t(9864) = -1.28$, $p = .199$, and dialectical complexity, B = -0.20, 95% CI [-1.41, 1.01], $t(9864) = -0.32$, $p = .749$ were not significant. Additionally, the interaction effect between year and defensive complexity was not significant, B = -0.38, 95% CI [-1.57, 0.80], $t(9864) = -0.63$, $p = .529$. These results indicate that the effect of complexity on number of citations was not affected by an article's publication year.

Discussion

Does complexity predict the number of citations of JPSP abstracts? The results of the current study suggest it depends on the type of complexity. Elaborative complexity predicts number of citations, whereas dialectical complexity does not. The difference between these two types of complexity is highlighted by the predictive power of defensive complexity (elaborative-dialectical complexity), which indicates high levels of elaborative and low levels of dialectical complexity. Taken together, these findings suggest that complexity used to defend a singular perspective, absent of complexity used to evaluate alternative perspectives, is predictive of subsequent number of citations of articles from the *Journal of Personality and Social Psychology*.

Below I discuss why complexity in defense of a singular perspective might predict subsequent citations. Then, I discuss the degree that small effect sizes limit the practical utility of the results, the limitations of the use of a single journal, possible cultural bias, the monolinguistic nature of the sample, and the use of abstracts.

The Possible Relation Between Complexity and Effortful Thought

Why might complexity in defense of a singular perspective predict subsequent citations? First, regarding complexity more generally, previous research has indicated that complexity can produce seemingly inconsistent outcomes in areas ranging from political success (e.g., Conway et al., 2012; Suedfeld & Rank, 1976) to negative health outcomes (e.g., Conway et al., 2017; Davidson et al., 2007). Emerging research, however, suggests a possible moderator to explain these apparent inconsistencies: effortful thought. In contexts that involve effortful thought, complexity leads to positive outcomes and evaluations (see McCullough, 2019a; McCullough & Conway, 2018a; McCullough et al., 2022; Zubrod et al., 2021). For instance, in a recent meta-analysis, McCullough et al. (2022) found that complexity is associated with successful outcomes in entertainment mediums that require more effortful and critical thought (e.g., fanfiction, reviews; McCullough et al., 2022). Similarly, Zubrod et al. (2021) argued that complexity led to winning in famous trials because the trial context requires more effortful thought. In contrast, in contexts that require little effortful thought, simplicity leads to more positive outcomes (see McCullough & Conway, 2018a). Even though this proposed moderator suggested by previous research remains largely untested, the current results are consistent with these previous conclusions. Indeed, I make no hard claims about the importance of effort in the current study (I did not directly measure effortful thought), but I highlight the connection to provide a possible lens for interpretation of the current findings given that scientific article abstracts likely require some effortful thought to read and are generally read by people high in effortful processing motives.

In the present work, complexity in article abstracts – an academic context which likely involves the use of effortful thought – predicts the number of citations of JPSP articles. While I cannot make a definitive claim, these findings are consistent with previous linguistic complexity

research, which suggests elaborative complexity in effortful thought contexts can lead to "successful" outcomes.

Increased Persuasion as a Possible Mechanism for the Influence of Elaboratively Complex Abstracts

What is the mechanism by which elaborative complexity might produce more citations? It is possible that elaboratively complex abstracts are cited more because they are more *persuasive* than less elaboratively complex abstracts. Research suggests linguistically complex arguments, specifically with high levels of elaborative complexity and low levels of dialectical complexity, might have more ability to persuade audiences (see Conway et al., 2008; Repke et al., 2018; Zubrod et al., 2021). For example, Zubrod et al. (2021) suggested that elaboratively complex statements are high quality arguments, and in turn, are more likely to persuade audiences in contexts that involve effortful thought. These findings dovetail the literature on the psychology of persuasion, which I will discuss next.

There are numerous theories related to attitude change/persuasion, such as the dual-process heuristic-systematic model (Chaiken, 1980) and the elaboration likelihood model (ELM) of persuasion (Petty & Cacioppo, 1986). Due to their similarity, I solely focus on the ELM for interpreting the current findings. According to the ELM framework, the extent to which a person (i.e., a "receiver") thinks about the arguments outlined in a message (elaboration) is determined by their ability and motivation to evaluate the information (Petty & Cacioppo, 1986). Persuasion occurs through two possible routes: (1) the central route, when a receiver is motivated, pays close attention to arguments presented, and engages in effortful thought, and (2) the peripheral route, when a receiver is less motivated, engages in less effortful thought, and peripheral cues (e.g., information from an expert or celebrity source) has a greater influence on persuasion (Petty

& Cacioppo, 1986). Does the route to persuasion influence perceived argument quality and therefore persuasion? Prior work indicates it does. For instance, high-quality messaging is more influential when people are more motivated and able to engage in effortful thought (Petty & Cacioppo, 1986). Additionally, in a meta-analysis, Carpenter (2015) found that high quality messages are more persuasive when messages are processed through the central route rather than the peripheral route of persuasion.

How is prior research on the ELM model related to elaborative complexity? ELM work suggests that although there are a lot of elements to consider when defining argument quality (e.g., O'Keefe, 2013; O'Keefe & Jackson, 1995), there is general consensus that high-quality messaging invokes the most positive elaboration in support of an attitude with the least opposed negative elaboration (e.g., Carpenter, 2015; Hoeken et al., 2019; O'Keefe, 2013). In other words, as defined in these previous studies (e.g., Carpenter, 2015; Hoeken et al., 2019), high-quality arguments involve elaboration concerning the number of arguments in support of the same idea. Similar to this criterion of high-quality arguments, elaborative and defensive complexity refers to arguments that involve multiple points that defends a singular idea or theme. While there is no prior research that connects elaborative/defensive complexity to argument quality (see Zubrod et al., 2021[7]), there is some conceptual overlap between elements of high-quality messaging and elaborative/defensive complexity. Abstracts that contain messaging similar to high-quality arguments – elaboratively complex support of a singular theme – could be perceived as high quality and be a potential reason why elaborative and defensively complex abstracts are cited more.

[7] Zubrod et al. (2021) provide further arguments regarding the nuances of this conceptual comparison that are beyond the scope of the current paper.

In sum, higher levels of elaborative and defensive complexity have been found to be indicative of persuasion and conceptually similar to markers of high-quality arguments, but strong, high-quality arguments are especially persuasive to those who are motivated and ready to engage in effortful thought. These elements could contribute to why complexity used to defend a singular perspective is predictive of the number of citations. Despite these interpretations, however, I do recognize that the main complexity findings did yield very small effect sizes.

Why Does Dialectical Complexity NOT Predict Subsequent Citations?

According to the Multiple Complexity Model, both elaborative and dialectical complexity supplement the overall complexity construct of integrative complexity (Conway et al., 2008). I have outlined above the reasons why higher levels of elaborative complexity might be especially likely to predict citation rates. But it is worth considering more directly dialectical complexity's *lack* of predictive power in this study.

Given the relatively limited prior research regarding linguistic style influencing subsequent citations, it is hard to pinpoint exactly why dialectical complexity did not predict citations. However, the multidimensional nature of dialectical complexity could possibly explain the lack of effect. Dialectical complexity represents competing perspectives (e.g., "Paul Newman has both good and bad movies") or the merit of multiple perspectives on the same topic (e.g., "There are reasons for both watching Newman movies and not watching his movies"). On the other hand, as illustrated previously, elaborative complexity defends a singular perspective in a multifaceted way (e.g., "All of Paul Newman's movies are amazing and here's why"). Compared to elaborative complexity, dialectical complexity might not be predictive of citations because it contradicts typical rules for well-written abstracts, such as synthesizing the findings into a singular context (Freysteinson & Stankus, 2019). For instance, a common indication of

dialectical complexity involves "pointing out that a certain thing has positive and negative consequences/traits/elements" (Conway, 2008, p. 2), which on the surface, seems counterintuitive for the content of abstracts.

For abstracts, dialectical complexity might not inherently make sense as a successful approach for writing, and most importantly, for compelling readers to continue to read and eventually cite the article. The broad discussion of competing or multiple perspectives might be more effective in other scientific writing contexts (e.g., discussion sections), but it might be too broad a scope and potentially distracting for successful use in article abstracts.

Limitations and Future Directions

Like all studies, the current is not without limitations. First, small effect sizes were reported for the main complexity findings: elaborative ($\beta = .03$, $p = .014$) and defensive complexity ($\beta = .03$, $p = .005$) do significantly predict subsequent citations of JPSP articles, but with very small effects (Cohen's f^2s < 0.01). In the present study, obtaining small effect sizes was not entirely unexpected because there are a lot of different characteristics that go into why an article is cited — not just language — and I tried to isolate one very particular aspect of language. Thus, all of the ample possible properties (e.g., gender, actual interest value of the content, quality of the research, university affiliation, interpersonal connection, etc.) that can influence a paper being cited necessarily means that any one linguistic property of the abstract will contribute only a small proportion of the variance.

Importantly, however, while small effect sizes are of course less impactful than large effect sizes, obtaining small effect sizes does not mean the current findings are devoid of meaning. Small effect sizes can matter (see, e.g., Prentice & Miller, 1992; Tesser, 1993). Indeed, when there are multiple factors that predict a complicated effect, a small effect size is still

valuable, and interpretations of effect sizes should go beyond Cohen's often used conventions (1977, 1988) of effect sizes (Funder & Ozer, 2019). Further, the effect sizes reported in the current paper are consistent with other naturalistic evaluations of language patterns (e.g., Kramer et al., 2014; Markowitz, 2019). That is especially the case for language studies that have large numbers for the primary unit of analysis (see Conway et al., 2020). These large-scale explorations contribute to the discovery of novel trends in data that can propel future exploration and provide understanding of how language and psychological processes relate (Markowitz, 2019).

Despite the relatively small effect sizes, the present findings bolster support for the possible relation between complexity of language and effortful thought, which has been evident in prior research. Furthermore, it is important to note that one of the strengths of integrative complexity as a measurement is its predictive value of real-world phenomenon (Houck et al., 2018). And as such, while it would likely be inaccurate to rashly infer these findings across *all* scientific communication contexts, it does not necessarily mean we should dismiss that possibility entirely. As such, small effect sizes spread over thousands of instances in the present study – or perhaps millions of scientific papers if the effects apply beyond the present study – could have a huge influence on the progression of science over time and an author's scientific reputation. For instance, an increase of 25 citations of an article per one-point increase in an abstract's elaborative and defensive complexity could potentially help increase an author's scientific influence. In summary, finding an effect at all in the present study is meaningful given the plethora of possible reasons why an article is cited and that I isolated a sole component of language to examine. However, with that being said, I do recognize these effect sizes as a severe

limitation, and future research should seek to find additional linguistic variables that are more predictive of the variance of citations received.

Second, there are some limitations that constrain the generalizability of the current findings. I solely collected abstracts from a single social psychology journal, all the abstracts are in English, and it is highly likely that a majority of the abstracts were from studies primarily conducted in Western (WEIRD; Schulz et al., 2018) populations and scientific frameworks. Thus, the single psychological discipline focus, the lack of cultural breadth, and monolingual nature of the current materials limits the generalization of the current findings. These limitations, however, do not invalidate the current findings. To some degree, all studies have selective samples, and this reality should not diminish or stop research on the complexity of language. In addition, I purposely sought to explore abstracts from one journal in the area of social psychology. While there is a vast availability of academic journals, as a top-ranked journal in social psychology, JPSP serves as an excellent candidate to explore this novel research area. In spite of these limitations, the current work at a minimum suggests that, in this sample of JPSP abstracts, elaborative and defensive complexity predict subsequent citations of JPSP articles. Moreover, the current findings advance theory building and evidence for understanding complexity of language in contexts with limited prior research.

Finally, the use of abstracts might provide limitations to interpretation. For instance, it is possible that reading abstracts does not require use of effortful thought. And although I cannot provide a definitive answer, I do think it is likely that abstracts require effortful thought to read because abstracts are written to engage readers in effortful thought and "hook" them to want to learn/read more (Baron, 2018; Freysteinson & Stankus, 2019). The process of hooking readers to read an article (Petty et al., 2009) to eventually cite likely requires the reader to engage in

effortful and critical thought (to decide if an article is worth reading/citing or not), and while individual differences in motivations to engage in effortful thought exist (Petty et al., 2009), it is quite likely that scientists on average are more likely to engage in effortful thought. Thus, abstracts themselves are likely written to engage readers in effortful thought and typical abstract readers are likely motivated to engage in effortful thought while reading abstracts. Perhaps, then, the addition of elaboratively complex language further increases the ability to "hook" readers into the article. Regardless of the mechanism, however, the current study not only provides insight into further understanding of linguistic style by way of natural language processing in the area of scientific communication, but also lays the groundwork for further exploration into this area of research.

Avenues for future research should address these limitations and expand the exploration of understanding the linguistic style of scientific communication. First, additional abstracts from other journals in the field of psychology should be examined to see if there are consistent findings across psychological research areas. Additionally, this exploration should be broadened to other fields of research (e.g., biology, chemistry, physics). Further, although abstracts are an invaluable source of scientific communication, it would be interesting to examine other aspects of scientific communication, such as components of the articles themselves. For instance, would higher levels of dialectical complexity in a discussion section result in more citations? As I have previously suggested, the acknowledgment of competing or multiple perspectives (high levels of dialectical complexity) may well be effective in discussion sections (although it was not effective in abstracts in the present study). Future work should further explore the application of the complexity of language in scientific communication.

Concluding Thoughts

> We have found that — when it comes to abstracts — "more is more," despite clear and abundant advice to the contrary. (Weinberger et al., 2015, p. 4)

The current findings provide insight into understanding the impact of the complexity of language on subsequent citations of JPSP abstracts. Although there has been ample research exploring characteristics that influence the number of citations an article receives, the current work represents a novel application of the linguistic construct – integrative complexity – to understand this phenomenon. While there are various sources with suggestions for writing a successful abstract, based on the current findings, to the suggestion of "more is more" from Weinberger et al. (2015), I might add that more is more, if "more" is used to complexly defend a singular theme in the abstract.

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Table 1

Zero-order Intercorrelations Between the Study Variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Number of Citations	-								
2. Integrative	.02*	-							
3. Elaborative	.04***	.77***	-						
4. Dialectical	.00	.81***	.42***	-					
5. Defensive	.03***	-.09***	.49***	-.59***	-				
6.Word Count	-.03***	.04***	.05***	.05***	.00	-			
7. Density	.03***	.22***	.18***	.20***	-.03***	.30***	-		
8. Year of Publication	.06***	.09***	.09***	.05***	.03***	.28***	.14***	-	
9. Month	.01	-.01	-.00	-.01	.01	-.02*	-.01	-.02*	-

Note. *** $p < .001$. * $p < .05$.

Table 2

Hierarchical Regression Results for Integrative Complexity

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.0079	.0079***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	3.00***	1.45	4.59	0.79	.04***		
Year of Publication	2.88***	2.09	3.67	0.40	.08***		
Month	1.062	-2.24	4.37	1.69	.01		
Step 2						.0080	.0001***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	2.83***	1.24	4.42	0.81	.04***		
Year of Publication	2.85***	2.06	3.64	0.41	.07***		
Month	1.08	-2.23	4.38	1.69	.01		
Integrative Complexity	6.93	-6.61	20.46	6.91	.01		

Note. *** $p < .001$. * $p < .05$.

Table 3

Hierarchical Regression Results for Elaborative Complexity

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.0079	.0079***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	3.00***	1.45	4.59	0.79	.04***		
Year of Publication	2.88***	2.09	3.67	0.40	.08***		
Month	1.06	-2.24	4.37	1.69	.01		
Step 2						.0085	.0006***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	2.67***	1.01	4.25	0.80	.04***		
Year of Publication	2.81***	2.02	3.60	0.41	.07***		
Month	1.05	-2.25	4.35	1.69	.01		
Elaborative Complexity	24.75**	4.99	44.52	10.08	.03**		

Note. *** $p < .001$. ** $p < .01$.

Table 4

Hierarchical Regression Results for Dialectical Complexity

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.0079	.0079***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	3.00***	1.45	4.59	0.79	.04***		
Year of Publication	2.88***	2.09	3.67	0.40	.08***		
Month	1.06	-2.24	4.37	1.69	.01		
Step 2						.0080	.0000***
Word Count	-0.91***	-1.20	-0.61	0.15	-.06***		
Word Count Density	3.11***	1.53	4.70	0.81	.04***		
Year of Publication	2.89***	2.01	3.68	0.40	.08***		
Month	1.06	-2.25	4.36	1.69	.01		
Dialectical Complexity	-6.64	-24.97	11.69	9.35	-.01		

Note. *** $p < .001$.

Table 5

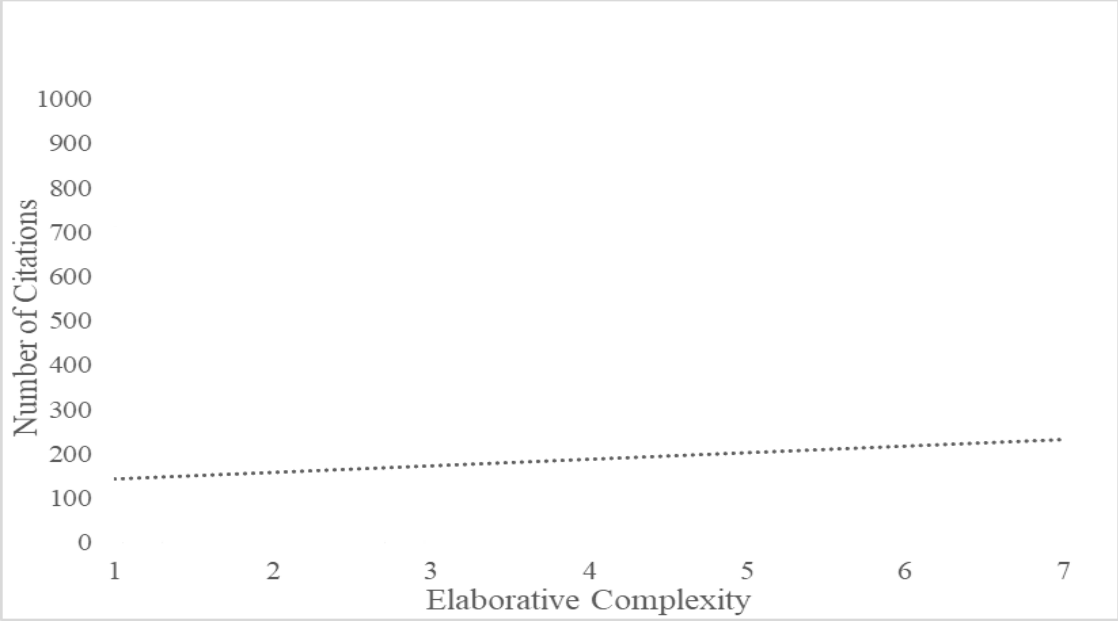
Hierarchical Regression Results for Defensive Complexity

Variable	B	95% CI for B		SE B	β	R^2	ΔR^2
		LL	UL				
Step 1						.0079	.0079***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	3.00***	1.45	4.59	0.79	.04***		
Year of Publication	2.88***	2.09	3.67	0.40	.08***		
Month	1.06	-2.24	4.37	1.69	.01		
Step 2						.0087	.0008***
Word Count	-0.90***	-1.20	-0.60	0.15	-.06***		
Word Count Density	3.10***	1.53	4.64	0.80	.04***		
Year of Publication	2.84***	2.05	3.63	0.40	.07***		
Month	1.03	-2.27	4.34	1.69	.01		
Defensive Complexity	24.88**	7.58	42.17	8.82	.03***		

Note. *** $p < .001$. ** $p < .01$.

Figure 1

Visualization of Model Prediction for Elaborative Complexity on Number of Citations



Appendix A

An Example of an Integratively Complex Abstract

Personality and situational components of expectancy for control were related to several performance variables in the present study. The subjects engaged in several tasks where the opportunity for the extraction and use of information necessary for successful completion of the task varied. Both personal expectancy for control, as measured by the Internal-External Scale, as well as the interactive effects of personal and situational expectancies, were strong predictors of all performance variables. In conjunction with post-performance rating scores, a cognitive-motivational interpretation of expectancy for control was postulated to account for the results in the present study as well as previous reported investigations.

Note. Integrative complexity score = 6.5

An Example of an Integratively Simple Abstract

This article examines the measurement of short-lived (i.e., state) changes in self-esteem. A new scale is introduced that is sensitive to manipulations designed to temporarily alter self-esteem, and 5 studies are presented that support the scale's validity. The State Self-Esteem Scale (SSES) consists of 20 items modified from the widely used Janis-Field Feelings of Inadequacy Scale (Janis & Field, 1959). Psychometric analyses revealed that the SSES has 3 correlated factors: performance, social, and appearance self-esteem. Effects of naturally occurring and laboratory failure and of clinical treatment on SSES scores were examined; it was concluded that the SSES is sensitive to these sorts of manipulations. The scale has many potential uses, which include serving as a valid manipulation check index, measuring clinical change in self-esteem, and untangling the confounded relation between mood and self-esteem.

Note. Integrative complexity score = 1.5

Appendix B

An Example of an Elaboratively Complex Abstract

The present study dealt with inconsistent communication of attitude in 2 components of a message. 3 degrees of attitude (positive, neutral, and negative) communicated in single-word contents were each combined with 3 degrees of attitude communicated in tone of voice. It was found, consistent with the proposed hypothesis, that the variability of inferences about communicator attitude on the basis of information available in content and tone combined is mainly contributed by variations in tone alone. For example, when the attitude communicated in content contradicted the attitude communicated by a negative tone, the total message was judged as communicating a negative attitude. The limitations of the findings, as well as their implications for the double-blind theory of schizophrenia, were discussed.

Note. Elaborative complexity score = 7.

An Example of an Elaboratively Simple Abstract

2 experiments were conducted to determine the effects of concession making in a 2-person bargaining game. In 1 condition agreement was required to win money, while in a 2nd condition agreement was not required. All Ss were led to believe that they were bargaining with a person in another room, but they were actually bargaining with E. The independent variable was the varying rate of concession making manipulated by E, and the dependent variable was the mean offer of Ss on the last trial. The results support the following conclusions: (a) Concessions by Ss are inversely related to concessions by E; (b) a firm bargaining strategy may increase the probability of reaching an advantageous agreement, but may reduce the probability of reaching a "fair" agreement; and (c) a strategy of making a "fair" offer initially and remaining firm thereafter is likely to evoke the least amount of yielding.

Note. Elaborative complexity score = 1.75.

Appendix C

An Example of a Dialectically Complex Abstract

The present research tested 2 competing models specifying how 2 traits (concern with the well-being of others and self-control) interact to predict forgiveness. According to the compensatory model, forgiveness requires being high on either trait; according to the synergistic model, forgiveness requires being high on both traits. Two preliminary studies demonstrated the main effect of trait (Study 1a) and primed (Study 1b) self-control on forgiveness. Three primary studies consistently supported the compensatory model in predicting willingness to forgive a partner who behaves noncooperatively in a 2-alternative prisoner's dilemma (Study 2), a continuous give-some dilemma (Study 3), and a 2-alternative maximizing difference game (Study 4). Among proselfs or those low in trait forgiveness, trait self-control positively related to forgiveness, suggesting that self-control can compensate for a lack of concern with others' well-being. Implications for theory and research on forgiveness are discussed.

Note. Dialectical complexity score = 5.5.

An Example of a Dialectically Simple Abstract

Three studies to pinpoint the underlying dynamics related to risk-taking in skilled and chance situations are presented. Study 1 is an attempt to demonstrate that cognitive and motivational theories of risk-taking must be combined to account for individual differences in skilled situations. Here, both informational influences as related to uncertainty orientation (cf. Sorrentino & Short, 1986) and affective influences as related to achievement-related motives are examined. In support of these notions, this study found that individual differences in uncertainty orientation and achievement-related motives combine to produce the greatest preference or avoidance of moderate risk (as opposed to low or high) in a skilled situation. Studies 2 and 3 show that the effect for uncertainty orientation generalizes to chance situations. Gender differences were also found to combine or interact with these effects. Taken together, these 3 studies help to clarify many issues remaining in the risk-taking area.

Note. Dialectical complexity score = 3.5.