SHOULD WE CRAFT FOR LAUGHTER?

WHAT 2000+ TED TALKS MIGHT TELL US ABOUT THE USE OF HUMOR IN RHETORICAL PUBLIC SPEAKING

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Abstract

The concept of persuasion is a puzzle. So is the concept of humor. The question is, can solving the second puzzle help solve the first one? Expressed in a different way, can successfully used humor serve as an effective means of persuasion? Using data from one of the world's largest platforms for persuasive public speeches, TED Talks, this paper makes an attempt to answer that question. The method applied relies upon two key variables: audience laughter counts and "acceptance"-related rating counts. Comparing these two against each other allows the authors to see how changes in humor usage rhetorically affects the audience addressed. Findings indicate slight positive changes in the audience's general acceptance level as a result of adding more humor. Not as large, however, as to say that humor should be viewed as an effective rhetorical device.

Keywords:

Public Speaking, Humor, Rhetoric, Persuasion, TED Talks, Psychology, Marketing, Leadership Communication, Data Modeling, Effect Measuring

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Definitions

TED: (Technology, Entertainment, Design) is an American non-profit organization that organizes conferences with public speeches on various subjects. The speeches are later published online and made available for free. Their slogan is "ideas worth spreading." More information is available on their official website ted.com.
Humor: See 2.2.1. & 3.3.2.
Rhetoric: See 2.1.
Audience: The receivers of the message, online or live. In chapter 3-5, the word audience represents the online audience. Those who have rated a talk.
Public speaking: Speaking in front of an audience.
Public speaker: Can be any person taking part in public speaking.
Public speeches: The most common categorization distinguishes between informative speeches, demonstrative speeches, persuasive speeches, and entertaining speeches.
Persuasive public speeches: Speeches with the intention to persuade.
Rhetorical public speeches: Speeches with the intention to persuade.
Persuasive public speaking: Speaking in front of an audience with the intention to persuade
Rhetorical public speaking: Speaking in front of an audience with the intention to persuade
Rhetorical device/tool: A stylistic technique (oftentimes oral) used in order to, directly or indirectly, reinforce the message or experience.
Rhetorical effect: A psychological effect making the audience more likely to "accept" your message.
Acceptance (of a message): If a person accepts a message, it means they have been convinced.
Informative public speeches: Speeches with the intention to inform the audience by accurately communicating information.
Demonstrative public speeches: Speeches with the intention to teach the audience in a practical manner using visual aid or demonstration techniques.
Entertaining public speeches: Speeches with the intention to entertain or amuse the audience.
Rating label: 14 adjectives viewers were able to rate TED Talk videos with online. The labels include: *inspiring, jaw-dropping, convincing, fascinating, beautiful, courageous, funny, informative, ingenious, long-winded, obnoxious, OK, unconvincing* and *persuasive*.
Rating count: The total number of clicks per label for each talk.

OLS: Ordinary Least Squares. A method used in a linear regression model that estimates a linear function's parameters.

Confounding variables: A variable that influences both the independent and dependent variables.

Spurious correlation: When two variables appear to have a causal relationship, but this is not the case.

1. INTRO🦆TION

We know you're smiling, even if you hate the fact that you are. Don't worry, you're not alone. It may be cheap, but it's still amusing. What's even funnier though, is the fact that it works. By doing something as simple as manipulating the headline of this chapter, we have now won your attention. And told you that we are human. And distracted your mind a little. The question is, have we made you more inclined to accept the things we have written in this paper? Well, let's not get ahead of ourselves. We'll get to that part.

1.1. Background

1.1.1. Rhetorical Public Speaking

The rhetorical voice is one of the strongest, most dangerous, and potentially most valuable assets a human has to work with. A persuasive speech held in a successful way can be powerful enough to start a war, impact an election, and in some cases, even save a life. An article published in Forbes, 2014 (Gallo, 2014), suggested that almost 70% of American workers considered rhetorical public speaking skills to be a "must-have" in order to succeed at their work. In the Harvard Business Review, Cialdini (2001) places eloquent communication among the most important leadership skills in the 21st century. Undeniably, mastering the art of persuasion has the potential to take you far. Hence, the subject has sparked human curiosity for centuries.

1.1.2. A Quick Look at the Art of Rhetoric

Dating back to ancient Greece, rhetoric is the third cornerstone in the lower division of the seven liberal arts and belongs to one of the oldest categories of studies known to man. One of the most prominent contributors to the field of rhetoric was Aristotle, who defined rhetoric as "the ability to see what is possibly persuasive in every given case". In other words, a skilled rhetorician always knows what methods they need to employ in order to shape the beliefs of their audience (Rapp, 2010). Today, rhetoric is a word with many definitions; most of them, however, has to do with the way we use language, gestures, and to some extent even props, in order to effectively persuade an audience - be it a group of voters, a client or a team at work (Corbett & Connors, 1999).

So, what were the people back in ancient Greece taught on this subject? And perhaps a more relevant question, what are people today taught on this subject? As a matter of fact, a large number of the principles, techniques, and tactics taught back then are still taught today. Many people are probably familiar with words such as “metaphor”, “simile” or “paradox”. These are all different kinds of language-related devices that were first developed during antiquity (Corbett & Connors, 1999). As hinted already, a rhetorical device, the way the authors define it here, is any type of technique used by a speaker in order to directly or indirectly sway or convert an audience. Other things still taught today, which can be traced back to philosophers such as Aristotle, Plato, and Socrates are different ways to combine logic, grammar, and vocabulary in order to construct convincing arguments, something which makes the subject closely related to the subject of “dialectics” (Rapp, 2010). The point to be made here is that, whether people know it or not, much of what is produced today in terms of both writing and speaking, is rooted in theories invented 300-700 B.C.

1.1.3. Who Invited Humor?

The use of humor as a rhetorical device in persuasive public speaking is a relatively new phenomenon (Goldstein & McGhee, 1972). Going back to antiquity, laughter was not necessarily something you sought to produce as a speaker. On the contrary, it was generally looked down upon by many practicing philosophers (Morreall, 2016). Plato, for instance, viewed laughter as something rather disgraceful as it implied either one of two things: contempt or incapability of rational self-control. For him, “being humorous”, or laughing was an insult, a sign of maliciousness (Morreall, 2016). Although Aristotle is said to have been in favor of comedy (a literary genre closely linked to the concept of humor), the aggregated number of comments made about laughter by philosophers during this time were predominantly negative. This perspective on laughter was later supported by the bible which also suggested that laughter was an act of hostility. Thus, western society hasn’t seen a great amount of humor in rhetorical public speaking over the course of history. The first publications to argue for the benefits of humor in this context came about as the general view on laughter started to shift in the late 1800s (Goldstein & McGhee, 1972). Since then, the topic has taken a gigantic leap. Today, humor can be seen everywhere, both in practice and in research. The more we learn about the concept, however, the less we seem to understand it.

1.2. TED Talks - The Elevator Pitch

An example of a context where persuasive speeches are held is at TED Talk conferences. TED (Technology, Entertainment, Design) is a non-profit organization with the aim to spread ideas and knowledge around the world, predominantly using their platform *TED.com*. In short, TED Talks are 10-20 minute video recorded conference talks covering a broad range of topics, from astrophysics to graphic design. Unlike informative, demonstrative, or entertaining public speakers, TED speakers most generally seek to inspire and foster new ways of thinking. Since the first videos were published in 2006, the platform has grown at a rapid speed. In 2013, it reached a total of 1 billion views and today, the videos are viewed more than 3 billion times annually (TED Staff, 2012; "TED Talks," 2019).

1.3. Purpose & Research Questions

The use of humor as a rhetorical technique has become increasingly popular among public speakers over the past 20-30 years. The aim of this paper is to numerically scrutinize this strategy. More specifically, the authors set out to investigate how effective the strategy is when used in the context of TED Talks. The first research question (RQ1) is:

How does changing the amount of successfully used humor in TED Talks, directly or indirectly, affect the audience's acceptance of the overall message conveyed?

Expanding on this question, the authors are also interested in the role "timing" might have in determining the rhetorical effects of humor. As will be explained further into the paper, rhetoric isn't only about what things you say and how you say them, but also in what order you say them. The second research question (RQ2) is:

How does changing the amount of successfully used humor in <u>the different parts of</u> TED Talks, directly or indirectly, affect the audience's acceptance of the overall message conveyed?

Why Acceptance?

"Acceptance of the overall message conveyed" can, according to the authors, be seen as a measure for how convinced an audience is.

Why Base the Analysis on TED Talks?

TED Talks as an abstraction exhibits strong resemblances to the definition of persuasive public speaking used in this paper - one person speaking in front of an audience with the intention to influence the listeners. Hence, the authors consider it to be one of the best cross-sectional data sources available for the purpose of this study. Similar studies based on TED Talks have been gathered in Appendix II.

1.4. Expected Contribution

1.4.1. Scientific Relevance

The concept of humor has received a lot of scientific attention in recent history. Whereas some scholars have focused on what the concept is and how it is produced, others have focused on what effects it can trigger. In the context of public speaking, behavioral scientists have gone broad, especially those in the latter of the two divisions (Martin & Ford, 2018). Unlike prior studies on the same topic, however, this study focuses on what the authors like to call "acceptance". So far, research has proven that humor can have a positive effect on, for example, audience attention, audience mood, and audience memory. Although all positive from a persuasion standpoint, these aspects are still just intermediaries in the rhetorical chain - not the end goal (Meyer, 2000). Thus, this study makes an impartial attempt to address an aspect that has not been given much focus in earlier research.

Apart from the measured effect per se, the authors also believe in the relevance of studying an online audience. Historically, public speeches have taken place in front of a live audience and a live audience only. In today's digitalized world, however, a majority of the total audience is often located online (Baidac, 2019; Chernova, 2020). With the chosen data, this paper might be able to provide a deeper understanding of how humor, from a rhetorical standpoint, affects people when it's experienced through a digital medium.

1.4.2. Practical Relevance

Supposing that the characteristics of TED Talks are representative for persuasive public speeches in general, hopes are that the results from this study could yield valuable insights, not only for future TED speakers, but for speakers in all kinds of contexts. It's once again important to highlight that rhetorical public speaking occurs each and every day - on all levels in our society. Company representatives, for instance, engage in persuasive speaking more often than they might think - both externally, as when they present products or solutions to current or future clients/customers, and internally, as when they try to get their ideas and visions across to their coworkers.

1.5. Delimitations

Three critical delimitations are set for the study. The first one concerns the empirical data used, the second concerns the amount of humor that is measured, and the third concerns the overall aim.

Empirical Data

Due to the practical difficulties associated with collecting suitable data, the study only looks at TED Talks. More specifically, the focus is narrowed down to a specific, pre-assembled, dataset containing information about TED Talks published on TED.com between 2006-2017. What this means, both in terms of opportunities, and in terms of limitations, will be perfectly clear throughout the paper. At this point, the only thing the reader needs to know is that no other contexts, nor sources, are scanned for data.

Amount of Humor Measured

When measuring the amount of humor used in a speech, the authors only look at "successfully used humor" - humor which has generated laughter among the live audience of a speech.

Overall Aim

Studies in the same category as this one are normally mistaken for striving to produce a full prediction model of some sort. This is, by no means, the purpose of this study. The authors of this paper are solely interested in the rhetorical effect of humor. Comparisons are not drawn to other rhetorical devices.

2. Theoretical Framework

The following chapter has been divided into three parts. The first part introduces the reader to the technical aspects of rhetoric, the second part does the same thing to humor, and the third part puts them together.

2.1. Rhetoric 101 (Lecture 2)

2.1.1. The Three Means of Persuasion

Three technical vehicles lie at the core of Aristotle's theories on persuasion. The first one is the character or appeal of the speaker, commonly known as the "**ethos**". Aristotle laid out three qualities which in his opinion were the most important to obtain in order to appear credible and reliable: perceived or practical intelligence, virtuous character, and goodwill. The second vehicle is the emotional state of the audience, or the "**pathos**". Aristotle saw that the ability of humans to form judgment is highly affected by the emotional state that they are in. Therefore, a speaker must have the skill to, not only read and break down different kinds of emotions, but also tailor their speech in order to bring about these emotions. A good rhetorical speaker should know exactly how to twist an argument to bring the audience to a certain emotional state. Pathos can for instance be achieved through the use of storytelling. The last vehicle is the argument itself, also known as "**logos**". Being able to demonstrate, through the use of logical reasoning (deductive or inductive), that something is the truth, is a critical skill for someone aiming to persuade an audience (Corbett & Connors, 1999).

2.1.2. The Five Canons of Rhetoric

For reasons that will be clear further on, a short introduction to rhetoric wouldn't be complete without mentioning "The Five Canons". The five canons (**invention, arrangement, elocution, memory**, and **delivery**), were first brought together by the Roman orator Cicero (Corbett & Connors, 1999). These five principles can be seen as the foundation of rhetorical education as they serve to guide a speaker or writer through the entire process of building a strong argumentative case (Hoffman & Ford, 2010). **Invention**, which was first coined by Aristotle, is the process of deciding what to say, in other words, selecting and building the arguments that are going to be presented. **Arrangement** is the sequential structuring of a text or speech (related to timing). The aim at this stage should be to organize the selected arguments in order for them to achieve maximum effect. **Elocution** is probably the most important one to talk about in this thesis. Instead of focusing on *what* is going to be said, this stage focuses on *how* it's going to be said. Aristotle argued that, although the main goal of any rhetoric process should be to achieve clarity, speakers must also strive to establish a sense of curiosity and excitement among their listeners, for instance by using unfamiliar words, creative expressions or illustrative comparisons. As hinted earlier, this is partly what we today refer to as the use of "rhetorical devices" - different ways to strategically decorate or twist a speech. **Memory,** closely related to a person's ethos, partly stands for the ability to recite the information that's going to be presented, partly for the ability to bring up information beyond what is being presented. According to Ciceron, a person who's able to confidently respond to questions for which they've nothing to fall back on, is likely to be seen as more credible than someone who isn't. **Delivery** is concerned with things such as tone of voice, body language, timing, speed, and use of pauses. Back in ancient Greece, the art of delivering a speech was seen as a gift only a few men received (Hoffman & Ford, 2010).

2.2. What You Should Know About Humor

2.2.1. Defining Humor

Humor is intricate, general, and most importantly, ambiguous. Despite, or maybe as a consequence of, numerous years of research on the subject (stretching over a number of different disciplines), a universal definition of the word has yet to be agreed upon among researchers (Martin & Ford, 2018). The reason people find it so difficult to define is due to the complex nature of the concept. Think of the following two statements:

Amy is a humorous person. She always makes me laugh.
Amy has a good sense of humor. She always laughs at my jokes.

The different meanings of these statements indicate that humor is a word with many dimensions. Whereas one dimension of the word is the cognitive ability to create and understand humor (Feingold & Mazzella, 1993), another dimension is the pleasant emotional ability to find joy in humor (Ruch & Hehl, 1998). Depending on the level of analysis, these two relatively broad layers can moreover be dissected into more thinner layers (Kohler & Ruch, 1996).

In order to further showcase the more or less hopeless views on trying to reach a generally applicable definition of the concept, the authors have borrowed a passage from the preface of Goldstein and McGhee's *The Psychology of Humor: Theoretical Perspectives and Empirical Issues* (1972):

> *"Note that we have not, in this preface, attempted to define precisely what humor is. [...]we all know it when we see it, but it becomes difficult to specify a priori what it is. We have not attempted a definition here for the simple reason that there is no single definition of humor acceptable to all investigators in the area."*

What many scientists, regardless of theoretical background, seem to agree upon is that humor is a "social" phenomenon - a playful interaction of some sort which brings about a feeling of amusement (Martin & Kupier, 1999). Peterson & Seligman (2004) make an attempt to define humor based on input from scholars active in different fields. They say that humor is:

> *"(a) the playful recognition, enjoyment, and/or creation of incongruity; (b) a composed and cheerful view on adversity that allows one to see its light side and thereby sustain a good mood; and (c) the ability to make others smile or laugh"*

This definition may not cover the entire spectrum of possible takes on the concept, however, it does capture some of the elements that in literature have been both empirically and theoretically described. Explicitly, the views of humor being a type of skill, a type of mood (or emotion), a type of strategy/mechanism and a type of human trait (Derks, 2017).

Moreover, a number of people have tried to deconstruct the concept and sort it out into different subdivisions. Martin et al. (2003) came up with the following four, in his words, "styles" of humor: Self-enhancing (humor that aims at making fun of oneself in a healthy way), affiliative (humor that aims to bring people together and promote happiness), self-defeating (humor that aims at making fun of oneself in an unhealthy way) and aggressive (humor that aims to insult). Another commonly referred to classification of the term was made by Long & Graesser (1988). They created 11 categories which they thought of as different kinds of spontaneous or conversational humor among them: irony, sarcasm, puns, and clever replies to serious questions.

In the end, the way in which humor should be defined, summoned, or categorized, ultimately comes down to the context in which it's used and what psychological function is discussed (Ruch, 1998). The definition of humor used in this study is described in section 3.3.2.

2.2.2. Humor & Laughter

As touched upon in the previous section, humor is often associated with the act of laughing (Keith-Spiegel in Goldstein & McGhee, 1972). The assumption that "what is funny or humorous makes you laugh, and symmetrically, what makes you laugh is funny or humorous" is deeply embedded in society today. Some may even claim that the two, humorous and laughable, are interchangeable (Lewis, 1989 as cited in Attardo, 1994). Due to the centrality of this assumption later in the paper, an introduction to the connection between humor and laughter is given below.

Laughter is a high intensity and rather complex neurophysiological demonstration of a positive emotion – often a signal that one is in a playful, happy or amused state (Mcdougall, 1903; van Hoff, 2003, as cited in Martin & Ford, 2018). As such, it often occurs as a response to what is perceived as humorous. Derks (2017) makes it clear that laughter denotes an effect, yet, not a cause. Hence, one should be careful to define humor solely in terms of what makes people laugh. As many people know from experience, the feeling of mirth can arise without laughter coming about. In much the same way, people can laugh without even knowing why they're laughing. What this is saying is that laughter is affected, or triggered if you might, by a lot more than just humor in and on itself (Olbrecht-Tyteca, 1974 as cited in Attardo, 1994).

In fact, apart from demographic factors, findings provided by Martin & Kuiper (1999) and Provine & Fisher (1989) show that people find it much easier to laugh when they are surrounded by others than when they are alone. This, in turn, is further supported by Chapman & Chapman (1974), whose research suggested that laughter can be heavily dependent on the laughter of someone else, for instance a companion sitting next to you. Another experiment conducted by Martin & Gray (1996) revealed that people who are exposed to recordings with background laughter of different kinds (think of a comedy broadcast or a Talk-show with a laughing audience) find the recording to be more comical and enjoyable than people exposed to the same recordings without the background laughter.

2.2.3. A Research Overview

Continuing on the previous section, the purpose of the following two tables is to give the reader an overview of what the field of humor studies has looked like over the past 120 years. As can be deducted from Table 1 and Table 2, the number of contributions to the literature has grown remarkably over the past 20-40 years, especially within the fields of Social Sciences and Art & Humanities.

Table 1. No. of Publications (1900-2019)

Year	1900-1919	1920-1939	1940-1959	1960-1979	1980-1999	2000-2019
No.	29	46	53	255	978	5402

Table 1 shows the number of publications with the words "humor", "humour", "laugh" or "laughter" in their title over periods of 20 years. Publications related to the areas of medicine, pharmacology, biology, veterinary and agriculture have been removed as "humor" in these studies could refer to the watery body fluid.
Database: Scopus, 2020-03-29

Table 2. Top Five Subject Areas

Field	Social Sciences	Arts & Humanities	Psychology	Computer Science	Business & Management
No.	3670	3619	1764	521	423

Table 2 shows the top five fields in terms of number of publications with the words "humor", "humour" or "laughter" in their title (1900-2019).
Database: Scopus, 2020-03-29

2.3. Humor as a Rhetorical Device

In the following section, "humor" or "humoristic elements" will refer to both verbal and non-verbal messages - everything done intentionally to evoke a feeling of mirth. A non-verbal message could, for example, be the incorporation of a PowerPoint slide or a physical gesture aiming at making the audience laugh. The type or style of humor won't be specified. "Audience" will refer to the receiver(s) of the humor.

Establishing a clear connection between humor and persuasion isn't easy. One way in which many scholars have tried it, however, is through the use of a theoretical framework known as the Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1986). Similar to Aristotle's three means of persuasion, the ELM proposes that persuasion can be achieved through two different routes, the *central route* and the *peripheral route*. The central route focuses on the actual content of a message - comparable with Aristotle's logos. The peripheral route, on the other hand, disregards the actual content and places all weight on what could be called heuristic cues. Examples could be perceived speaker attractiveness and intelligence - comparable with Aristotle's ethos. As the central route (making sense of a graph or a complex way of reasoning) takes a considerable amount of cognitive work, our natural instinct tends to push us towards the peripheral route unless we are motivated enough to think deeply about the actual logic of the arguments put forth (Petty, Cacioppo, Schumann 1986). What this tells us is that some people will always be tricked into accepting our ideas as long as we appeal to them emotionally or "intelligently" (Lyttle, 2001).

But what about those people who are more inclined to look for logic? These are the people who should be targeted with humor. According to Jones (2005), Eisend (2011), and Osterhouse & Brock (1970), the extra cognitive processing that is forced upon someone when they are exposed to humor could easily distract them from thinking critically about what is being said, thereby blocking them from constructing potential counter-arguments. Alley (2003), among others, adds to this theory that using humor is a great way to make both the speaker and the audience feel more "relaxed". The ability to turn, for instance, a mistake or a counter-argument into something funny creates the perception that the speaker is confident enough to maintain control over the situation, regardless of how things fold out (Savage et. al, 2017).

Continuing on the same path, the succeeding part of this section will look at a total of five - slightly more distinct - psychological effects humor can have on people, all of which have close links to the act of persuasion. What should be noted is that many of the below presented theories have been formed based on studies conducted in other contexts than persuasive public speeches.

Humor Effects on Perceived Speaker Likability/Credibility

As explained in the previous passage, focusing all efforts on "what is going to be said" may not always be the best strategy. Unless people engage fully in what is being communicated, they are much more likely to be influenced by factors other than the actual arguments, for instance, how "likable" the speaker is (Petty & Cacioppo, 1986; Harvey & Mill, 1972). This is partly why humor could be an effective tool when trying to persuade an audience. According to a number of studies conducted over the years, the use of <u>appropriate</u> humor seems to be strongly linked to perceived likeability. Meyer (2000) argued that one possible explanation for this could be that a shared sense of humor might imply a shared set of values or perhaps interests. Studying both students in classroom settings and board members in boardroom settings, Weaver & Cottrell (1987) came up with a similar conclusion. They saw that humor in general, affiliative humor in particular, has the potential to reduce perceived differences between the speaker and the audience, hence increase speaker likeability. Last but not least, Giffin (1967) claimed that opening a speech with humor is one of the most effective ways to connect and establish a common ground with the audience.

Closely linked to the discussion of humor being a way to manifest confidence, studies have also found that people who display a sense of humor, especially those using self-deprecating humor, tend to be seen as more charismatic than people who don't (Apte, 1987). Hence, it could be argued that the use of humor is a strategic way to attract and maintain followers (Hughes, 2009).

Lastly, research has shown that speakers who promote a message which seems to be contending their own self-interest are far more effective in their persuasion than speakers who don't (Walster, Aronson & Abrahams, 1966). According to Lyttle (2001), one way to create this illusion can be by using self-deprecating humor.

Humor Effects on Audience Mood & Attention

Another way in which humor may be serving as a good tool for persuading an audience is the positive effect it can have on people's moods (Kuiper, McKenzie & Belanger, 1995; Eisend, 2011; Ford et al., 2012). Both laughing and smiling are known to act as endorphin-releasers and endorphins are known for reducing feelings such as stress and anxiety (Dunbar et al. 2011). Moreover, people who are in a good and relaxed mood are less likely to disagree with someone trying to persuade them (Freedman, Sears & Carlsmith, 1978 as cited in Martin & Ford, 2018). Eisend (2011) explains this by proposing a link between mood and number of mentally generated pro-arguments. On the same subject, a good mood has also reported to lower the motivation to engage in central route-thinking (Bless & Schwartz, 1999). Thus, another explanation for the correlation between a good mood and the reduced likeliness of disagreement could possibly be found in the previous passage about speaker character.

Following this further, numerous studies provide evidence for a positive relationship between speaker use of humor and selected audience attention (Savage et al., 2017; Wanzer & Frymier, 2009; Gorham & Christophel, 2009). Linked, yet not equal to, the focus area of this paper, Wanzer & Frymier (2009) examined the use of humorous messages in learning situations. One of the things they highlight is that humor, especially in the context of academics, often comes as a surprise. For that reason, it tends to not only attract, but also maintain the conscious concentration of the audience when used repeatedly. This goes in line with the arguments saying that every time we're exposed to humor, our brain is forced to take part in a "sense-making" cognitive process, something which unconsciously awakes our attention (Suls, as cited in Goldstein & McGhee, 1972). So why are we even bringing this up? As stated by Cicero, the process of convincing an audience always starts with getting them in the right condition. Gallo (2014) draws upon Cicero's statement and says that grabbing the audience's attention in the opening moments of a speech, is more or less a must in order to gain trust.

Humor Effects on Content Recollection

Lastly, research has time and time again suggested humor to be a successful tool for making central messages more memorable (Cline & Kellaris, 2007; Schmidt, 1994; Garner, 2006; Ziv, 2014). For instance, in an experiment involving a total of 160 students studying statistics, Ziv (2014), found that those students who, as opposed to the control group, were taught the class in a more humorous way demonstrated significantly higher results on the final exam of the course. Ford & Martin (2018) explained why humor could be a strategic way to help people recall information better by pointing towards the emotional stimulation evoked. Strong emotional arousal has shown to work as a type of glue for vivid details in our brains (Heuer, Reisberg & Burke 1990; Todd, 2013). Others have followed the line of our previous discussions, saying that it probably has to do with the increased attention evoked when encountering something incongruous (Wanzer & Frymier, 2009).

General Critique Against the Use of Humor as a Rhetorical Device

A majority of the criticism that has been laid out by scholars against the use of humor as a tool fit for persuasion has, oddly enough, come from cases of advertising - print, audio, and broadcasting. Although many studies over the years have presented evidence that humor might have persuading effects in the context of advertising, many haven't been able to find any effect at all (Weinberger & Gulas, 1992, Markiewicz, 1974). One thing scholars seem to agree upon is that it might be useful in terms of drawing attention to an ad (Weinberger & Gulas, 2006). According to Duncan (1979), everything discussed apart from attention ought to include a nuanced reflection on how different types of mediating variables might influence the results.

2.4. Hypotheses Development

Based on the authors' collective interpretation of the theories presented in this chapter, two hypotheses have been developed - one for each research question.

H1: Overall acceptance of a message varies positively with the amount of successfully used humor in TED Talks.

H2: The supposed positive relationship between successfully used humor and overall acceptance of a message is stronger when the humor occurs in the beginning and middle, rather than at the end, of a TED Talk.

3. Data & Methodology

The following chapter aims to describe the characteristics of the data set used in this study, performed adjustments, and applied statistical methods. Preparing and analyzing the data has primarily been done using the R programming language and software environment. A limited set of actions, however, have been carried out using Python and Excel.

3.1. TED Talks - A Technical Point of View

Although known for popularizing “science”, there is no formal requirement for TED speakers to root their ideas in scientific research. Instead, speakers are allowed to back up their ideas with things such as experience and observations, as long as they stick to the formal guidelines provided by TED (‘TEDx Rules’, 2020; ‘TED Content Guidelines’, 2020). What TED Talks does expect is a considerable amount of preparation. Have a thesis and basic outline finished 6 months prior to the speech is just one example (‘Outline + Script’, 2020).

Following this further, it’s important to mention that TED has been widely criticized over the years for the format they use to disseminate knowledge. One specific aspect that many have brought up is the absence of interaction between the speaker and the audience (Romanelli, Cain, McNamara, 2015). So far, the structure hasn’t allowed for questions to be asked, concerns to be raised or criticism to be presented. While it’s true that comments can be left on the TED website, the lack of debate and regular fact updates in the video recordings leave the online audience with few things but the talk, in and of itself, to base their opinions on. The authors see this as a good thing for the purpose of this study as it, to some degree, isolates the effects of the “rhetorical performance of the speaker” on the audience’s acceptance of the message.

Lastly, it should be mentioned that TED talks are written and structured to suit a large audience. Compared to ordinary conference talks which often builds on the assumption that the audience has some kind of prior knowledge, TED talks are rather simple in their nature. The focus on one core message, and not several minor messages, makes most TED talks relatively easy to comprehend, as long as you have reached a certain age.

3.2. Data Properties

3.2.1. Sample Description

The two observational datasets used to conduct this study were downloaded from the open source data science community, Kaggle.com, on February 7th, 2020. The data was originally scraped off of TED.com by the data scientist Rounak Banik and contains detailed information about all recorded TED Talks uploaded to the TED website between June 27th, 2006 and September 22nd, 2017. Table 3 and 5 show the exact information included in the original datasets.

Table 3. Data Set #1

Column Variables (# = integer, A = string)	**Description**
(#) comments	Number of comments placed. N = 473 552; Mean = 192; Std. Deviation = 292
(A) description	A short description of each talk.
(#) duration	The length of each talk in seconds. Mean = 827 ; Std. Deviation = 374
(A) event	The TED/TEDx event where each talk was held.
(#) film_date	"Unix" timestamp of the recording of each talk.
(#) languages	Number of languages to which each talk had been translated. Mean = 27.3; Std. Deviation = 9.56
(A) main_speaker	The first name of the speaker of each talk.
(A) name	The official TED name of each talk (title and speaker).
(#) num_speaker	Number of speakers giving each talk. Mean = 1.03; Std. Deviation = 0.21
(#) published_date	"Unix" timestamp of the publication of each talk.
(A/#) ratings	Number of ratings made. N = 6 212 841; Mean = 2436; Std. Deviation = 4226.80
(A) related_talks	Recommended talks based on the topic.
(A) speaker_occupation	The occupation of the main speaker.
(A) tags	Themes/topics related to the talk.
(A) title	The title of the talk.
(A) URL	The URL of the talk.
(#) views	Number of views of each talk. Mean = 1.7m; Std. Deviation = 2.5m

From here on forth, unless otherwise is stated, the word "audience" will refer to the online audience - those whose opinions are measured.

As revealed in Table 3, TED used to have a rating-feature on their website which allowed them to collect and present opinion-based data for each talk. Since this data will serve as the backbone of this study, it is critical to let the reader know how the rating system worked.

Briefly described, ratings were submitted by choosing three of the following predefined labels: *inspiring, jaw-dropping, convincing, fascinating, beautiful, courageous, funny, informative, ingenious, long-winded, obnoxious, OK, unconvincing and persuasive*. If only one of these labels was selected by an online viewer, TED assigned it three times the weight. Although this might be seen as a fair system to collect large amounts of information, some things deserve to be commented on.

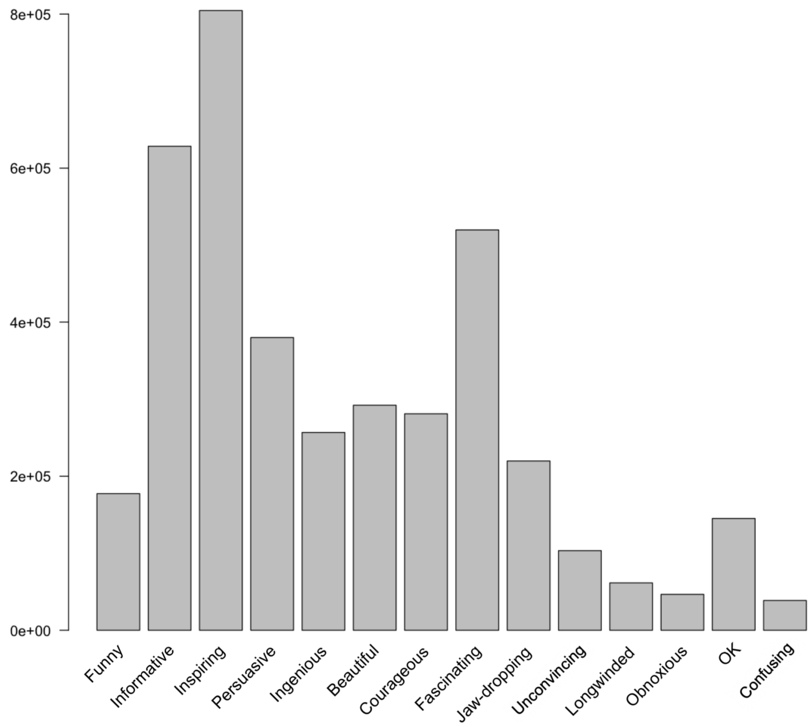
Table 4. List of Rating Labels Categorized

Positive Labels	Negative Labels	Obscure Labels
Informative	Unconvincing	OK
Inspiring	Long-winded	Persuasive
Ingenious	Obnoxious	
Fascinating	Confusing	
Beautiful		
Jaw-dropping		
Courageous		
Funny		

Table 4 shows a categorization of the different labels based on definitions taken from the Cambridge Dictionary (Cambridge Dictionary, 2020).

First of all, it is worth paying attention to the distribution of the labels. As demonstrated in Table 4, the number of positive labels a viewer could choose from far exceeded the number of negative labels. That in combination with the fact that the positive labels were displayed prior to the negative labels in the rating window (see Appendix III) could possibly be an answer to why the rating counts in the data are distributionally biased. As Figure 1 shows, positive ratings appear more frequently than negative ratings.

Figure 1. Total Number of Ratings of the Different Labels.



Following this further, it is reasonable to assume that different interpretations of the labels may have caused people to rate the talks differently, although having formed the same opinion in terms of acceptance.

Lastly, it is important to shed light on the information that was known to the viewers at the time of rating. There are strong reasons to believe that things such as prior ratings, number of views, speaker facts and tonality of placed comments, may have impacted the way in which a viewer rated a talk. The graph presented in Appendix III, for instance, shows that talks with more than 20 million views have, on average, received more “Inspiring”-ratings than talks with less than 20 million views. The reasons for this are unknown, but the trend is good to be aware of.

In order not to make any false conclusions, these aspects are all accounted for - either through adjustments or through interpretation.

Table 5. Data Set #2

Column Variables (# = integer, A = string)	Description
(A) transcript	The official English transcript of each talk, including “applause” and “laughter”.
(A) URL	The URL of the talk.

As Table 5 shows, the second dataset is a collection of transcripts with matching URLs. What makes these transcripts particularly useful for a study like this is the fact that they contain the markup “(Laughter)”, signaling when during a recorded speech the audience laughed. The use of this markup will be explained in section 3.3.2.

3.2.2. Sample Reconstruction & Adjustment

Table 6 depicts a chronological list of all the actions that are taken in order to:

1. Enable the quantitative analysis.
2. Manually construct the variables needed to test the hypotheses.
3. Limit the impact of unwanted, potentially influential, variables on the results.

The adjustments are made using a combination of R and Excel.

Table 6. Reconstruction & Adjustments of the Two Data Sets

#	Action	Rationale	n = X
1	Dataset #1 and #2 are combined and the transcripts in #2 are matched with the right talks in #1 using their URLs.	In order to enable the analysis.	2550
2	All talks without matching transcripts as well as all transcripts without matching talks are excluded.	No value provided.	2326
3	The variable 'ratings' (including information on 14 different rating labels) is stripped off all information but the counts for each rating and split into 14 different variables - one for each rating.	In order to enable the analysis.	2326
4	The number of counts for each rating label is divided by the total number of counts for all ratings/talk, turning these variables into percentages.	Basis for the four response variables used to answer RQ1.	2326
5	A new variable is created, containing the extracted number of (laughter)-markups from each transcript.	Basis for the explanatory variable used to answer RQ1.	2326
6	The variable 'transcript' is copied and split into thirds based on the total number of words in each transcript.	Basis for the three explanatory variables used to answer RQ2.	2326
7	Using the same methodology as in #5, three new variables are created containing the extracted number of (laughter)-markups from each transcript	Basis for the three explanatory variables used to answer RQ2.	2326
8	The variables created in #5 and #7 are converted into laughs per minute.	To offset the effect of duration.	2326
9	In line with the theories presented earlier, far outside values in terms of 'views' (talks>4 506 612 views) are excluded from the data, leaving the analysis with 2213 talks.	To mitigate the potential external effect of exceedingly high view counts on rating inclination - such as "best talks" framing.	2213
10	Similar to Iftekhar Tanveer et. al. (2019), any talk with <400 ratings is excluded, leaving the analysis with a total number of 2124 observations.	To ensure each talk has a solid number of rating counts (remove potential noise).	2124
11	Any talk held by "comedians" as well as any talk tagged with "comedy" are removed.	Removed in order to further isolate the effect of the independent variables on the dependent variables.	2084
12	All "performances" are removed from the dataset.	Not representable for the purpose of this study.	2032

As can be seen in the table, the *adjusted sample* is made up of a total of 2032 observations (talks). In order to conduct a repeated study, the sample is furthermore divided into two different datasets, a lead sample containing half of the observations (n=1016) and a verification sample containing the other half (n=1016).

Because the rating counts are fixed to one point in time, the data is not treated as panel data.

3.3. Statistical Analysis - Modeling Approach

To estimate the partial effect of humor incorporation on audience acceptance, the authors use OLS regressions. In total, eight (2*4) regressions are computed, four related to hypothesis 1 and four related to hypothesis 2. The intention is to investigate if variation in the selected regressands (see 3.3.1.) can be explained by variation in the selected regressors (see 3.3.2.). The strength of the relationships (bivariate correlations) are tested using t-tests and showcased in the form of summarized statistics tables in Chapter 4. Standardized coefficients will be calculated along with the ordinary coefficients to facilitate comparisons between the regressors.

3.3.1. Regressands (Dependent Variables)

Due to the complexity of constructing a single variable measuring acceptance, the authors include four of the available rating labels as regressands in the models:

1. *INSPIRING*
2. *INGENIOUS*
3. *OBNOXIOUS*
4. *UNCONVINCING*

Acknowledging that it would be interesting to study all available ratings, doing so would leave the analysis with 28 regressions, a number not suitable for the format of this paper. Hence, the authors have had to filter out a majority of the labels based on their relation to acceptance (see Table 7). The assessment draws upon the theoretical framework provided in Chapter 2 as well as the definition of each word as expressed in the Cambridge Dictionary.

Table 7. Summary of Dependent Variables

Label	Definition (Cambridge Dictionary, 2020)	Connection to “acceptance”	Expected corr.
INSPIRING	Encouraging, or making you feel you want to do something.	Strong positive	(+)
INGENIOUS	(Of a person) Very intelligent and skillful.	Strong positive	(+)
OBNOXIOUS	Very unpleasant or rude.	Strong negative	(–)
UNCONVINCING	If an explanation or story is unconvincing, it does not sound or seem true or real.	Strong negative	(–)

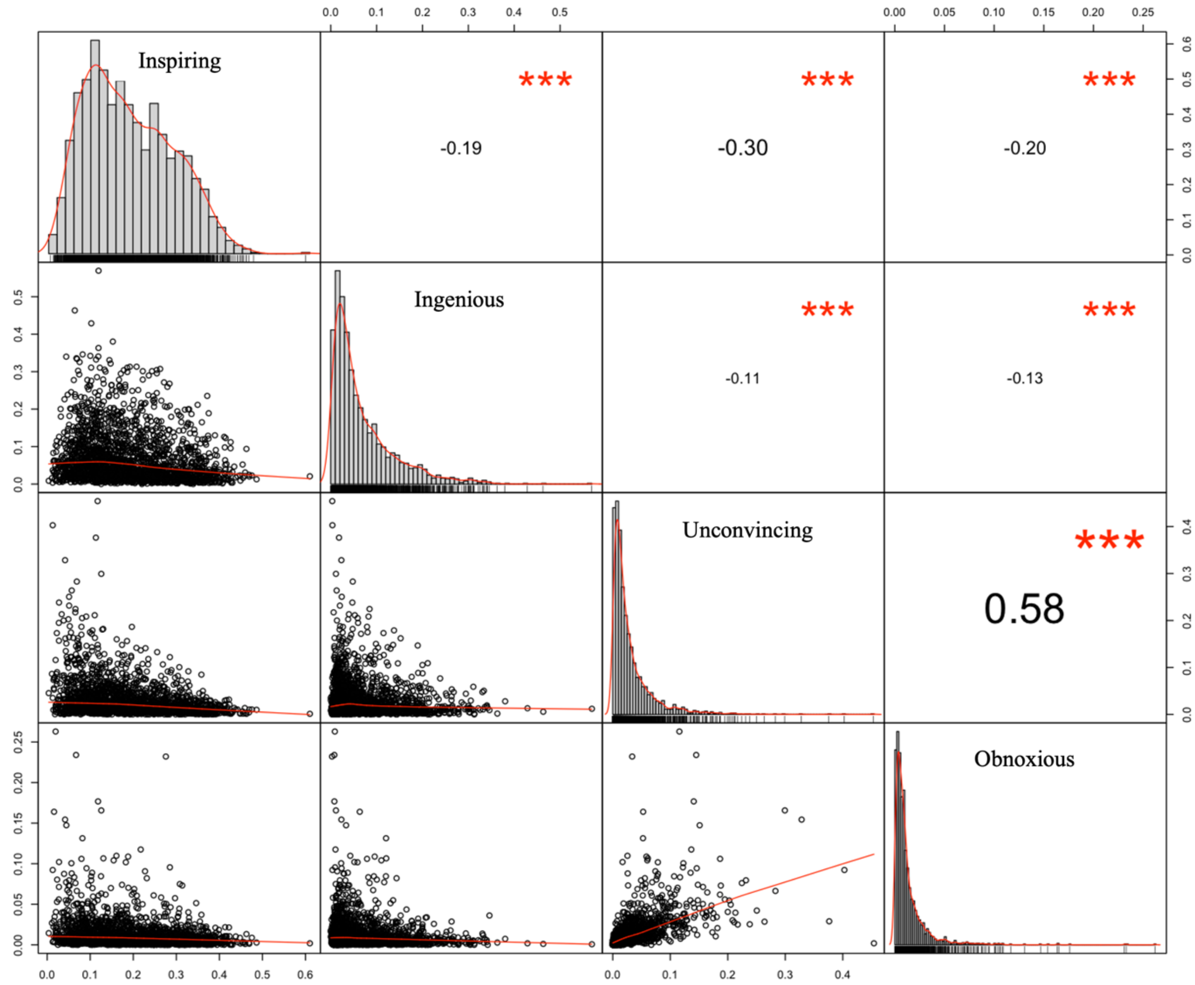
A potentially arguable action the authors take is removing the rating label “persuasive”. The reason for taking action is twofold. One reason is the negative connotation of the word. The other reason is the, not entirely waterproof, rating system. It’s definitely possible that some of the viewers mistook the rating system for a “describing system”, and describing a talk as persuasive wouldn’t be the same as saying they were convinced. Describing a talk as ingenious or inspiring, however, would indirectly reveal a certain level of acceptance. Hence, this action can be seen as a safety-measure. To reduce any type of subjective bias, the authors’ reached out for help from an external group of people (n=10) during the filtering process.

In order to test the hypotheses, the results from each regression will be assessed and discussed both individually and collectively, taking everything surrounding the selected labels into account. To avoid the occurrence of deceptive information, rating counts are expressed as relative numbers (percentages) rather than absolute numbers.

It should be noted that neither one of the authors asserts this to be an optimal method of approximating “acceptance”. For someone looking to do a similar study, yet collect data using a manual approach, the authors suggest reading about the commonly used Generalised Belief Measure (GBM) (Brotherton, French & Pickering, 2013).

The matrix provided in Figure 2 yields two noteworthy insights about the selected variables. The first is that people have clicked more positive ratings than negative ratings (these variables showing less skewed distributions). The second is that people have placed more than one negative rating in those cases a talk has been negatively perceived (a relatively strong correlation between the negative rating variables).

Figure 2. Descriptive Statistics of the Four Dependent Variables



The matrix provided in Figure 2 demonstrates the following descriptives for each of the regressands:

1. Approximate value distributions in the form of histograms (frequency on the Y-axis, intervals of values on the X-axis)
2. Scatterplots of interrelationships between each of the variables
3. Correlations between each of the variables

3.3.2. Main Regressors (Independent Variables)

The four models used to test the first hypothesis include one main regressor. The four models used to test the second hypothesis include three main regressors. Although the regressors slightly differ from one another, they all represent the same thing, namely the "amount of successful humor used in a speech". The number of times the live audience laughs is used as a proxy for successfully used humor. Indirectly, this can be interpreted as the number of perceived humorous elements in each talk. This measurement method finds both opposition and support in the theories presented in 2.2., however, given the scope and characteristics of the study, the authors deem it to be a suitable approach.

A questionable, yet critical, assumption made with regards to this proxy is that the laughs of the people in the online audience (those who have rated the talks) have corresponded with the laughs of the people in the live audience (those whose collective number of laughs are counted). A miniature study - based on observing people watch a given number of TED Talks - was conducted to verify the validity of this assumption.

The number of laughs in each talk is divided by the duration of the talks to account for differences in duration, leaving the authors with a variable showing "average number of laughs per minute" instead of "total number of laughs".

H1/RQ1

To test the first hypothesis and research question, the authors use the following variable:

- *LAUGHS - "number of laughs per minute"*

H2/RQ2

To test the second hypothesis, each talk is divided into three equal phases based on the number of words in their transcripts. The number of laughs is counted in each phase and divided by the duration of the same phase (~total duration of the talk/3). The results are three new variables:

- *PART1 - "number of laughs per minute in the first ⅓ of the talk"*
- *PART2 - "number of laughs per minute in the second ⅓ of the talk"*
- *PART3 - "number of laughs per minute in the third ⅓ of the talk"*

Given the assumption that all humorous elements are intentional, as well as the assumption that all humorous elements generate laughter, Figure 3 suggests that, on average, speakers tend to include more humorous elements in the beginning of their speeches than they do in the middle or the end.

Figure 3. Normalized Distribution of Laughter Occurrence.

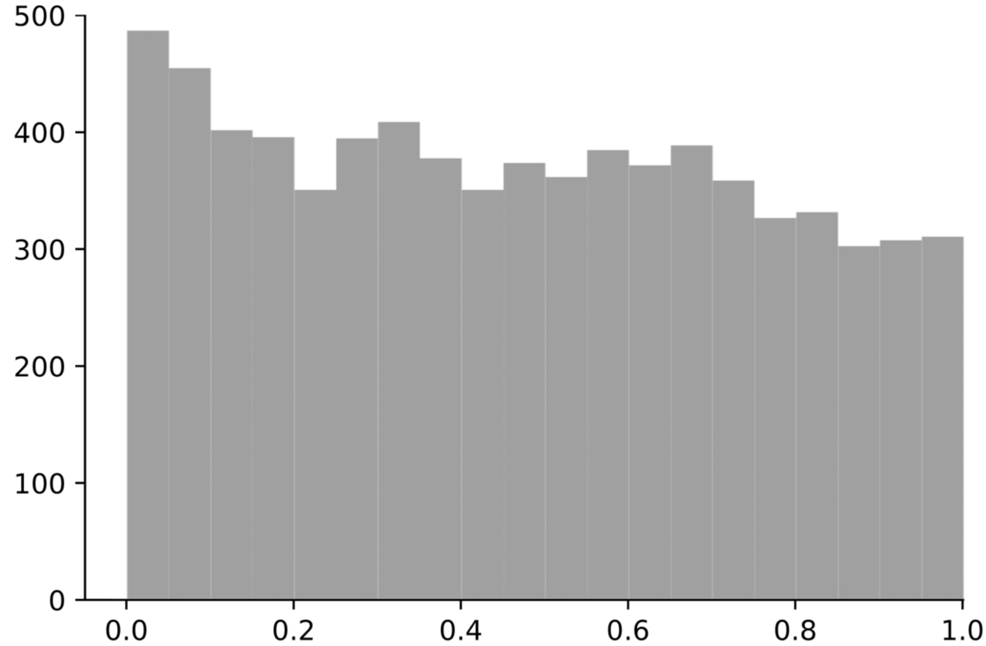


Figure 3 shows the distribution of laughs in relative time, expressed in absolute numbers. The x-axis represents how far into the talk a speaker is (timewise), the y-axis how many talks in which laughter at that time occurs. For instance, 10% into a talk, laughter occurs in approximately 400 out of the 2032 talks.

3.3.3. Control Variables

Four control variables are included in the models. These variables are chosen based on their individual likelihood to affect the results.

Languages (LANGUAGE)

The number of languages a talk is translated to might play a role in explaining the results of a study like this. Not only could a large number of translations imply that a talk has been given a lot of attention by TED, but it could also be viewed more favorably by people lacking sufficient English skills.

Published Date (PUBLISHED)

Given the rapid growth TED has experienced over the past years, the authors find it rational to believe that the speaker selection process may have undergone a couple of changes. If the process used to be less tough (one likely theory), this may have had a positive effect on the way in which people from later days were viewed by the audience. This variable takes the form of a fixed effect dummy variable, one for each year.

Event (EVENT)

It is more than plausible to think that the selection criteria looks different for different types of TED events. With that said, the authors wouldn't be surprised to see "better" results on a general level for TED talks held at any of the bigger events. On par with the variable *PUBLISHED*, the event variable has been converted to a dummy variable for "TED" events as opposed to "TEDx" events" or "TEDed" events or similar.

Words Per Minute (PACE)

Words per minute, or speaker pace, is a continuous variable strongly related to the fifth rhetorical canon (delivery). The reason the authors choose to include it has to do with the way it can affect speaker ethos.

Published Date (PUBLISHED)

Given the rapid growth TED has experienced in over the past years, the authors find it rational to believe that the speaker selection process may have undergone a couple of changes. If the process used to be less tough (one likely theory), this may have had a positive effect on the way in which people from later days were viewed by the audience. This variable takes the form of a fixed effect dummy variable, one for each year.

Omitted Variables

Indeed, the number of potentially interesting aspects to control for is vast. Unfortunately, however, the datasets being used only makes a few variables available to the authors. Below is a list of variables the authors wish they could include in the models, all of which concerns the speaker:

1. the number of arguments put forth
2. the type of arguments put forth
3. the number of rhetorical devices used
4. gender, ethnicity, age & tone of voice
5. fit between occupation and topic
6. reputation (overtime)

Moreover, it bears mentioning that no respect will be paid to the following factors, all of which might have an impact on the results.

1. Audience demographics, size, culture, and ethnicity (including both the live audience and the online audience).
2. The circumstances under which the talks were rated.
3. The circumstances under which the talks were held (setting characteristics).

3.3.4. Model Specifications

The models computed take the following forms:

Model 1 (RQ1)

$$\text{Inspiring}_i = \beta_0 + \beta_1\text{Laughs}_i + \beta_2\text{Language}_i + \beta_3\text{Event}_i + \beta_4\text{Pace}_i + \beta_5\text{Published}_i + \varepsilon_i$$

$$\text{Ingenious}_i = \beta_0 + \beta_1\text{Laughs}_i + \beta_2\text{Language}_i + \beta_3\text{Event}_i + \beta_4\text{Pace}_i + \beta_5\text{Published}_i + \varepsilon_i$$

$$\text{Unconvincing}_i = \beta_0 + \beta_1\text{Laughs}_i + \beta_2\text{Language}_i + \beta_3\text{Event}_i + \beta_4\text{Pace}_i + \beta_5\text{Published}_i + \varepsilon_i$$

$$\text{Obnoxious}_i = \beta_0 + \beta_1\text{Laughs}_i + \beta_2\text{Language}_i + \beta_3\text{Event}_i + \beta_4\text{Pace}_i + \beta_5\text{Published}_i + \varepsilon_i$$

Model 2 (RQ2)

$$\text{Inspiring}_i = \beta_0 + \beta_1\text{Part1}_i + \beta_2\text{Part2}_i + \beta_3\text{Part3}_i + \beta_4\text{Language}_i + \beta_5\text{Event}_i + \beta_6\text{Pace}_i + \beta_7\text{Published}_i + \varepsilon_i$$

$$\text{Ingenious}_i = \beta_0 + \beta_1\text{Part1}_i + \beta_2\text{Part2}_i + \beta_3\text{Part3}_i + \beta_4\text{Language}_i + \beta_5\text{Event}_i + \beta_6\text{Pace}_i + \beta_7\text{Published}_i + \varepsilon_i$$

$$\text{Unconvincing}_i = \beta_0 + \beta_1\text{Part1}_i + \beta_2\text{Part2}_i + \beta_3\text{Part3}_i + \beta_4\text{Language}_i + \beta_5\text{Event}_i + \beta_6\text{Pace}_i + \beta_7\text{Published}_i + \varepsilon_i$$

$$\text{Obnoxious}_i = \beta_0 + \beta_1\text{Part1}_i + \beta_2\text{Part2}_i + \beta_3\text{Part3}_i + \beta_4\text{Language}_i + \beta_5\text{Event}_i + \beta_6\text{Pace}_i + \beta_7\text{Published}_i + \varepsilon_i$$

3.4. Model Uncertainties & Robustness Tests

The purpose of this section is essentially to highlight the measures that are taken in order to validate the accuracy of the estimates produced by our regression models. Seeing that the study builds on inferential, or cross-sectional, analysis, the goal is to generate estimates with the smallest amount of sampling variance and largest amount of consistency possible.

3.4.1. OLS Linear Regression Assumption Tests

Multiple linear regression based on OLS-calculations relies upon seven key assumptions, six as to satisfy the Gauss-Markov Theorem of Best Linear Unbiased Estimators, one as to make the method as efficient as possible (Wooldridge, 2019). Since neglecting or violating any of these conditions could lead to poorly calculated estimates, the authors make sure to test all of the computed models for all seven assumptions (Wooldridge, 2019). Seeing that the observations have been randomly divided over the two samples, it should be reasonable to assume that the same conditions prevail in both samples. Consequently, the tests are only carried out on the first dataset. The results for all tests performed can be found in Appendix IV.

1. Linearity

The assumption of linearity is automatically fulfilled by modeling the regressands as linear functions of the regressors and checking their fit to the data (Newbold, Carlson & Thorne, 2013). Although the authors would have wished for better visual results, no major changes will be made to improve upon the fit. Variable transformation is discussed below.

2. Random Sampling of Observations (i.i.d.)

Even if the number of observations is large (n>30), and the values of the regressors are fixed, the authors remain careful to state that the sample is independently and identically distributed (Newbold, Carlson & Thorne, 2013). The chosen sampling method does pose a risk of selection bias as it only includes talks published on the official TED website and not talks that didn't "make the cut". Another potential selection bias might be found in the sampled audience - those who decided to rate talks as opposed to just viewed them (Newbold, Carlson & Thorne, 2013).

3. No Endogeneity & Conditional Mean of Zero

"Conditional mean of zero" implies that the expected mean of the error term for the population should be zero ($E(u) = 0$). In some situations, this assumption is satisfied by the inclusion of a constant term (β0), equaling the fixed portion of the total explanatory value, in the regression. Generally, a constant term forces the mean of the residuals (ei) to equal zero (Wooldridge, 2019). However, despite doing so, the models might still suffer from endogeneity. Endogeneity commonly refers to a case where one or more regressors are correlated with the error term ($Cov(Xi, u) \neq 0 \rightarrow E(\varepsilon i) \neq 0$) and is often rooted in any of the following issues: measurement errors, reverse causality/simultaneity and/or omitted variable bias (Wooldridge, 2019). Although no theories should be ruled out, pure common sense tells the authors that none of the computed models should have issues with reverse causality or simultaneity - contrasting or simultaneous relationships between the regressand and the regressors. The likelihood of measurement error is a bit bigger given the inadequacies, already explained, of the measurements being used. Perhaps the most plausible explanation for potential endogeneity in our case, however, is omitted variable bias (OVB). OVB occurs when confounding variables are left out of the equations and the spurious effects of which are passed over to the variables still left. As mentioned in 3.3.3., the number of omitted, potentially confounding, variables in this case is relatively high. Hence, so might the risk for OVB be.

Although it is theoretically possible to run tests for detecting exogeneity, for instance by employing instrumental techniques, correcting for all possible causes of exogeneity is practically very difficult. Especially if the range of observed values lacks interesting data points from which you can form additional control variables (Colonescu, 2018).

On the subject of exogeneity and OVB, it should be mentioned that despite reducing the risk of bias in the coefficient estimates, including more variables into a model might result in lost precision due to increased multicollinearity (Wooldridge, 2019).

4. No Autocorrelation (Spherical Error 1)

Autocorrelation, also known as serial or lagged correlation, is tested for using both Durbin Watson tests and Breusch-Godfrey LM tests. Testing for autocorrelation basically means to ensure the absence of linear relationships between current and past disturbance values of a certain variable ($Cov(\varepsilon i, \varepsilon j) = 0$). As all tests conducted using Durbin Watson show DW-statistics close to 2, and all tests conducted using Breusch-Godfrey LM show p-values > 0,05, the null hypothesis of no serial correlation cannot be rejected for any of the models. The way to interpret this is that none of the models show signs of autocorrelation (Wooldridge, 2019).

5. No Heteroscedasticity (Spherical Error 2)

Heteroscedastic standard errors ($Var(\varepsilon i) \neq (\sigma^2)$), refers to a state where the errors of a certain variable varies across a range of values. Simply put, a non-constant spread of the residuals (estimated errors) along the fitted line (Wooldridge, 2019). The authors test for heteroscedasticity using studentized Breusch Pagan tests and visual diagrams (Appendix IV). Results from the tests indicate that heteroscedasticity is present in two of the eight models, both of which include the variable *INSPIRING*. The severity of this problem could be discussed. While it is true that heteroscedasticity doesn't cause biases in the OLS estimates, it is possible that it may cause biases in the regression errors and thus lead to poorly calculated t-statistics (Wooldridge, 2019). Hence, as a measure of caution, the authors use heteroscedasticity-consistent standard errors (White-Huber standard errors) to improve upon the final precision of these two models (Wooldridge, 2019).

6. No Multicollinearity

By letting R assign variance inflation factors (VIF-values) to each of the variables included in the computed models, the authors can easily detect if any of the models have issues with multicollinearity - strong correlation between different explanatory variables (Wooldridge, 2019). Since none of the VIF-values are found to exceed the critical number of 5, this assumption is safely seen to hold for all of the models.

7. Normally Distributed Error Terms (With a Mean of Zero)

Error term normality ($\varepsilon i \sim \mathcal{N}(0,\sigma 2)$), sometimes called residual normality, is tested for using both quantile-quantile residual plots (normal probability plots) and Shapiro-Wilk tests. Looking at the results, the authors quickly conclude that pretty much all of the models suffer from a lack of normally distributed error terms. As visually displayed in the residual plots (Appendix IV), a large number of the observations show distinct deviation from the fitted line. These deviations are confirmed to infringe the laws of this condition by the p-values reported from the Shapiro-Wilk tests - all falling below the significance level of 0.5. Since a deletion of outliers is generally undesirable (Newbold, Carlson & Thorne, 2013), and variable transformation relatively difficult in the present case, an attempt to tackle this issue was made by letting each of the variables take on logarithmic, squared and box-xc values instead of ordinary values. Although yielding fairly positive results for the residuals, this action ended up giving rise to a whole set of other issues. For this reason, the authors intentionally ignores the violation of this assumption and accept the shortcomings that follow as a consequence. After all, not correcting for this assumption doesn't necessarily render the results invalid, but only affects the predictive ability of the coefficients (Newbold, Carlson & Thorne, 2013).

3.4.2. Control Tests

RQ2 Method Manipulation (Fuzzy Set)

Apart from the test-retest reliability measure, the authors take one final measure to increase the validity of the results produced by the regressions. In addition to the first procedure used for clustering the laughs, a parallel, python-coded, procedure is followed as well. Whereas the first method rests on splitting each talk into three distinct parts, the second method rests on splitting each talk into five[1], evenly distributed, triangular fuzzy sets with partially overlapping areas. The authors use distance-dependent linear weighting as opposed to precise membership to cluster the laughs. In essence, each laugh is assigned a weight based on its location in relation to the central points of the different sets - and then categorized accordingly. An illustration of the method is provided in Appendix IV. For the interested reader, the authors recommend reading L. A. Zadeh's paper "Fuzzy Sets" (1965) for a more thorough explanation. The values rendered from this way of modeling the laughs are tested in the same way as the values rendered from the first method. Additional regression models are specified below. The variable *LAUGHS* is included as a control variable.

$$\begin{aligned}\mathrm{Inspiring_i} = {} & \beta_0 + \beta_1\mathrm{Set1_i} + \beta_2\mathrm{Set2_i} + \beta_3\mathrm{Set3_i} + \beta_4\mathrm{Set4_i} + \beta_5\mathrm{Set5_i} + \beta_6\mathrm{Laughs} + \beta_7\mathrm{Language_i} \\ & + \beta_8\mathrm{Event_i} + \beta_9\mathrm{Pace_i} + \beta_{10}\mathrm{Published_i} + \varepsilon_i\end{aligned}$$

$$\begin{aligned}\mathrm{Ingenious_i} = {} & \beta_0 + \beta_1\mathrm{Set1_i} + \beta_2\mathrm{Set2_i} + \beta_3\mathrm{Set3_i} + \beta_4\mathrm{Set4_i} + \beta_5\mathrm{Set5_i} + \beta_6\mathrm{Laughs} + \beta_7\mathrm{Language_i} \\ & + \beta_8\mathrm{Event_i} + \beta_9\mathrm{Pace_i} + \beta_{10}\mathrm{Published_i} + \varepsilon_i\end{aligned}$$

$$\begin{aligned}\mathrm{Unconvincing_i} = {} & \beta_0 + \beta_1\mathrm{Set1_i} + \beta_2\mathrm{Set2_i} + \beta_3\mathrm{Set3_i} + \beta_4\mathrm{Set4_i} + \beta_5\mathrm{Set5_i} + \beta_6\mathrm{Laughs} + \beta_7\mathrm{Language_i} \\ & + \beta_8\mathrm{Event_i} + \beta_9\mathrm{Pace_i} + \beta_{10}\mathrm{Published_i} + \varepsilon_i\end{aligned}$$

$$\begin{aligned}\mathrm{Obnoxious_i} = {} & \beta_0 + \beta_1\mathrm{Set1_i} + \beta_2\mathrm{Set2_i} + \beta_3\mathrm{Set3_i} + \beta_4\mathrm{Set4_i} + \beta_5\mathrm{Set5_i} + \beta_6\mathrm{Laughs} + \beta_7\mathrm{Language_i} \\ & + \beta_8\mathrm{Event_i} + \beta_9\mathrm{Pace_i} + \beta_{10}\mathrm{Published_i} + \varepsilon_i\end{aligned}$$

3.4.3. Conclusion

Seeing that a couple of the conditions aren't fully met, and another one deliberately disregarded, there is a risk that the regression estimates won't be efficient enough to optimally explain the properties of the larger population tested. This will be taken into account when interpreting the results of the study.

3.5. Final Samples

As no further adjustments will be made, the two *final samples* are made up of the same number of observations (talks) as the two *adjusted samples*. The lead sample will be used to carry out the initial tests of our hypotheses and the verification sample to verify the results

[1] The second method brings conditions which make five central points more suitable for manipulation reasons. As can be seen in Appendix IV, the first and last sets are only half triangles to further isolate the first and last part of the talks. The three triangles in the middle provide a better representation of the data given the conditions of the method.

from these tests. In short, one could say that the study contains two studies, one main study and one replication study.

Table 8. Descriptive statistics for the lead sample.

Variables	Mean	SD	Min	Median	Max	Skew	Kurtosis	SE
Inspiring	0.190	0.101	0.011	0.177	0.610	0.415	-0.508	0.003
Ingenious	0.067	0.067	0	0.042	0.463	1.890	4.327	0.002
Unconvincing	0.032	0.041	0	0.018	0.454	3.820	23.725	0.001
Obnoxious	0.013	0.017	0	0.008	0.166	3.461	17.863	0.001
Laughs	0.270	0.341	0	0.166	2.105	2.152	5.528	0.011
Part1	0.296	0.472	0	0.154	4.489	3.206	15.797	0.015
Part2	0.279	0.434	0	0.000	3.130	2.346	6.750	0.014
Part3	0.234	0.386	0	0.000	2.788	2.612	8.638	0.012
Set1	0.107	0.191	0	0	1.000	2.381	6.194	0.006
Set2	0.196	0.236	0	0.116	1.000	1.212	1.096	0.007
Set3	0.188	0.232	0	0.090	1.000	1.237	1.049	0.007
Set4	0.170	0.226	0	0.046	1.000	1.499	2.099	0.007
Set5	0.076	0.165	0	0	1.000	2.978	10.019	0.005
Event	0.569	0.495	0	1.000	1.000	-0.278	-1.925	0.016
Pace	2.506	0.420	0.468	2.521	4.123	-0.475	1.441	0.013
Language	28.075	6.956	1.000	28.000	61.000	0.175	1.677	0.218
Published_2006	0.025	0.155	0	0	1.000	6.128	35.589	0.005
Published_2007	0.049	0.216	0	0	1.000	4.162	15.336	0.007
Published_2008	0.067	0.250	0	0	1.000	3.461	9.987	0.008
Published_2009	0.081	0.273	0	0	1.000	3.074	7.457	0.009
Published_2010	0.103	0.305	0	0	1.000	2.602	4.776	0.010
Published_2011	0.102	0.303	0	0	1.000	2.620	4.868	0.010
Published_2012	0.125	0.331	0	0	1.000	2.264	3.131	0.010
Published_2013	0.096	0.295	0	0	1.000	2.730	5.457	0.009
Published_2014	0.105	0.307	0	0	1.000	2.568	4.598	0.010
Published_2015	0.086	0.280	0	0	1.000	2.957	6.753	0.009
Published_2016	0.105	0.307	0	0	1.000	2.568	4.598	0.010
Published_2017	0.055	0.228	0	0	1.000	3.893	13.169	0.007

Table 9. Descriptive Statistics for the Verification Sample

Variables	Mean	SD	Min	Median	Max	Skew	Kurtosis	SE
Inspiring	0.192	0.104	0.004	0.175	0.486	0.444	-0.759	0.003
Ingenious	0.070	0.069	0	0.045	0.569	1.815	4.422	0.002
Unconvincing	0.030	0.038	0	0.017	0.376	3.292	16.689	0.001
Obnoxious	0.013	0.021	0	0.008	0.263	5.886	49.231	0.001
Laughs	0.255	0.324	0	0.158	2.931	2.698	12.092	0.010
Part1	0.274	0.414	0	0.148	4.255	2.743	12.889	0.013
Part2	0.261	0.438	0	0	4.372	3.351	18.173	0.014
Part3	0.228	0.369	0	0	3.621	2.544	10.344	0.012
Set1	0.107	0.194	0	0	1.000	2.545	7.135	0.006
Set2	0.192	0.240	0	0.083	1.000	1.270	1.189	0.008
Set3	0.183	0.234	0	0.052	1.000	1.389	1.736	0.007
Set4	0.169	0.225	0	0.042	1.000	1.491	1.997	0.007
Set5	0.078	0.158	0	0.000	1.000	2.708	8.443	0.005
Event	0.549	0.498	0	1.000	1.000	-0.198	-1.963	0.016
Pace	2.498	0.415	0.778	2.507	3.721	-0.203	0.356	0.013
Language	28.024	7.455	1.000	28.000	69.000	0.397	2.266	0.234
Published_2006	0.012	0.108	0	0	1.000	9.024	79.516	0.003
Published_2007	0.048	0.214	0	0	1.000	4.211	15.748	0.007
Published_2008	0.077	0.266	0	0	1.000	3.175	8.087	0.008
Published_2009	0.092	0.289	0	0	1.000	2.829	6.008	0.009
Published_2010	0.087	0.281	0	0	1.000	2.935	6.621	0.009
Published_2011	0.105	0.307	0	0	1.000	2.568	4.598	0.010
Published_2012	0.100	0.301	0	0	1.000	2.655	5.056	0.009
Published_2013	0.100	0.301	0	0	1.000	2.655	5.056	0.009
Published_2014	0.098	0.298	0	0	1.000	2.692	5.253	0.009
Published_2015	0.099	0.299	0	0	1.000	2.674	5.154	0.009
Published_2016	0.104	0.306	0	0	1.000	2.585	4.686	0.010
Published_2017	0.077	0.266	0	0	1.000	3.175	8.087	0.008

A comprehensive description of the two samples won't be provided. Nor an exhaustive comparison between the two. Instead, the following points aim to highlight the most important information revealed in the tables above:

- Both samples demonstrate relatively similar means, standard deviations, and standard errors for the different variables. This is seen as a good thing as it reduces test-retest variability.
- One major difference found between the two samples is that of the means for the variable *PUBLISHED_2006*. Evidently, talks from 2006 haven’t been completely randomized, something that might cause a small impact on the results from the t-tests. However, it is worth mentioning that only 36 talks in the data set were published in 2006. Therefore, the randomization of the variable has minor effects.

- Slight differences can be found in the distributions of some variables. On the whole however, things look relatively similar.
- The minimum percentage of *INSPIRING* in both samples are above zero, meaning every talk included in the final data set has been rated Inspiring.

4. Empirical Results

The following chapter deals with the actual results of the study. The chapter begins with presenting the outcome of the regressions and ends with drawing a connection to the hypotheses developed.

4.1. Results Overview

The tables in this section reveal two things of particular interest:

1. The beta estimates (below referred to as both coefficients and relationships) that demonstrate statistical significance (p-value < 0,05).
2. The characteristics of these estimates.

Estimates that don't display significant values aren't necessarily disregarded, however, since the observed data hasn't provided enough evidence to reject the null hypothesis of these being equal to zero, the authors can't draw any conclusions upon them. Moreover, although values are presented for all explanatory variables included in the models, the authors primarily focus on those that are of the highest interest, namely, the main regressors.

Estimate standard errors aren't presented and for that reason not commented upon. These can be found in Appendix V.

4.1.1. Lead Sample Results

Table 10. (Lead Sample) Average Number of Laughs per Minute (RQ1/H1).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Laughs	-0.001	-0.005	0.882	0.011	0.055	0.082.	0.003	0.051	0.103	-0.010	-0.082	0.010 *
Language	0.001	0.091	0.012*	-0.00005	-0.005	0.889	-0.0003	-0.107	0.003 **	-0.0004	-0.072	0.050 *
Event	-0.013	-0.062	0.067	0.015	0.113	0.001 **	-0.001	-0.028	0.416	0.002	0.020	0.572
Pace	-0.018	-0.007	0.023 *	0.018	0.111	0.001 ***	-0.004	-0.099	0.002 **	-0.003	-0.029	0.367
Published_2006	-0.040	-0.061	0.227	-0.002	-0.005	0.888	0.014	0.127	0.001 **	0.022	0.085	0.030 *
Published_2007	-0.066	-0.140	0.002**	0.006	0.012	0.655	0.010	0.131	0.003 **	0.019	0.100	0.026 *
Published_2008	-0.080	-0.196	0.000***	0.002	0.007	0.885	0.013	0.192	0.000 ***	0.022	0.133	0.007 **
Published_2009	-0.072	-0.193	0.000***	0.016	0.064	0.204	0.015	0.244	0.000 ***	0.034	0.228	0.000 ***
Published_2010	-0.047	-0.143	0.009**	0.015	0.070	0.120	0.010	0.185	0.001 ***	0.018	0.135	0.014 *
Published_2011	-0.071	-0.212	0.000***	0.021	0.096	0.091 .	0.010	0.188	0.001***	0.023	0.171	0.003 **
Published_2012	-0.071	-0.231	0.000***	0.020	0.098	0.087 .	0.009	0.183	0.001**	0.020	0.163	0.004 **
Published_2013	-0.053	-0.155	0.004**	0.014	0.064	0.237	0.007	0.130	0.016 *	0.019	0.139	0.010 *
Published_2014	-0.054	-0.162	0.002**	0.007	0.032	0.564	0.007	0.122	0.025 *	0.019	0.142	0.010 **
Published_2015	-0.044	-0.121	0.017*	0.003	0.011	0.827	0.004	0.059	0.244	0.013	0.088	0.084 .
Published_2016	-0.040	-0.120	0.022*	0.001	0.006	0.904	0.007	0.126	0.015 *	0.012	0.088	0.095 .
Residual standard error	0.09963 on 1000 DF			0.06614 on 1000 DF			0.01634 on 1000 DF			0.04039 on 1000 DF		
R2	0.047			0.041			0.049			0.036		
Adjusted R2	0.032			0.027			0.035			0.023		
F-statistic	3.272 on 15 and 1000 DF			2.879 on 15 and 1000 DF			3.437 on 15 and 1000 DF			2.514 on 15 and 1000 DF		
p-value	0.000			0.000			0.000			0.001		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*
Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

Out of the four relationships t-tested for the purpose of answering RQ1, only one of them is found to demonstrate a significant p-value, that is, the relationship between *LAUGHS* and *UNCONVINCING*. As the sign of the coefficient (-0,001) suggests, the correlation between these two variables is negative. This suggests that as the value for the variable *LAUGHS* increases, the mean of the variable *UNCONVINCING* tends to decrease. A more precise interpretation would be: For each one-unit shift in the variable *LAUGHS*, the regressand *UNCONVINCING* changes with -0,001 units, holding all other variables fixed. Evidently, it isn’t a major change, however, one should remember that the regressand is measured in percent with a mean of 0.032 and laughs is measured in laughter per minute with a mean of 0.270.

Table 11. (Lead Sample) Average Number of Laughs in the First, Second, and Third Parts of the Talks (RQ2/H2).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Part1	-0.002	-0.010	0.782	-0.014	-0.100	0.006 **	0.002	0.067	0.068 .	0.002	0.022	0.551
Part2	0.013	0.056	0.126	0.016	0.103	0.005 **	-0.001	-0.022	0.543	-0.010	-0.107	0.004 **
Part3	-0.014	-0.053	0.144	0.013	0.072	0.045 *	0.001	0.019	0.594	-0.002	-0.019	0.595
Language	0.001	0.090	0.013 *	-0.0001	-0.008	0.828	-0.0003	-0.106	0.003 **	-0.0004	-0.070	0.056 .
Event	-0.012	-0.060	0.076 .	0.015	0.109	0.001 **	-0.001	-0.027	0.426	0.002	0.019	0.569
Pace	-0.018	-0.072	0.023 *	0.017	0.109	0.001 ***	-0.004	-0.098	0.002 **	-0.003	-0.028	0.380
Published_2006	-0.038	-0.059	0.132	0.0023	0.006	0.876	0.013	0.123	0.002 **	0.021	0.078	0.046 *
Published_2007	-0.066	-0.141	0.002**	0.007	0.022	0.612	0.010	0.131	0.003 **	0.019	0.099	0.027 *
Published_2008	-0.081	-0.200	0.000 ***	0.001	0.003	0.943	0.013	0.194	0.000 ***	0.022	0.137	0.005 **
Published_2009	-0.072	-0.194	0.000 ***	0.016	0.065	0.199	0.015	0.244	0.000 ***	0.034	0.229	0.000 ***
Published_2010	-0.047	-0.141	0.009 **	0.016	0.071	0.193	0.010	0.184	0.000 ***	0.018	0.134	0.014 *
Published_2011	-0.071	-0.212	0.000 ***	0.020	0.093	0.102	0.010	0.189	0.001 ***	0.023	0.173	0.002 **
Published_2012	-0.070	-0.230	0.000 ***	0.020	0.100	0.079 .	0.009	0.182	0.001 **	0.020	0.162	0.005 **
Published_2013	-0.054	-0.158	0.003 **	0.014	0.063	0.241	0.007	0.132	0.015*	0.020	0.142	0.009 **
Published_2014	-0.053	-0.161	0.003 **	0.007	0.033	0.540	0.007	0.121	0.027 *	0.019	0.140	0.010 *
Published_2015	-0.043	-0.121	0.0170 *	0.004	0.017	0.744	0.003	0.057	0.258	0.013	0.086	0.091 .
Published_2016	-0.040	-0.122	0.012 *	0.002	0.007	0.886	0.007	0.127	0.015 *	0.012	0.088	0.092 .
Residual standard error	0.09955 on 998 DF			0.06574 on 998 DF			0.01634 on 998			0.04033 on 998 DF		
R2	0.050			0.055			0.05113			0.0411		
Adjusted R2	0.034			0.039			0.0349			0.0248		
F-statistic	3.1 on 17 and 998 DF			3.405 on 17 and 998 DF			3.164 on 17 and 998 DF			2.521 on 17 and 998 DF		
p-value	0.000			0.000			0.000			0.00061		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*

Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

Method 1

Looking at the 12 relationships tested for the purpose of answering RQ2, only four of them are found to demonstrate significant p-values. Positive correlations are found between *PART2* and *INGENIOUS*, and *PART3* and *INGENIOUS*. A negative, slightly contradicting correlation, however, emerges between *PART1* and *INGENIOUS*. Moreover, a negative correlation is found between *PART2* and *UNCONVINCING*.

Table 12. (Lead Sample) Average Number of Laughs in each Fuzzy Set of the Talks (RQ2/H2).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Set1	0.027	0.051	0.136	-0.017	-0.047	0.168	-0.000	-0.002	0.943	0.001	0.005	0.891
Set2	-0.014	-0.032	0.362	-0.016	-0.056	0.110	-0.001	-0.011	0.744	0.000	0.000	0.991
Set3	0.038	0.088	0.010 **	0.015	0.052	0.130	-0.002	-0.034	0.327	-0.008	-0.046	0.183
Set4	0.018	0.040	0.253	0.002	0.007	0.839	-0.001	-0.016	0.638	-0.014	-0.075	0.031 *
Set5	-0.006	-0.010	0.758	0.022	0.054	0.107	-0.001	-0.010	0.768	0.005	0.021	0.539
Laughs	-0.010	-0.035	0.333	0.011	0.054	0.132	0.003	0.068	0.060 .	-0.007	-0.057	0.114
Language	0.001	0.094	0.010 *	-0.0001	-0.009	0.802	-0.0003	-0.109	0.003 **	-0.0004	-0.073	0.046 *
Event	-0.012	-0.063	0.068 .	0.015	0.107	0.002 **	-0.001	-0.027	0.432	0.002	0.020	0.563
Pace	-0.019	-0.080	0.012 *	0.016	0.103	0.001 **	-0.004	-0.095	0.003 **	-0.002	-0.020	0.537
Published_2006	-0.038	-0.058	0.135	0.000	0.001	0.984	0.014	0.127	0.001 **	0.021	0.083	0.035 *
Published_2007	-0.062	-0.133	0.003 **	0.008	0.027	0.547	0.010	0.132	0.003 **	0.018	0.097	0.031 *
Published_2008	-0.078	-0.193	0.000***	0.002	0.006	0.901	0.013	0.193	0.000 ***	0.022	0.132	0.007 **
Published_2009	-0.067	-0.181	0.000 ***	0.019	0.077	0.130	0.015	0.242	0.000***	0.033	0.221	0.000 ***
Published_2010	-0.044	-0.133	0.015 *	0.016	0.071	0.193	0.010	0.185	0.000 ***	0.018	0.131	0.017*
Published_2011	-0.067	-0.200	0.000 ***	0.023	0.104	0.068 .	0.010	0.186	0.001 **	0.022	0.164	0.004 **
Published_2012	-0.067	-0.220	0.000***	0.020	0.099	0.085 .	0.009	0.182	0.002 **	0.019	0.157	0.006 **
Published_2013	-0.052	-0.150	0.005 **	0.015	0.067	0.212	0.007	0.130	0.016 *	0.019	0.137	0.012 *
Published_2014	-0.052	-0.157	0.004 **	0.007	0.031	0.570	0.007	0.121	0.027 *	0.019	0.141	0.010 *
Published_2015	-0.040	-0.111	0.030 *	0.0034	0.015	0.761	0.003	0.057	0.261	0.012	0.083	0.106
Published_2016	-0.036	-0.108	0.039 *	0.003	0.015	0.779	0.007	0.125	0.017 *	0.011	0.081	0.123
Residual standard error	0.09937 on 995 DF			0.06582 on 995 DF			0.01637 on 995 DF			0.04033 on 995 DF		
R2	0.056			0.055			0.050			0.044		
Adjusted R2	0.0374			0.036			0.031			0.025		
F	2.976 on 20 and 995 DF			2.912 on 20 and 995 DF			2.638 on 20 and 995 DF			2.3 on 20 and 995 DF		
p-value	0.000			0.000			0.000			0.001		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*

Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

Method 2 (Fuzzy Set Clustering)

The statistical relationships yielded from the "second set" of regressions indicate a slightly different truth. Here, none of the regressors are found to significantly correlate with the regressand *INGENIOUS*. Instead, a positive correlation shows up between the variables *SET3* (halfway into the talk) and *INSPIRING*. Similar but not identical to what was found running the first line of regressions, however, is the detection of a negative correlation between *SET4* (75% into the talk) and *UNCONVINCING*.

The correlations pointed out in this passage can be interpreted in much the same way as the correlations described in the previous passage. Worth reiterating is the fact that they don't tell us how a certain number of humorous elements best should be distributed over a persuasive speech. Instead what they tell us is how the average perception of a speech (in terms of rating percentage) would change if you were to alter the amount of humor in a certain part, given that all other aspects remain equal.

4.1.2. Verification Sample Results

Table 13. (Verification Sample) Average Number of Laughs per Minute (RQ1/H1).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Laughs	-0.013	-0.041	0.188	0.013	0.063	0.045 *	0.0002	0.002	0.942	-0.011	-0.099	0.002 **
Language	0.001	0.088	0.018 *	-0.000	-0.039	0.292	-0.0003	-0.093	0.012 *	-0.0002	-0.039	0.291
Event	-0.017	-0.080	0.016 *	0.012	0.084	0.011 *	-0.001	-0.030	0.365	0.002	0.033	0.322
Pace	-0.032	-0.128	0.000 ***	0.022	0.132	0.000***	-0.004	-0.085	0.008 **	-0.009	-0.100	0.002 **
Published_2006	-0.033	-0.035	0.299	0.031	0.049	0.145	0.014	0.070	0.038 *	0.007	0.019	0.565
Published_2007	-0.052	-0.108	0.008 **	0.005	0.015	0.707	0.010	0.101	0.013 *	0.023	0.130	0.001 **
Published_2008	-0.041	-0.106	0.016 *	-0.002	-0.009	0.845	0.017	0.217	0.000 ***	0.018	0.129	0.003 **
Published_2009	-0.040	-0.112	0.019 *	0.011	0.044	0.354	0.018	0.240	0.000 ***	0.030	0.229	0.000 ***
Published_2010	-0.035	-0.096	0.045 *	0.025	0.100	0.036 *	0.016	0.211	0.000 ***	0.021	0.157	0.001***
Published_2011	-0.026	-0.078	0.132	0.024	0.106	0.040 *	0.013	0.183	0.000 ***	0.016	0.127	0.013*
Published_2012	-0.038	-0.110	0.023 *	0.028	0.121	0.012 *	0.008	0.108	0.026 *	0.016	0.124	0.010 **
Published_2013	-0.028	-0.080	0.105	0.029	0.126	0.011 *	0.008	0.112	0.023 *	0.016	0.128	0.009 **
Published_2014	-0.017	-0.048	0.312	0.007	0.028	0.549	0.007	0.097	0.040 *	0.008	0.064	0.171
Published_2015	-0.020	-0.059	0.214	-0.006	-0.027	0.571	0.006	0.090	0.058 .	0.005	0.042	0.380
Published_2016	-0.009	-0.027	0.570	0.006	0.026	0.579	0.003	0.043	0.357	0.003	0.026	0.580
Residual standard error	0.1014 on 1000 DF			0.06782 on 1000 DF			0.02094 on 1000 DF			0.03653 on 1000 DF		
R2	0.055			0.0592			0.055			0.0657		
Adjusted R2	0.041			0.0451			0.0410			0.05174		
F-statistic	3.914 on 15 and 1000 DF			4.201 on 15 and 1000 DF			3.899 on 15 and 1000 DF			4.692 on 15 and 1000 DF		
p-value	0.000			0.000			0.000			0.000		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*
Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

When replicating the tests on the verification sample, the authors find two of the four focal relationships to be statistically significant. Inconsistent with the results yielded from the first regressions is the appearance of a positive correlation between *LAUGHS* and *INGENIOUS*. Again, however, a negative correlation appears between *LAUGHS* and *UNCONVINCING*.

Table 14. (Verification Sample) Average Number of Laughs in the First, Second, and Third Parts of the Talks (RQ2/H2).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Part1	0.013	0.054	0.139	-0.008	-0.050	0.170	0.002	0.035	0.338	-0.002	-0.025	0.490
Part2	-0.004	-0.019	0.603	0.007	0.043	0.241	-0.001	-0.022	0.639	-0.006	-0.07	0.070 .
Part3	-0.025	-0.089	0.015 *	0.017	0.089	0.014 *	-0.001	-0.016	0.664	-0.003	-0.034	0.345
Language	0.001	0.090	0.016 *	-0.0004	-0.041	0.266	-0.0003	-0.092	0.013 *	-0.0002	-0.038	0.301
Event	-0.017	-0.080	0.016 *	0.012	0.085	0.011 *	-0.001	-0.031	0.356	0.0024	0.032	0.335
Pace	-0.032	-0.129	0.000 ***	0.022	0.133	0.000 ***	-0.004	-0.085	0.008 **	-0.009	-0.099	0.002 **
Published_2006	-0.034	-0.036	0.289	0.032	0.050	0.139	0.0138	0.070	0.039 *	0.007	0.019	0.565
Published_2007	-0.050	-0.104	0.010 *	0.004	0.013	0.748	0.010	0.101	0.013 *	0.023	0.129	0.001 **
Published_2008	-0.039	-0.101	0.022 *	-0.003	-0.013	0.769	0.018	0.218	0.000 ***	0.018	0.128	0.004 **
Published_2009	-0.038	-0.106	0.027 *	0.009	0.038	0.424	0.018	0.2414	0.000 ***	0.030	0.229	0.00 ***
Published_2010	-0.033	-0.090	0.059 .	0.023	0.095	0.047 *	0.016	0.213	0.000 ***	0.021	0.157	0.001 ***
Published_2011	-0.024	-0.073	0.159	0.023	0.101	0.050 .	0.013	0.184	0.000 ***	0.016	0.128	0.013 *
Published_2012	-0.036	-0.103	0.033 *	0.027	0.116	0.017 *	0.008	0.109	0.024*	0.015	0.124	0.010 *
Published_2013	-0.026	-0.075	0.125	0.028	0.122	0.013 *	0.008	0.113	0.022 *	0.016	0.128	0.009 **
Published_2014	-0.016	-0.046	0.324	0.006	0.027	0.567	0.007	0.098	0.039 *	0.008	0.064	0.169
Published_2015	-0.020	-0.058	0.222	-0.006	-0.027	0.563	0.006	0.090	0.059 .	0.005	0.041	0.389
Published_2016	-0.008	-0.025	0.595	0.006	0.024	0.601	0.003	0.044	0.353	0.003	0.026	0.581
Residual standard error	0.1012 on 998 DF			0.06768 on 998 DF			0.02095 on 998 DF			0.03655 on 998 DF		
R2	0.061			0.065			0.056			0.066		
Adjusted R2	0.045			0.049			0.040			0.050		
F-statistic	3.826 on 17 and 998 DF			4.082 on 17 and 998 DF			3.497 on 17 and 998 DF			4.166 on 17 and 998 DF		
p-value	0.000			0.000			0.000			0.000		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*
Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

Method 1

The regressions run for the purpose of answering RQ2 indicate two significant correlations – a negative correlation between *PART3* and *INSPIRING* and a positive correlation between *PART3* and *INGENIOUS*. The latter of the two confirms the findings from the regressions run on the lead sample. Virtually confirmed is the negative correlation between *PART2* and *UNCONVINCING*. Based on the verification sample, the authors can be 90% confident (p<0,1), as opposed to 99% confident which the lead sample suggested, that if a speaker were to increase the amount of humor in the second part of a talk, the conditional mean of the variable *UNCONVINCING* would decrease, holding everything else constant.

Table 15. (Verification Sample) Average Number of Laughs in each Fuzzy Set of the Talks (RQ2/H2).

Variable	Inspiring			Ingenious			Obnoxious			Unconvincing		
	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P	Coeff	Std. Coeff	P
Set1	0.031	0.059	0.077 .	-0.002	-0.005	0.887	-0.006	-0.051	0.124	-0.012	-0.061	0.066 .
Set2	0.031	0.072	0.037 *	-0.015	-0.051	0.137	0.002	0.028	0.425	0.002	0.014	0.692
Set3	0.027	0.061	0.073 .	-0.008	-0.044	0.413	-0.004	-0.039	0.254	-0.007	-0.045	0.185
Set4	0.010	0.022	0.526	0.010	-0.058	0.372	-0.005	-0.052	0.143	-0.010	-0.058	0.098 .
Set5	-0.018	-0.027	0.428	0.021	-0.005	0.167	-0.002	-0.012	0.716	-0.001	-0.005	0.873
Total	-0.026	-0.081	0.022 *	0.015	-0.071	0.050 .	0.002	0.024	0.498	-0.008	-0.071	0.045 *
Language	0.001	0.096	0.010 **	-0.0004	-0.044	0.278	-0.0003	-0.097	0.009 **	-0.0002	-0.044	0.236
Event	-0.016	-0.078	0.018*	0.012	0.031	0.012 *	-0.001	-0.032	0.341	0.002	0.031	0.348
Pace	-0.033	-0.131	0.000 ***	0.022	-0.097	0.00 ***	-0.004	-0.083	0.010 **	-0.009	-0.098	0.002 **
Published_2006	-0.035	-0.037	0.275	0.033	0.017	0.124	0.013	0.068	0.044 *	0.006	0.017	0.604
Published_2007	-0.050	-0.105	0.010 **	0.003	0.135	0.804	0.011	0.107	0.009 **	0.024	0.135	0.001 ***
Published_2008	-0.041	-0.107	0.016 *	-0.003	0.134	0.781	0.018	0.222	0.000 ***	0.019	0.134	0.002 **
Published_2009	-0.040	-0.111	0.020 *	0.010	0.232	0.388	0.018	0.244	0.000 ***	0.030	0.232	0.000 ***
Published_2010	-0.036	-0.098	0.039 *	0.024	0.165	0.041 *	0.017	0.219	0.000***	0.022	0.165	0.001 ***
Published_2011	-0.026	-0.077	0.134	0.023	0.133	0.049 *	0.013	0.189	0.000 ***	0.016	0.133	0.010 **
Published_2012	-0.037	-0.107	0.027 *	0.027	0.128	0.016 *	0.008	0.112	0.021*	0.016	0.128	0.008 **
Published_2013	-0.026	-0.076	0.121	0.028	0.131	0.013 *	0.008	0.115	0.020 *	0.016	0.131	0.008 **
Published_2014	-0.016	-0.046	0.329	0.007	0.064	0.519	0.007	0.097	0.041 *	0.008	0.064	0.176
Published_2015	-0.022	-0.063	0.184	-0.006	0.048	0.557	0.007	0.096	0.044 *	0.006	0.048	0.313
Published_2016	-0.011	-0.031	0.508	0.006	0.031	0.557	0.003	0.048	0.306	0.004	0.031	0.501
Residual standard error	0.1009 on 995 DF			0.037 on 995 DF			0.02092 on 995 DF			0.03649 on 995 DF		
R2	0.0683			0.0724			0.06122			0.07237		
Adjusted R2	0.0495			0.05372			0.0423			0.0537		
F-statistic	3.648 on 20 and 995 DF			3.881 on 20 and 995 DF			3.244 on 20 and 995 DF			3.881 on 20 and 995 DF		
p-value	0.000			0.000			0.000			0.000		

Significance codes: p<0.001 ***; p<0.01 **; p<0.05*
Note: Some p-values have been rounded up to three decimals, but the significant codes remain unchanged.

Method 2 (Fuzzy Set Clustering)

The second set of tests on the fuzzy clustered data resulted in one significant relationship – a positive correlation between *SET2* and *INSPIRING*. Similar to the case above, however, the negative coefficient for *SET4* in relation to *UNCONVINCING* is found to be significant on a 90% level. Accepting this level would verify this correlation as this is the second time it appears.

4.1.3. Goodness of Fit Results

Little attention is paid to the low R2-values. These are all congruent with the authors' expectations. Low R2-values for regression models trying to explain psychological mechanisms aren't uncommon (Wooldridge, 2019). The high residual standard errors (similar to RMSEs) are a little more disturbing, but just like the R2-values, in line with already made assumptions.

4.1.4. Hypothesis 1 (RQ1)

Verified Significant Values

Since the only coefficient found to be significant twice is that of *LAUGHS* in relation to *UNCONVINCING*, the authors would be wrong to state that enough empirical evidence has been collected in order to fully support the hypothesis developed for RQ1. The conclusion is drawn upon the results as a whole and only one out of four models shows significant results.

H1: Overall acceptance of a message varies positively with the amount of successfully used humor in TED Talks.	**Empirically Unsupported**

Noteworthy Statistics

To the authors' surprise, both coefficients estimating the relationship between *LAUGHS* and *INSPIRING* show negative signs. Similarly, both coefficients estimating the relationship between *LAUGHS* and *OBNOXIOUS* show positive signs. Although insignificant (not trustworthy) and small in size, these estimates speak in direct opposition to the hypothesis that was formed. The same patterns, although in this case significant, can be spotted when looking at the relationships between *PUBLISHED* and the same regressors.

Moreover, when comparing the size of the different estimates (standardized coefficients), the first thing you notice is how the explanatory value of *LAUGHS* changes depending on the regressands. From a statistical stance, the impact of *LAUGHS* (successfully used humor) appears to be much bigger on the variable *UNCONVINCING* (people's likeliness to rate unconvincing) than on any of the other regressands. Other notable variables are *PACE* and *EVENT*. On the whole, these two variables seem to be the most important for explaining the regressands - at least for *INGENIOUS* and *OBNOXIOUS*, where they display significant correlations.

4.1.5. Hypothesis 2 (RQ2)

Verified Significant Values

Although the coefficients of *PART2/SET4* in relation to *UNCONVINCING*, show persistent significance across both sets, none of the other coefficients rule in favor of supporting the hypothesis developed for RQ2. As in the case of H1, the collective results are found to show too much variety in order for the authors to make a strong case for H2.

H2: The supposed positive relationship between successfully used humor and overall acceptance of a message is stronger when the humor occurs in the beginning and middle, rather than at the end, of a TED Talk.	**Empirically Unsupported**

Noteworthy Statistics

Another correlation found to be persistent over both sets is that between *PART3* and the variable *INGENIOUS.*

4.2. Summary of Results

In summary, the authors don't find enough evidence in their data to fully support the hypotheses developed for the study. What they do find, however, is a couple of significant correlations, both of which argue for the viewing of humor as a rhetorically effective tool.

5. Discussion & Concluding Remarks

The main purpose of this study has been to quantify the rhetorical effects of humor when used in persuasive public speeches. The following chapter begins by providing a discussion around the findings made, continues by presenting a number of conclusions, and ends by bringing light to the limitations of the study.

5.1. Interpretation of Results

So, how highly should we think of humor as a rhetorical tool? Based on the results of this study, perhaps not as highly as some people tend to nowadays. Although shown to vary negatively with the relative number of people rating a speech "unconvincing", none of the other ratings showed significant results throughout all tests. Quite obviously, this was not what the authors expected to see. Two questions should be asked though. The first is why the results didn't turn out in accordance with what was expected. The second is where they stand in relation to the theories presented in Chapter 2.

Why incongruence with expectations?

On the why-question, the authors have a number of theories. One theory could for example be that "high-quality" speeches such as TED Talks, on average, enjoy less of the rhetorical benefits that humor can bring. Another theory could be that the method used in this study – referring to the variables created, and the assumptions made – lacked substance. Humor is a constantly evolving, not to mention culturally divergent, phenomenon. Hence, although strengthened by running an additional regression on the rating "Funny" (see Appendix I), there is a risk that the assumption of equal perceptions between the live audience and the online audience may have malfunctioned. There is also a chance that humor is topic sensitive. What the authors mean by this is that the rhetorical effects attributed to humor might vary depending on the subject of the speech. Lastly, it bears mentioning that the authors didn't distinguish between different types of humor. Consequently, it could be the case that some types of humor worked very well, whereas other types didn't, similar to what Weaver & Cottrell (1987) found in their studies.

One thing that should be stressed, however, is that none of the significant coefficients pointed in the opposite direction. With that said, people who say that it's rhetorically inappropriate to add a couple of humorous elements to a persuasive public speech are, if anything, more wrong than the people who praise it.

Comparison

The second question asked is a little more complicated. A quick analysis of the results would probably find them inconsistent with the theories presented in Chapter 2. It's not that easy, however. In fact, comparing the findings from this study with findings made from other studies wouldn't be very appropriate. The reason for this is simply because they measure different things. Take the case of humor and selected audience attention for instance. Had this study been aimed at testing effects on attention, chances are high it would have found something similar to what Wanzer & Frymier (2009), Gorham & Christophel (2009) among others have found. With that said, a plausible idea is that humor used in rhetorical public speaking works similarly to how many think it works in advertising (Weinberger & Gulas, 1992). It catches your attention, it makes you feel good about the sender, but it doesn't increase your willingness to buy what they're selling.

If any of the results yielded from this study should be put up for comparison, it should probably be those of *UNCONVINCING* in RQ2. As seen, the results associated with this question remotely suggest that if you want to reduce the relative number of "unconvincing"-ratings, you should place your humorous elements towards the end of the second third of the speech. Since this is where people normally present their logical arguments, these results can, to some extent, be said to point in the same direction as those yielded by Jones (2005), Moyer-Guse, Mahood, & Brookes (2011) and Osterhouse & Brock (1970). Perhaps the best notions about the rhetorical aspects of using humor are those saying that it can distract your cognitive ability and lead you into *peripheral thinking*.

Last but not least, admitting that many of the estimates could be questioned from a robustness-standpoint, the authors cannot guarantee the results to be 100% reliable.

5.2. Alternative Approaches

In order to reach the goal of this study, the authors chose to make use of already collected data. Had the circumstances looked differently, an alternative approach would have been to, in a controlled way, collect data on their own. Presented below are three ways in which this could have been done.

1. Participate in live events, take notes of the humor used by the speakers, and collect opinions from the audiences using “mentometer” tools. Examples of relevant events are business conferences, TED conferences, pitching events or business-client presentations.
2. Ask N number of people to watch a number of speeches (with different amounts of humor) on their computers, observe them while watching, and then ask them to answer a set of questions.
3. Interview N speakers, ask them to answer a set of questions related to the subject based on their experience, and measure their influence online.

The upsides with these approaches would have been (1) reduced uncertainty due to fewer assumptions, (2) more nuanced data due to the determination of questions/scales, and (3) less data adjustments. The downsides would have been (1) less diversity in terms of speakers, audience members and speech topics, and (2) considerably fewer observations.

In short, the positive aspects of taking another approach would have been many. The power of the study, however, would have been greatly reduced.

5.3. Conclusion & Implications

Each and everyone one of us has a connection to rhetorical public speaking. It isn’t always something we take notice of, but it’s frequently something we take part in. So, what do we know about persuasion? As with anything involving human behavior, the authors would say: a lot - yet at the same time, nothing. Tools that, rhetorically, appear to work in some situations, may not work in other situations. This study zoomed in on humor as a rhetorical tool. By analyzing data from over 2000 TED Talks, the authors investigated whether a relationship could be found between the amount of humor TED speakers use in their persuasive speeches and the audiences’ acceptance of the messages conveyed in them. Additional depth was added to the study by weighing in the temporal distribution of laughs as an aspect. On the whole, no empirical evidence was found for being able to label humor an <u>effective</u> rhetorical tool. Of the four proxies chosen to collectively represent an audience’s message acceptance, only one showed a significant correlation with “total amount of successfully used humor”. Out of the different “timings” tested, none seemed to display particular dominance over another based on the collective assessment. In short, so long as the results can be generalized, these findings yield two noteworthy insights.

On a practical note, they tell us that we shouldn't be afraid to use humor when we try to convince an audience of some sort. It may not drastically increase our chances of winning the audience’s acceptance, but it certainly won't decrease them either.

On a theoretical note, they urge both online journalists and the research field to use the term “rhetorical effects” with caution. Although more or less crucial for persuasive speakers to achieve, there is still a difference between likeability, credibility, attention, mood, memory etc. and actual acceptance.

5.4 Limitations & Directions for Future Research

Acceptance Measure

Clearly, there are different degrees of acceptance, something this study doesn’t capture. In situations where a speaker seeks to inspire a certain type of action, for instance when trying to attract voters, acceptance can’t just be measured using speech ratings, but has to be measured using follow-up observation methods.

Language & Audience

This study only looked at speeches held in English. It might be possible that humor works differently when used in another language or culture. This is something the authors recommend future studies to look at. Following this further, the authors took no measures to check the eligibility/diversity of the measured audience in this study. Hence, this goes on the recommendation list as well.

Content Control

The authors of this study adjusted the data that was used for performances and comedy related talks, but disregarded adjustments for other various topics, including generally controversial subjects. In order to control for this, future studies on the same topic are recommended to group their data (speeches) based on content.

Choice of Control Variables

The chosen control variables included in the models were selected based on the information accessible through the dataset. Unfortunately, due to the lack of time and resources, the authors were unable to control for other external factors, such as speaker ethnicity, age, reputation, gender, and occupation, all of which could have impacted the results (Ruch, 1992 as cited in 1998). A recommendation for future studies looking to examine a similar phenomenon would definitely be to control for these aspects.

Opinion Reflection

Lastly, the authors would like to raise a couple more concerns regarding the rating system through which much of the data was collected. Firstly, the listener could only choose three ratings. This may have limited the authors' ability to capture the audience's full experiences of the talks. Secondly, the dataset provided rating counts for 14 different rating labels, but only four were analyzed in further detail. Consequently, important information may have been left out. A suggestion would be that future research, instead, collect data only for the ratings intended to be used in the analysis. This would capture the true opinions of all viewers.

5.5 Closing Lines

Back in ancient Greece, Aristotle asked what it takes to persuade a public audience. Today, more than 2300 years later, the authors of this study ask the same thing. As Gallo (2019) once wrote in the Harvard Business Review:

"Words and ideas created the modern world, and words and ideas have the potential to make you a star in your field, as long as you can persuade someone else to act on them."

Congratulations, you managed to make it all the way to the end!

Now, before we lose you, how would you rate this paper?

- ▢ inspiring
- ▢ ingenious
- ▢ unconvincing
- ▢ obnoxious

Oh, and here's a TED Talk we recommend:

Comedy is Translation | Chris Bliss | TEDxRainier

https://www.ted.com/talks/chris_bliss_comedy_is_translation

Interested in re-using any of the codes written for the purpose of this study?

Please follow the link below:

github.com/thesis-humor/code

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Appendices

6.1. Appendix I: Additional Findings

The authors took the opportunity to apply the *LAUGHS* regression model on two additional dependent variables included in the dataset:

- VIEWS - “Total number of views”
- FUNNY - “Rating “Funny” in percent”

Both variables showed positive correlations with *LAUGHS* on a strong significant level indicating that the level of laughter included in the talks vary positively with the number of views of the video and the relative amount of “Funny”-ratings.

Table 16. Regression Results Views and Laughs per Minute

	Dependent variable:	
	Views Lead Sample	Views Verification Sample
Laughs	459,657.800*** (66,765.180)	468,792.500*** (66,669.700)
Language	62,370.210*** (3,759.661)	51,941.210*** (3,411.753)
Event	118,892.500** (49,554.140)	131,847.600*** (45,764.850)
Pace	118,403.100** (54,792.140)	51,488.930 (52,954.610)
Published_2006	-641,659.100*** (180,842.300)	-333,930.400 (214,033.400)
Published_2007	-707,726.000*** (147,751.800)	-422,698.900*** (130,291.600)
Published_2008	-880,652.700*** (140,105.000)	-878,320.900*** (114,256.500)
Published_2009	-938,507.300*** (133,673.000)	-714,193.700*** (114,000.400)
Published_2010	-929,366.000*** (128,968.900)	-808,632.800*** (116,486.300)
Published_2011	-1,126,330.000*** (135,106.700)	-845,996.800*** (115,845.600)
Published_2012	-736,600.700*** (124,545.100)	-645,443.900*** (110,746.700)
Published_2013	-456,790.400*** (131,561.100)	-360,575.100*** (112,763.300)
Published_2014	-477,088.500*** (128,178.300)	-196,161.000* (108,941.500)
Published_2015	-508,367.500*** (130,977.300)	-198,763.500* (109,563.000)
Published_2016	-364,905.000*** (122,468.700)	-221,649.700** (105,646.300)
Constant	-219,332.300 (176,919.600)	34,156.270 (168,658.800)
Observations	1,016	1,016
R2	0.465	0.292
Adjusted R2	0.457	0.282

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 17. Regression Results Funny and Total Laughs per Minute

	Dependent variable:	
	Funny Lead Sample	Funny Verification Sample
Laughs	0.133*** (0.005)	0.145*** (0.005)
Language	0.001*** (0.0003)	0.001** (0.0003)
Event	-0.001 (0.004)	-0.003 (0.004)
Pace	0.001 (0.004)	0.002 (0.004)
Published_2006	-0.012 (0.013)	-0.010 (0.016)
Published_2007	0.021** (0.011)	0.022** (0.010)
Published_2008	0.018* (0.010)	0.017* (0.009)
Published_2009	0.005 (0.010)	0.008 (0.009)
Published_2010	-0.002 (0.009)	0.007 (0.009)
Published_2011	-0.002 (0.010)	0.011 (0.009)
Published_2012	-0.003 (0.009)	0.001 (0.008)
Published_2013	0.003 (0.009)	0.010 (0.009)
Published_2014	0.013 (0.009)	0.023*** (0.008)
Published_2015	-0.002 (0.009)	-0.001 (0.008)
Published_2016	0.002 (0.009)	-0.003 (0.008)
Constant	-0.033*** (0.013)	-0.024* (0.013)
Observations	1,016	1,016
R2	0.465	0.460
Adjusted R2	0.457	0.452

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

6.2. Appendix II: Previous Research Made on TED Talk Data

Table 18. Similar Studies Based on TED Talks

Study	Author	Conducted	Focus
"A Causality-Guided Prediction of the TED Talk Ratings from the Speech-Transcripts using Neural Networks"	Md Iftekhar Tanveer, Md Kamrul Hassan, Daniel Gildea, M. Ehsan Hoque	2019	Prediction Modeling, Machine Learning, Audience Ratings
"A Community of Curious Souls: An Analysis of Commenting Behavior on TED Talks Videos"	Andrew Tsou, Mike Thelwall, Philippe Mongeon, Cassidy R. Sugimoto	2014	Audience Reactions, Comment Analysis
"Fostering User Engagement: Rhetorical Devices for Applause Generation Learnt from TED Talks"	Zhe Liu, Anbang Xu, Mengdi Zhang, Jalal Mahmud and Vibha Sinha	2017	Audience Engagement, Applause Generating Techniques, Rhetorical Devices
"Predicting Audience's Laughter Using Convolutional Neural Network"	Lei Chen, Chong Min Lee	2017	Prediction Modeling, Machine Learning, Audience Laughter
"Scientists Popularizing Science: Characteristics and Impact of TED Talk Presenters"	Cassidy R. Sugimoto, Mike Thelwall, Vincent Larivière, Andrew Tsou, Philippe Mongeon, Benoit Macaluso	2013	Speaker Characteristics, Popularity Metrics, Citation Impact
"Sentiment analysis of user comments for one-class collaborative filtering over ted talks"	Nikolaos Pappas, Andrei Popescu-Belis	2013	Recommendations, Machine Learning, Audience Comments
"Spreading Ideas: TED Talks' Role in Cancer Communication and Public Engagement"	Verjovsky, Marina Jurberg, Claudia	2019	Cancer Communication, Audience Perception
"Words that fascinate the listener: Predicting affective ratings of on-line lectures"	F. Weninger, Pascal Staudt, Björn Schuller	2013	Prediction Modeling, Machine Learning, Language, Audience Ratings
Detection and Mitigation of Bias in Ted Talk Ratings	Rupam Acharyya,Shouman Das, Ankani Chattoraj, Oishani Sengupta, Md Iftekar Tanveer	2020	Bias, Ratings, Prediction Modeling, Machine Learning

6.3. Appendix III: Additional Information on TED Talks

Figure 4. TED Talk Rating Window (2006-2017)

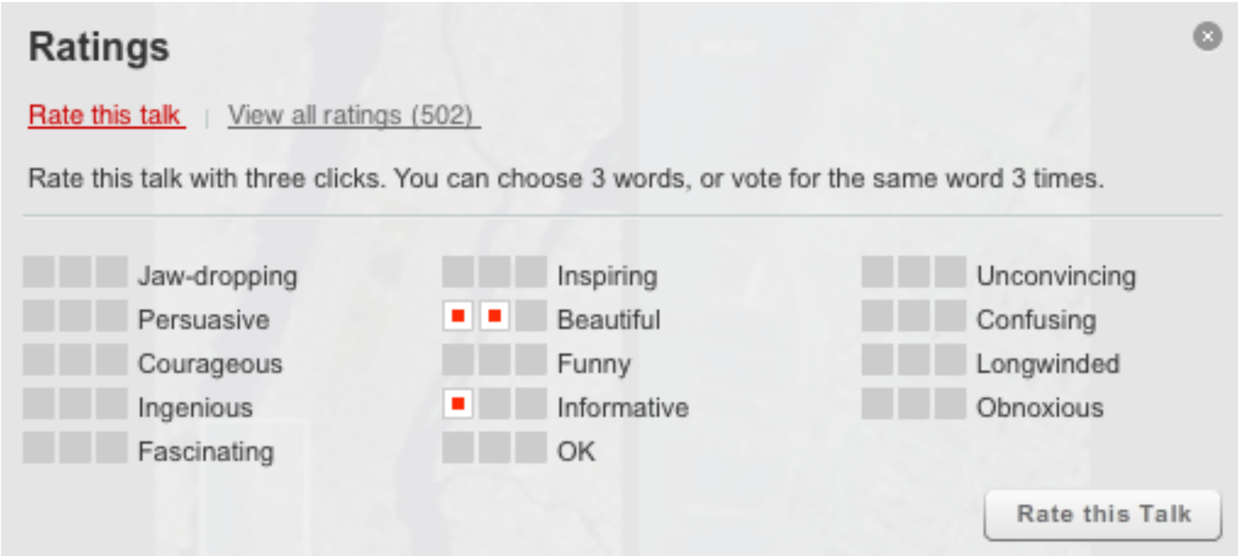
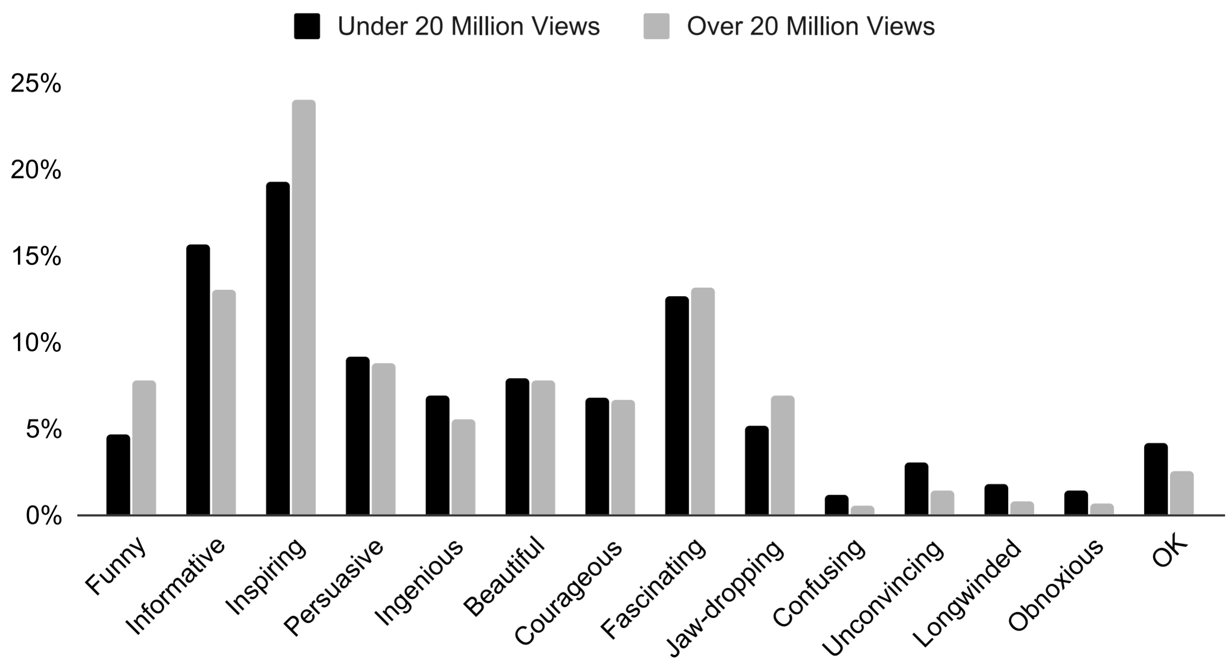


Figure 5. Distribution of Ratings in Percent



6.4. Appendix IV: Robustness Test Results

Table 19. Robustness Results RQ1

	Dependent variable:			
	Inspiring	Ingenious	Obnoxious	Unconvincing
Studentized Breusch-Pagan test	BP = 30.003 df = 15 p-value = 0.012	BP = 19.856 df = 15 p-value = 0.178	BP = 23.731 df = 15 p-value = 0.070	BP = 6.881 df = 15 p-value = 0.961
Breusch-Godfrey test	LM test = 0.313 df = 1 p-value = 0.576	LM test = 1.930 df = 1 p-value = 0.165	LM test = 0.008 df = 1 p-value = 0.930	LM test = 0.540 df = 1 p-value = 0.463
Durbin-Watson test	DW = 1.959 p-value = 0.247	DW = 2.083 p-value = 0.904	DW = 2.005 p-value = 0.524	DW = 1.954 p-value = 0.224
Variance inflation factor (VIF)				
o Laughs	1.046	1.046	1.046	1.046
o Language	1.377	1.377	1.377	1.377
o Event	1.214	1.214	1.214	1.214
o Pace	1.068	1.069	1.068	1.068
o Published_2006	1.582	1.582	1.582	1.582
o Published_2007	2.059	2.059	2.059	2.059
o Published_2008	2.471	2.471	2.471	2.471
o Published_2009	2.672	2.672	2.672	2.672
o Published_2010	3.106	3.106	3.106	3.106
o Published_2011	3.380	3.380	3.380	3.380
o Published_2012	3.419	3.419	3.419	3.419
o Published_2013	3.040	3.040	3.040	3.040
o Published_2014	3.120	3.120	3.120	3.120
o Published_2015	2.707	2.707	2.707	2.707
o Published_2016	2.848	2.848	2.848	2.85

Table 20. Robustness Results RQ2

	Dependent variable:			
	Inspiring	Ingenious	Obnoxious	Unconvincing
Studentized Breusch-Pagan test	BP = 29.943 df = 17 p-value = 0.026	BP = 26.529 df = 17 p-value = 0.065	BP = 26.253 df = 17 p-value = 0.070	BP = 8.485 df = 17 p-value = 0.955
Breusch-Godfrey test	LM test = 0.079 df = 1 p-value = 0.779	LM test = 2.208 df = 1 p-value = 0.137	LM test = 0.024 df = 1 p-value = 0.878	LM test = 0.461 df = 1 p-value = 0.497
Durbin-Watson test	DW = 1.976 p-value = 0.344	DW = 2.090 p-value = 0.920	DW = 2.009 p-value = 0.549	DW = 1.957 p-value = 0.241
Variance inflation factor (VIF)				
○ Part1	1.418	1.418	1.418	1.418
○ Part2	1.386	1.386	1.386	1.386
○ Part3	1.367	1.367	1.367	1.367
○ Language	1.377	1.377	1.377	1.377
○ Event	1.216	1.216	1.216	1.216
○ Pace	1.068	1.068	1.068	1.068
○ Published_2006	1.592	1.592	1.592	1.592
○ Published_2007	2.059	2.059	2.059	2.059
○ Published_2008	2.474	2.474	2.474	2.474
○ Published_2009	2.672	2.672	2.672	2.672
○ Published_2010	3.106	3.106	3.106	3.106
○ Published_2011	3.381	3.381	3.381	3.381
○ Published_2012	3.420	3.420	3.420	3.420
○ Published_2013	3.043	3.043	3.043	3.043
○ Published_2014	3.120	3.120	3.120	3.120
○ Published_2015	2.709	2.709	2.709	2.709
○ Published_2016	2.849	2.849	2.849	2.849

Table 21. Heteroskedasticity Robust Standard Errors Test, Inspiring RQ1

	Dependent variable:	
	Inspiring Lead Sample	Inspiring Verification Sample
Laughs	-0.001 (0.009)	-0.013 (0.011)
Language	0.001** (0.001)	0.001** (0.001)
Event	-0.013* (0.007)	-0.017** (0.007)
Pace	-0.018** (0.008)	-0.032*** (0.008)
Published_2006	-0.040* (0.023)	-0.033 (0.030)
Published_2007	-0.066*** (0.018)	-0.052*** (0.018)
Published_2008	-0.080*** (0.018)	-0.041** (0.017)
Published_2009	-0.072*** (0.017)	-0.040** (0.017)
Published_2010	-0.047*** (0.017)	-0.035** (0.017)
Published_2011	-0.071*** (0.019)	-0.026 (0.017)
Published_2012	-0.071*** (0.017)	-0.038** (0.016)
Published_2013	-0.053*** (0.018)	-0.028* (0.017)
Published_2014	-0.054*** (0.017)	-0.017 (0.016)
Published_2015	-0.044*** (0.016)	-0.020 (0.016)
Published_2016	-0.040*** (0.015)	-0.009 (0.015)
Constant	0.259*** (0.024)	0.277*** (0.026)

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 22. Heteroskedasticity Robust Standard Errors Test, Inspiring RQ2

	Dependent variable:	
	Inspiring Lead Sample	Inspiring Verification Sample
Part1	-0.002 (0.008)	0.013 (0.009)
Part2	0.013 (0.009)	-0.004 (0.011)
Part3	-0.014 (0.010)	-0.025** (0.010)
Language	0.001** (0.001)	0.001** (0.001)
Event	-0.012* (0.007)	-0.017** (0.007)
Pace	-0.018** (0.008)	-0.032*** (0.008)
Published_2006	-0.038* (0.023)	-0.034 (0.031)
Published_2007	-0.066*** (0.018)	-0.050*** (0.018)
Published_2008	-0.081*** (0.018)	-0.039** (0.017)
Published_2009	-0.072*** (0.017)	-0.038** (0.017)
Published_2010	-0.047*** (0.016)	-0.033* (0.017)
Published_2011	-0.071*** (0.019)	-0.024 (0.017)
Published_2012	-0.070*** (0.017)	-0.036** (0.016)
Published_2013	-0.054*** (0.018)	-0.026 (0.017)
Published_2014	-0.053*** (0.017)	-0.016 (0.016)
Published_2015	-0.044*** (0.016)	-0.020 (0.016)
Published_2016	-0.040*** (0.015)	-0.008 (0.015)
Constant	0.259*** (0.024)	0.275*** (0.026)

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Figure 7-10. Robustness Tests for RQ1 and RQ2 Models with Dependent Variable Inspiring

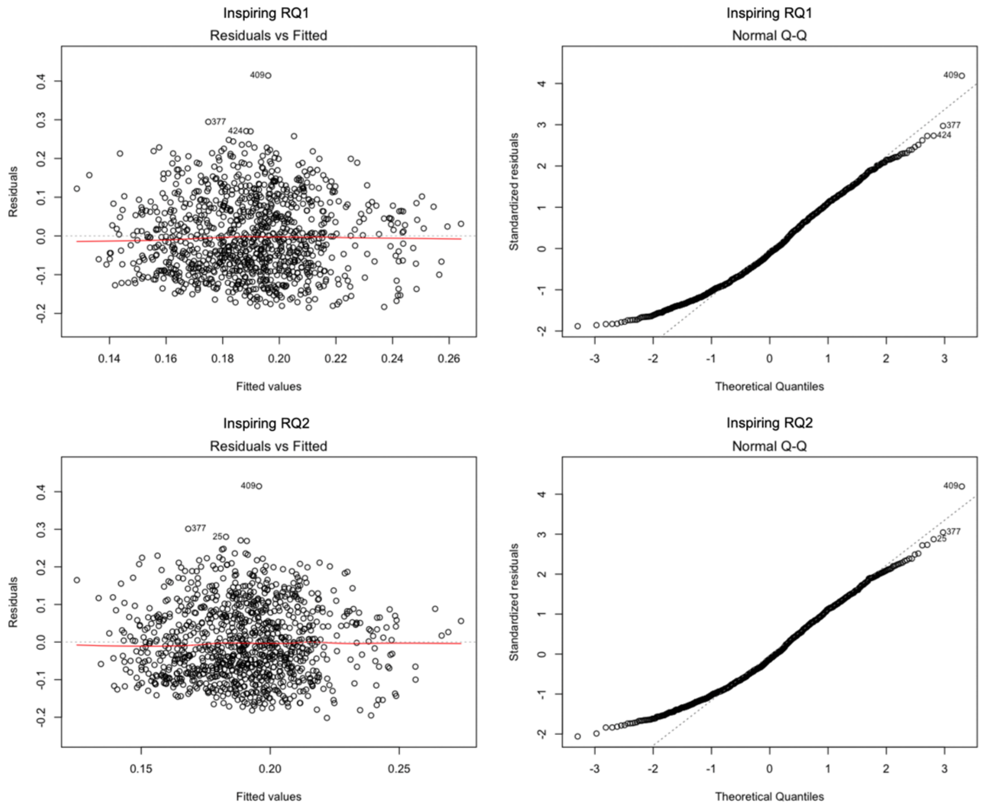


Figure 11-14. Robustness Tests for RQ1 and RQ2 Models with Dependent Variable Ingenious.

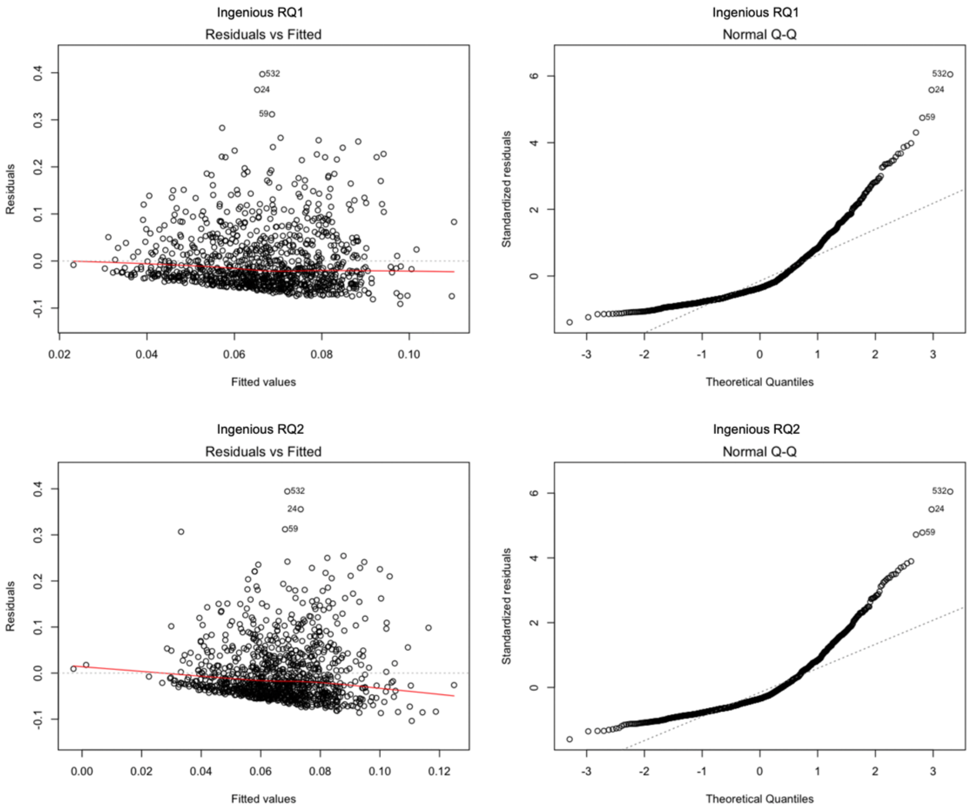


Figure 15-18. Robustness Tests for RQ1 and RQ2 Models with Dependent Variable Obnoxious

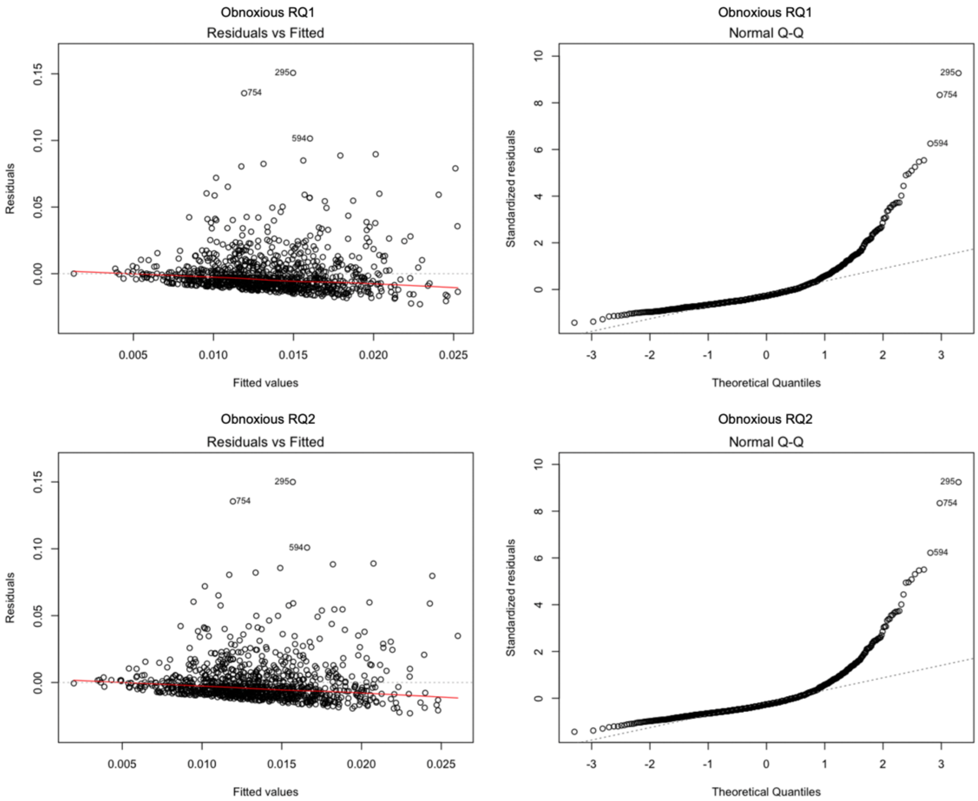


Figure 19-22. Robustness Tests for RQ1 and RQ2 Models with Dependent Variable Unconvincing

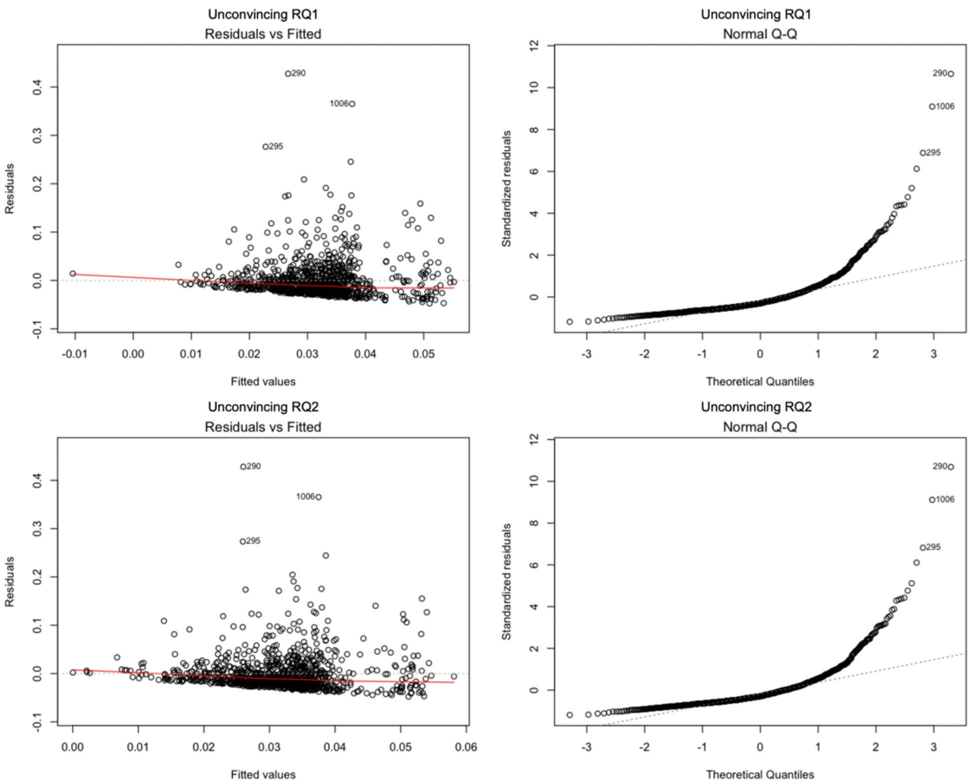
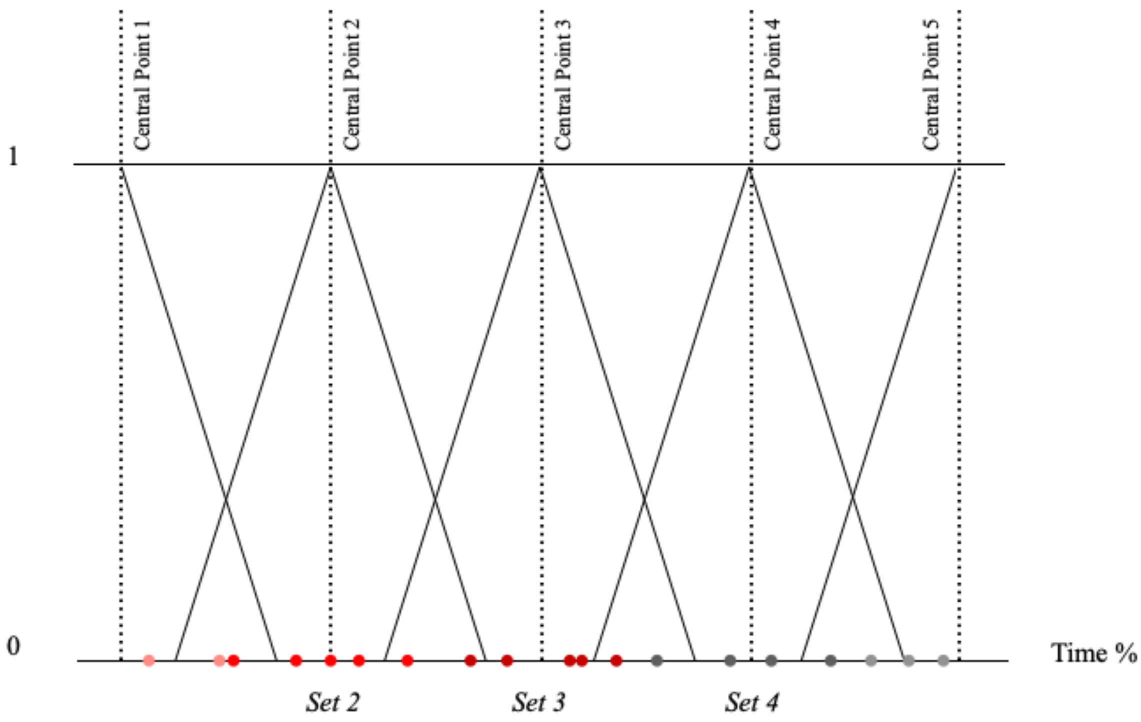


Figure 23. Illustration of Triangular Fuzzy Set Membership Theory



Note: The illustration above is not a representation of the actual observations.

6.5. Appendix V: Additional Details on Test Results with Standard Errors

Table 23. Regression Results RQ1 Lead Sample

	Dependent variable:			
	Inspiring	ingenious	obnoxious	unconvincing
Laughs	-0.001 (0.009)	0.011* (0.006)	0.003 (0.002)	-0.010** (0.004)
Language	0.001** (0.001)	-0.00005 (0.0004)	-0.0003*** (0.0001)	-0.0004** (0.0002)
Event	-0.013* (0.007)	0.015*** (0.005)	-0.001 (0.001)	0.002 (0.003)
Pace	-0.018** (0.008)	0.018*** (0.005)	-0.004*** (0.001)	-0.003 (0.003)
Published_2006	-0.040 (0.025)	-0.002 (0.017)	0.014*** (0.004)	0.022** (0.010)
Published_2007	-0.066*** (0.021)	0.006 (0.014)	0.010*** (0.003)	0.019** (0.008)
Published_2008	-0.080*** (0.020)	0.002 (0.013)	0.013*** (0.003)	0.022*** (0.008)
Published_2009	-0.072*** (0.019)	0.016 (0.012)	0.015*** (0.003)	0.034*** (0.008)
Published_2010	-0.047*** (0.018)	0.015 (0.012)	0.010*** (0.003)	0.018** (0.007)
Published_2011	-0.071*** (0.019)	0.021* (0.013)	0.010*** (0.003)	0.023*** (0.008)
Published_2012	-0.071*** (0.017)	0.020* (0.012)	0.009*** (0.003)	0.020*** (0.007)
Published_2013	-0.053*** (0.018)	0.014 (0.012)	0.007** (0.003)	0.019** (0.007)
Published_2014	-0.054*** (0.018)	0.007 (0.012)	0.007** (0.003)	0.019*** (0.007)
Published_2015	-0.044** (0.018)	0.003 (0.012)	0.004 (0.003)	0.013* (0.007)
Published_2016	-0.040** (0.017)	0.001 (0.011)	0.007** (0.003)	0.012* (0.007)
Constant	0.259*** (0.025)	0.002 (0.016)	0.022*** (0.004)	0.034*** (0.010)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 24. Regression Results RQ1 Verification Sample

	Dependent variable:			
	Inspiring	ingenious	obnoxious	unconvincing
Total	-0.013 (0.010)	0.013** (0.007)	0.0002 (0.002)	-0.011*** (0.004)
Language	0.001** (0.001)	-0.0004 (0.0003)	-0.0003** (0.0001)	-0.0002 (0.0002)
Event	-0.017** (0.007)	0.012** (0.005)	-0.001 (0.001)	0.002 (0.002)
Pace	-0.032*** (0.008)	0.022*** (0.005)	-0.004*** (0.002)	-0.009*** (0.003)
Published_2006	-0.033 (0.032)	0.031 (0.022)	0.014** (0.007)	0.007 (0.012)
Published_2007	-0.052*** (0.020)	0.005 (0.013)	0.010** (0.004)	0.023*** (0.007)
Published_2008	-0.041** (0.017)	-0.002 (0.011)	0.017*** (0.004)	0.018*** (0.006)
Published_2009	-0.040** (0.017)	0.011 (0.011)	0.018*** (0.004)	0.030*** (0.006)
Published_2010	-0.035** (0.018)	0.025** (0.012)	0.016*** (0.004)	0.021*** (0.006)
Published_2011	-0.026 (0.017)	0.024** (0.012)	0.013*** (0.004)	0.016** (0.006)
Published_2012	-0.038** (0.017)	0.028** (0.011)	0.008** (0.003)	0.016*** (0.006)

Published_2013	-0.028 (0.017)	0.029** (0.011)	0.008** (0.004)	0.016*** (0.006)
Published_2014	-0.017 (0.016)	0.007 (0.011)	0.007** (0.003)	0.008 (0.006)
Published_2015	-0.020 (0.016)	-0.006 (0.011)	0.006* (0.003)	0.005 (0.006)
Published_2016	-0.009 (0.016)	0.006 (0.011)	0.003 (0.003)	0.003 (0.006)
Constant	0.277*** (0.025)	0.003 (0.017)	0.023*** (0.005)	0.046*** (0.009)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 25. Regression Results RQ2 Lead Sample

	Dependent variable:			
	Inspiring	ingenious	obnoxious	unconvincing
Part1	-0.002 (0.008)	-0.014*** (0.005)	0.002* (0.001)	0.002 (0.003)
Part2	0.013 (0.008)	0.016*** (0.006)	-0.001 (0.001)	-0.010*** (0.003)
Part3	-0.014 (0.009)	0.013** (0.006)	0.001 (0.002)	-0.002 (0.004)
Language	0.001** (0.001)	-0.0001 (0.0003)	-0.0003*** (0.0001)	-0.0004* (0.0002)
Event	-0.012* (0.007)	0.015*** (0.005)	-0.001 (0.001)	0.002 (0.003)
Pace	-0.018** (0.008)	0.017*** (0.005)	-0.004*** (0.001)	-0.003 (0.003)
Published_2006	-0.038 (0.025)	0.003 (0.017)	0.013*** (0.004)	0.021** (0.010)
Published_2007	-0.066*** (0.021)	0.007 (0.014)	0.010*** (0.003)	0.019** (0.008)
Published_2008	-0.081*** (0.020)	0.001 (0.013)	0.013*** (0.003)	0.022*** (0.008)
Published_2009	-0.072*** (0.019)	0.016 (0.012)	0.015*** (0.003)	0.034*** (0.008)
Published_2010	-0.047*** (0.018)	0.016 (0.012)	0.010*** (0.003)	0.018** (0.007)
Published_2011	-0.071*** (0.019)	0.020 (0.013)	0.010*** (0.003)	0.023*** (0.008)
Published_2012	-0.070*** (0.017)	0.020* (0.012)	0.009*** (0.003)	0.020*** (0.007)
Published_2013	-0.054*** (0.018)	0.014 (0.012)	0.007** (0.003)	0.020*** (0.007)
Published_2014	-0.053*** (0.018)	0.007 (0.012)	0.007** (0.003)	0.019** (0.007)
Published_2015	-0.044** (0.018)	0.004 (0.012)	0.003 (0.003)	0.013* (0.007)
Published_2016	-0.040** (0.017)	0.002 (0.011)	0.007** (0.003)	0.012* (0.007)
Constant	0.259*** (0.025)	0.003 (0.016)	0.022*** (0.004)	0.033*** (0.010)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 26. Regression Results RQ2 Verification Sample

	Dependent variable:			
	Inspiring	ingenious	obnoxious	unconvincing
Part1	0.013 (0.009)	-0.008 (0.006)	0.002 (0.002)	-0.002 (0.003)
Part2	-0.004 (0.009)	0.007 (0.006)	-0.001 (0.002)	-0.006* (0.003)

Part3	-0.025** (0.010)	0.017** (0.007)	-0.001 (0.002)	-0.003 (0.004)
Language	0.001** (0.001)	-0.0004 (0.0003)	-0.0003** (0.0001)	-0.0002 (0.0002)
Event	-0.017** (0.007)	0.012** (0.005)	-0.001 (0.001)	0.002 (0.002)
Pace	-0.032*** (0.008)	0.022*** (0.005)	-0.004*** (0.002)	-0.009*** (0.003)
Published_2006	-0.034 (0.032)	0.032 (0.021)	0.014** (0.007)	0.007 (0.012)
Published_2007	-0.050** (0.020)	0.004 (0.013)	0.010** (0.004)	0.023*** (0.007)
Published_2008	-0.039** (0.017)	-0.003 (0.011)	0.018*** (0.004)	0.018*** (0.006)
Published_2009	-0.038** (0.017)	0.009 (0.011)	0.018*** (0.004)	0.030*** (0.006)
Published_2010	-0.033* (0.017)	0.023** (0.012)	0.016*** (0.004)	0.021*** (0.006)
Published_2011	-0.024 (0.017)	0.023* (0.012)	0.013*** (0.004)	0.016** (0.006)
Published_2012	-0.036** (0.017)	0.027** (0.011)	0.008** (0.003)	0.015** (0.006)
Published_2013	-0.026 (0.017)	0.028** (0.011)	0.008** (0.004)	0.016*** (0.006)
Published_2014	-0.016 (0.016)	0.006 (0.011)	0.007** (0.003)	0.008 (0.006)
Published_2015	-0.020 (0.016)	-0.006 (0.011)	0.006* (0.003)	0.005 (0.006)
Published_2016	-0.008 (0.016)	0.006 (0.011)	0.003 (0.003)	0.003 (0.006)
Constant	0.275*** (0.025)	0.004 (0.017)	0.022*** (0.005)	0.046*** (0.009)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 27. Regression Results RQ2 Set Method Lead Sample

	Dependent variable:			
	Inspiring	Ingenious	Obnoxious	Unconvincing
Set1	0.023 (0.018)	-0.013 (0.012)	0.001 (0.003)	-0.001 (0.007)
Set2	-0.017 (0.014)	-0.012 (0.010)	0.0004 (0.002)	-0.002 (0.006)
Set3	0.034** (0.014)	0.019** (0.009)	-0.001 (0.002)	-0.011* (0.006)
Set4	0.014 (0.015)	0.006 (0.010)	0.00002 (0.002)	-0.016*** (0.006)
Set5	-0.010 (0.020)	0.025* (0.013)	0.0001 (0.003)	0.003 (0.008)
Total	0.001** (0.001)	-0.00002 (0.0003)	-0.0002*** (0.0001)	-0.0005** (0.0002)
Language	-0.012* (0.007)	0.014*** (0.005)	-0.001 (0.001)	0.002 (0.003)
Event	-0.019** (0.008)	0.016*** (0.005)	-0.004*** (0.001)	-0.002 (0.003)
Pace	-0.038 (0.025)	0.001 (0.017)	0.014*** (0.004)	0.022** (0.010)
Published_2006	-0.062*** (0.021)	0.008 (0.014)	0.010*** (0.003)	0.019** (0.008)
Published_2007	-0.078*** (0.020)	0.001 (0.013)	0.013*** (0.003)	0.022*** (0.008)
Published_2008	-0.067*** (0.019)	0.018 (0.012)	0.015*** (0.003)	0.034*** (0.008)
Published_2009	-0.043** (0.018)	0.014 (0.012)	0.010*** (0.003)	0.019** (0.007)
Published_2010	-0.065*** (0.019)	0.021* (0.013)	0.010*** (0.003)	0.023*** (0.008)
Published_2011	-0.067*** (0.017)	0.020* (0.012)	0.009*** (0.003)	0.019*** (0.007)
Published_2012	-0.050*** (0.018)	0.014 (0.012)	0.007** (0.003)	0.020*** (0.007)
Published_2013	-0.050*** (0.018)	0.005 (0.012)	0.006** (0.003)	0.020*** (0.007)

Published_2014	-0.040** (0.018)	0.003 (0.012)	0.003 (0.003)	0.012* (0.007)
Published_2015	-0.035** (0.017)	0.002 (0.011)	0.007** (0.003)	0.011 (0.007)
Published_2016	0.253*** (0.025)	0.005 (0.017)	0.022*** (0.004)	0.035*** (0.010)
Constant	0.023 (0.018)	-0.013 (0.012)	0.001 (0.003)	-0.001 (0.007)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01

Table 28. Regression Results RQ2 Set Method Verification Sample

	Dependent variable:			
	Inspiring	Ingenious	Obnoxious	Unconvincing
Set1	0.031* (0.018)	-0.002 (0.012)	-0.006 (0.004)	-0.012* (0.006)
Set2	0.031** (0.015)	-0.015 (0.010)	0.002 (0.003)	0.002 (0.005)
Set3	0.027* (0.015)	-0.008 (0.010)	-0.004 (0.003)	-0.007 (0.005)
Set4	0.010 (0.016)	0.010 (0.011)	-0.005 (0.003)	-0.010* (0.006)
Set5	-0.018 (0.022)	0.021 (0.015)	-0.002 (0.005)	-0.001 (0.008)
Total	-0.026** (0.011)	0.015* (0.008)	0.002 (0.002)	-0.008** (0.004)
Language	0.001*** (0.001)	-0.0004 (0.0003)	-0.0003*** (0.0001)	-0.0002 (0.0002)
Event	-0.016** (0.007)	0.012** (0.005)	-0.001 (0.001)	0.002 (0.002)
Pace	-0.033*** (0.008)	0.022*** (0.005)	-0.004*** (0.002)	-0.009*** (0.003)
Published_2006	-0.035 (0.032)	0.033 (0.021)	0.013** (0.007)	0.006 (0.012)
Published_2007	-0.051*** (0.020)	0.003 (0.013)	0.011*** (0.004)	0.024*** (0.007)
Published_2008	-0.041** (0.017)	-0.003 (0.011)	0.018*** (0.004)	0.019*** (0.006)
Published_2009	-0.040** (0.017)	0.010 (0.011)	0.018*** (0.004)	0.030*** (0.006)
Published_2010	-0.036** (0.017)	0.024** (0.012)	0.017*** (0.004)	0.022*** (0.006)
Published_2011	-0.026 (0.017)	0.023** (0.012)	0.013*** (0.004)	0.016*** (0.006)
Published_2012	-0.037** (0.017)	0.027** (0.011)	0.008** (0.003)	0.016*** (0.006)
Published_2013	-0.026 (0.017)	0.028** (0.011)	0.008** (0.004)	0.016*** (0.006)
Published_2014	-0.016 (0.016)	0.007 (0.011)	0.007** (0.003)	0.008 (0.006)
Published_2015	-0.022 (0.016)	-0.006 (0.011)	0.007** (0.003)	0.006 (0.006)
Published_2016	-0.011 (0.016)	0.006 (0.011)	0.003 (0.003)	0.004 (0.006)
Constant	0.264*** (0.026)	0.004 (0.017)	0.024*** (0.005)	0.049*** (0.009)
Observations	1,016	1,016	1,016	1,016

Note: The significant codes start at 0.1 not 0.05 as in Chapter 4.
*p<0.1; **p<0.05; ***p<0.01