

**Understanding the effects of topic factors and threat  
exposure on motivation to participate in knowledge artefacts:  
The case of Wikipedia**

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Seren Yenikent, M.Sc.

aus Izmir, Türkei

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Dekan : Prof. Dr. Wolfgang Rosenstiel

1. Berichterstatter : Prof. Dr. Joachim Kimmerle

2. Berichterstatter : Prof. Dr. Sonja Utz

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## Summary

Wikipedia's unique feature that prompts voluntary knowledge creation makes it relevant for researchers to examine what motivates editors to contribute to the platform when there are no obvious compensations that they could receive in exchange of their efforts. Earlier studies have identified various encouraging factors of Wikipedia participation (e.g., fun, ideology, community aspect). In this dissertation, I undertook a psychology perspective and examined the issue with a focus on person-object-environment paradigm that has not been previously studied within the context of Wikipedia motivation. This paradigm explains the human behavior as a product of a person's interest-oriented relationship with an object and with her/his environment. The aim of this dissertation was then to investigate motivation to work with Wikipedia (in terms of willingness to contribute to the articles and production of article measures) in relation to topic factors (object) and threat exposure (environment). Two laboratory and one Wikipedia textual analysis studies suggested that general (i.e., topic familiarity and controversiality) and specific characteristics (i.e., sentiment and psychological content) of a topic played significant roles in Wikipedia motivation. Specifically, working with familiar and controversial topics that had sociopolitical references increased engagement to Wikipedia articles. Results also suggested that Wikipedia community produced article measures (e.g., longer articles) related to content with both positive and negative sentiments. A closer examination on psychological content showed that affective (positive and negative emotion) and drive states (achievement, reward, power, affiliation and risk) were the best predictors of article production. With regards to threat exposure, although threat manipulations induced in the forms of mortality salience and uncertainty salience led to negative mood states, they did not result in any changes in people's willingness to work with the articles. Overall, the findings suggest that Wikipedia motivation was significantly influenced by general familiar and controversial characteristics of the presented topic as well as positive/negative polarity and specific psychological orientations of the content. Threat-evoking environmental cues during Wikipedia use, on the other hand, did not seem to affect the motivation levels. These results support the human-oriented aspect of Wikipedia platform that is distinctively fostered by editors' psychological, social and emotional interests.

## Zusammenfassung

Wikipedias einzigartige Eigenschaft, freiwillige Wissenskonstruktion zu fördern, macht es für Forscher relevant, zu untersuchen, was die Autoren dazu motiviert, zur Plattform beizutragen, wenn es keine offensichtliche Vergütung gibt, die sie als Gegenleistung für ihre Bemühungen erhalten könnten. Bisherige Studien haben verschiedene motivierende Faktoren für eine Beteiligung an Wikipedia identifiziert (z. B. Spaß, Ideologie, Community-Aspekt). In diesem Dissertationsprojekt habe ich eine psychologische Perspektive eingenommen und das Thema mit einem Fokus auf das Person-Objekt-Umwelt Paradigma untersucht, was bisher im Rahmen Forschung zur Wikipedia-Motivation nicht untersucht wurde. Dieses Paradigma erklärt Verhalten als Produkt einer interessenorientierten Beziehung einer Person zu einem Objekt und zu seiner Umgebung. Ziel dieser Dissertation war die Motivation zur Mitarbeit an Wikipedia (hinsichtlich der Bereitschaft zu Artikeln beizutragen) in Bezug auf Themenfaktoren (Object) und Bedrohungsexposition (Environment) zu untersuchen. Zwei Laborstudien und eine Textanalyse-Studie legten nahe, dass allgemeine (d.h. Bekanntheit und Kontroversität des Themas) und spezifische Merkmale (d.h. emotionaler und psychologischer Inhalt) eines Themas eine wichtige Rolle bei der Wikipedia-Motivation spielen. Insbesondere die Arbeit mit bekannten und kontroversen Themen, die sozialpolitische Bezüge hatten, verstärkte das Interesse an Wikipedia-Artikeln. Die Ergebnisse zeigten auch, dass die Wikipedia-Community Artikel (z. B. längere Artikel) für positive und negative Inhalte erstellt hat. Eine genauere Untersuchung der psychologischen Inhalte zeigte, dass affektive (positive und negative Emotionen) und Antriebszustände (Leistung, Belohnung, Macht, Zugehörigkeit und Risiko) die besten Prädiktoren für die Artikelproduktion waren. In Bezug auf Bedrohungsexpositionen führten zwar Bedrohungsmanipulationen, die durch die kognitive Verfügbarkeit von Sterblichkeit (mortality salience) und Ungewissheit ausgelöst wurden, zu negativen Stimmungszuständen, führten jedoch zu keiner Änderung der Bereitschaft, an Artikeln mitzuarbeiten. Insgesamt deuten die Ergebnisse darauf hin, dass die Motivation von zur Mitarbeit an Wikipedia durch allgemein bekannte und kontroverse Merkmale des vorgestellten Themas sowie durch positive / negative Polarität und spezifische psychologische Ausrichtungen des Inhalts beeinflusst wurde. Bedrohliche

Umweltmerkmale während der Nutzung von Wikipedia hatten keinen Einfluss auf die Motivation. Diese Ergebnisse unterstützen den individuellen Aspekt der Wikipedia-Plattform, der eindeutig durch die psychologischen, sozialen und emotionalen Interessen der Autoren gefördert wird.

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## 1. Introduction

Wikipedia is today's most leading user-generated platform for free and universal encyclopedic knowledge. The knowledge is collaboratively created by its voluntary users i.e., editors. The notion of voluntary participation has corroborated the key role of the editors and raised the need to have a robust understanding on what motivates editors to engage with the platform (Nov, 2007). The major interest in the phenomenon of voluntary participation in the collaboratively maintained knowledge artefacts comes from the fact that users do not receive a direct compensation (e.g., monetary compensation) in exchange of the work they provide (Hars & Ou, 2002). While this paradigm could simply be addressed as 'free work force', research has shown that there may be a great number of factors playing significant roles in determining users' interest in voluntary content creation (e.g., Hars & Ou, 2002; Moskaliuk & Kimmerle, 2009; Nov, 2007; Rafaeli, Hayat, & Ariel, 2009). Owing to its large open content and popular use throughout the world, Wikipedia has become the most attractive platform for researchers to understand the mechanisms of voluntary collaborative knowledge construction (Okoli, Mehdi, Mesgari, Nielsen, & Lanamäki, 2012). The work that has been done within this dissertation aims to contribute to this line of research that is dedicated to identify different motivational factors that influence participation in and contribution to Wikipedia.

Various motivational frameworks have been utilized by earlier studies to get clear insights in the encouraging factors of Wikipedia participation. Based on Clary et al.'s (1998) work on underlying motivations of volunteerism, Nov (2007) came up with eight factors: fun, ideology (i.e., belief in the free access to information), values (i.e., altruistic intentions), understanding (i.e., knowledge and skill advancement), enhancement (i.e., the positive feeling of being needed), protective (i.e., release from the negative features of ego while sharing knowledge with others), career (i.e., job-related benefits) and social (i.e., collective need). Kuznetsov (2006) applied the framework of Value Sensitive Design (VSD), that combines the technical and social aspects of technologies (Friedman, Kahn, & Borning, 2006), on Wikipedia and suggested that altruism, reciprocity, community interest, reputation and autonomy were the factors that motivated users. In their study on the German Wikipedia, Schroer and Hertel (2009)

regarded Wikipedia as a social movement act, and found that perceived task characteristics and benefits, identification with the community and more particularly autonomy, task significance, and skill variety affected editors' Wikipedia motivation. Personal motivation factors such as self-satisfaction, self-efficacy, internal self-concept about personal skills and achievement were also found to have a significant impact on knowledge sharing on Wikipedia (Ciffolilli, 2003; Yang & Lai, 2011). Xu and Li (2015) provided a distinction between intrinsic motivations, such as altruism and sense of community, and external motivations, such as reciprocity and need for self-development, that lead users to engage in Wikipedia activities. Asadi and colleagues (Asadi, Ghafghazi, & Jamali, 2013) scrutinized the Persian Wikipedia to identify motivators and demotivators of Wikipedia participation. Their model suggested two sets of factors: internal factors that inherently originate from the Wikipedia environment, such as content development and platform structure, and external factors that have to do with environment outside of Wikipedia, such as sociocultural background and web-based content. Here, I also adopt a similar approach in tackling the question "which factors affect the Wikipedia motivation?" and approach the issue on internal (topic-based factors within Wikipedia) and external levels (environmental factors outside of Wikipedia).

While contributing to the above-mentioned research line, my dissertation takes a unique approach to the issue of Wikipedia motivation by undertaking a psychology perspective that combines experimental laboratory methods and textual analysis of real Wikipedia data. I postulate the issue in a *person-object-environment* context. In order for a person to be motivated for a particular task and thus to take action toward it (i.e., behavior), there needs to be a certain level of interest directed to that task. This interest is the relational result between the person and the object within her or his 'life space', that is the environment (Burnes & Cooke, 2013; Krapp, 2002; Lewin, 1936). An object could refer to concrete things, topics and ideas that could evoke personal interest and define individual's attendance to the task (Ainley, Hidi, & Berndorff, 2002). Environmental stimuli are also important elements that trigger interest and task engagement. These stimuli usually create instant reflections on the behavior, which may cease immediately or endure (Krapp, 2002). I incorporate these two factors, object and

environment, into the framework of my dissertation as the irritators of the cognitive system that steer the psychological state required for users to actively take part in the knowledge construction process.

These interest-referenced theoretical considerations that attribute the outcome behavior to a person's relationship with the object of interest and the environment have not directly been linked to motivation to work on Wikipedia by previous research. The main objective of this dissertation was then to utilize this framework (see Figure 1) and shed light on two factors within the context of Wikipedia motivation: *topic factors* (object) and *threat exposure* (environment). First, topic factors address the topic at hand by taking the issue on two aspects: in a broader perspective of *topic familiarity* and *topic controversiality*, and in a more specific content-based perspective as the *sentiment characteristics* and *psychological characteristics*. The second factor taken into account as a potential influencer of Wikipedia motivation is threat exposure as an environmental stimulus, which is particularly examined as *mortality salience* and *uncertainty salience*. The following sections provide theoretical and empirical background for these factors and their relevance to the Wikipedia motivation research.

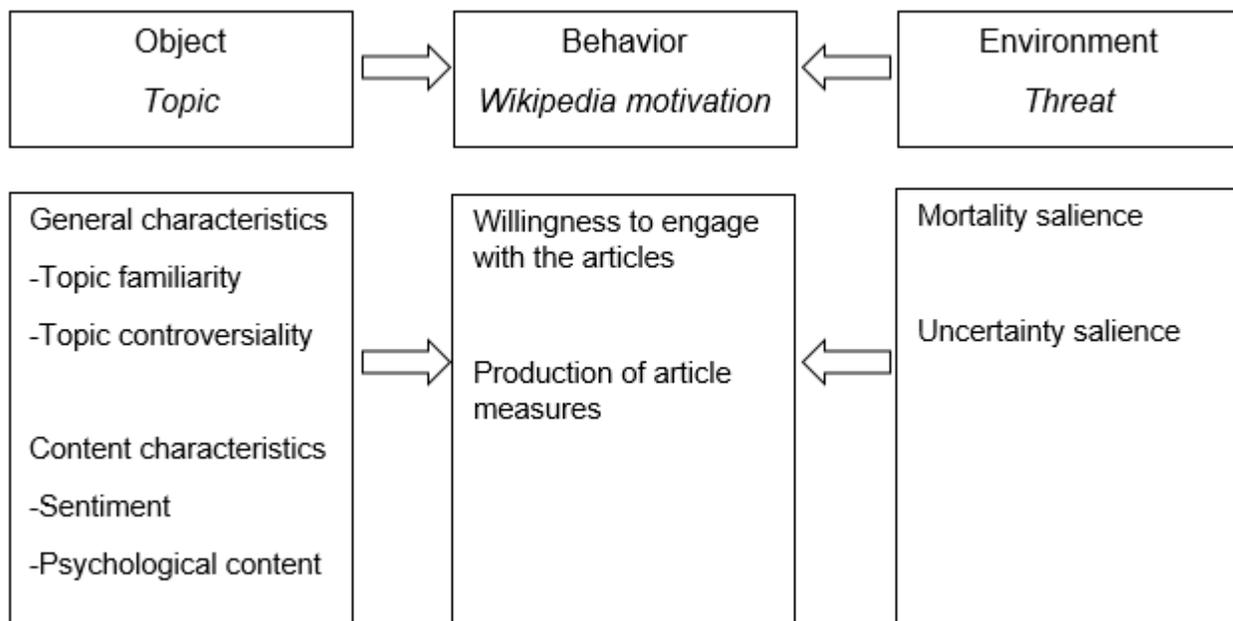


Figure 1. This model illustrates the main framework of the dissertation project.

## 1.1. Topic factors

People prefer to deal with topics whose subject matter is interesting to them. Personal interest in the topic increases the positive feelings, focus and engagement (Renninger, 2000). As the engagement increases, people get more motivated to spend more time and effort on different aspects of the topic (Ainley et al., 2002). After all, “to be motivated means to be moved to do something” (Ryan & Deci, 2000, pp.54).

People who attend online environments also tend to spend more time on content and websites that they are interested in (Kubat & Tapia, 2007). Thus, it is important to analyze characteristics that drive online users to engage with the content. Empirical studies suggested approaches to identify those characteristics that could boost personal interest in the web content (e.g., Mele, 2013). Analyses pointed to certain characteristics that attract more attention in the online environments. For instance, Berger and Milkman (2013) suggest that online content that is shared most generally contains interesting, practical and surprising information as well as high-arousal emotions such as anger and awe. Presented topic is the main object of interest within an online knowledge artefact like Wikipedia and motivates users to learn more about or to review the existing information (Moskaliuk & Kimmerle, 2009). My approach in this dissertation then was to study factors related to the topic at hand that could potentially affect motivation to work with Wikipedia articles. Those factors are divided into two levels as a broader approach on the general characteristics and a more narrowed down approach on the content. The following two sections are dedicated to provide theoretical basis for the inclusion of these levels into Wikipedia motivation context.

### 1.1.1. General characteristics of the topic: Familiarity and controversiality

There are two topic characteristics that can be considered as appealing to online users as well as Wikipedia editors in the broader sense: familiarity with a topic and controversiality of the topic. These characteristics refer to a rather more general distinction regardless of the particular content of the presented topic.

#### *Topic familiarity*

Personal and cultural associations attached to the topics that are familiar to individuals make these topics more appealing to engage with (Gürkan, 2012). Dealing

with familiar topics requires relatively less levels of information processing, and thus the lessened cognitive load usually leads to more interest and better performance (Oller, 1995). Based on this knowledge on tendency to familiar topics, online environments are designed as to suggest and activate user-specific material. One great instance of this is the personalization features of the search engines that optimize queries or recommendations based on users' online activity streams. Although it is debated that such methods could result in filter bubbles (i.e., isolation of users from wider range of topics and viewpoints due to online personalization; Nguyen, Maxwell, Loren, & Joseph, 2014), confirmation bias (i.e., selective search for content based on pre-existing beliefs; Jirschitzka et al., 2017) and echo chamber effect (i.e., homogeneous clusters formed by like-minded users; Del Vicario et al., 2016), these attempts show that there is at least a demand from users' side to engage with more relevant online material calibrated on their needs.

Tendency to engage with familiar topics is also observed within the Wikipedia environment. West and colleagues (West, Weber, & Castillo, 2012) highlighted the motivator effect of familiarity by revealing that familiar Wikipedia articles contained more and longer edits compared to unfamiliar articles. Laboratory studies from Lucassen and Schraagen (2011, 2012) suggest that participants spent more time on the semantic features when working with familiar Wikipedia articles and more time on the surface features for unfamiliar articles. As a result of high motivation for personal associations, editors become more willing to spend time and effort and work on familiar material; and in return the community benefits more from the constructed knowledge that was based on editors' personally interested and relevant topics (Moskaliuk & Kimmerle, 2009).

There are various ways to define "familiarity with a topic". One of the most common approaches in the research context is cultural relevance that is referred as *cultural schema* (Ketchum, 2006; Yule, 1996). This approach refers to the role of the cultural membership in engaging with a topic, and considers culture-specific materials as an accelerator for motivation. Group identification catalyzes the way for motivation by activating an easier and less effortful fitting for the pre-existing schemas. It was shown in earlier studies that working with culturally relevant content increased the

comprehension levels of learners (Erten & Razi, 2009; Gürkan, 2012). This dissertation also takes the cultural schema approach in handling the topic familiarity and argues that familiarity with the topic of a Wikipedia article would increase editors' willingness to work with those articles.

### *Topic controversiality*

Topics that create controversies often include disagreements and polarized views on contradictory issues. More often than not, controversial issues attract people's attention, including users of online communities. Previous research showed that online users spent more time on controversial topics eventually leading to growth of communities (Buttlere & Buder, 2017; Chmiel et al., 2011; Sobkowicz & Sobkowicz, 2010). Buttlere and Buder (2017) showed that when given the chance, online forum users prefer to write back to the posts they disagree most. Web-based environments proliferate participation in controversial topics since the responsibility of a face-to-face interaction hardly exists in online identities. Furthermore, given the anonymity feature of most online platforms, it is likely that users may feel more comfortable to voice their opinions on debated topics (Sobkowicz & Sobkowicz, 2010).

Much research has been dedicated to examine topic controversiality on Wikipedia due to its user-generated content that is open to diverse opinions and topics (Dori-Hacohen, Jensen, & Allan, 2016). Empirical findings in general suggest that controversial Wikipedia articles are more appealing to the editors and receive, for instance, more edits (e.g., Jirschitzka et al., 2017). In order to understand and measure the controversiality levels of the articles in a precise way, researchers have developed tools. One approach to detection of controversiality relies on a ranking score that is quantified based on edit histories (Sumi, Yasseri, Rung, Kornai, & Kertesz, 2011; Vuong et al., 2008). *Contropedia* platform was also built based on edit and discussion histories to identify and visualize controversial Wikipedia articles (Borra et al., 2014). Zielinski and colleagues (Zielinski, Nielek, Wierzbicki, & Jatowt, 2018) developed a model that used the sentiment of discussions in the talk pages to identify the controversial articles. Analysis of page network (i.e., neighboring articles) was also suggested as a profound method to detect the controversies (Dori-Hacohen et al., 2016).

Apart from this research line that focuses on the controversies extracted from activity streams (e.g., talk pages, revision histories, page networks), some earlier studies have also exploited the controversiality of the topic itself. Wikipedia content reflects the public opinion; thus, it has a “mirror function of societal controversies” (Borra et al., 2014, p.1). As in line with this function, the most popular topics that are tagged as ‘controversial’ by the Wikipedia editors are mainly about socially disputed topics such as religion, history, and politics (Rad & Barbosa, 2012). Due to the high relevance with the social and political concerns of the society, these topics are likely to get more attention from the Wikipedia community. For instance, Wilson and Likens (2015) showed that more edits and more word changes were applied to the politically controversial articles than neutral topics. The approach taken in this dissertation in terms of controversy also depends on the socio-political controversiality of the topic at hand. As socio-political topics are usually linked to regions (e.g., Arab-Israeli conflict), we defined the controversiality of a topic also based on a cultural/regional identity (Yasseri, Spoerri, Graham, & Kertesz, 2013). More specifically, it was assessed whether and how topics that create societal disputes in particular countries would affect the levels of motivation to work with those articles for people of those countries.

### **1.1.2. Characteristics of the content: Sentiment and psychological orientation**

Apart from a broader distinction of familiarity and controversiality, this dissertation also takes more specific characteristics of the Wikipedia content: sentiment and psychological orientation. This section describes the theoretical and empirical reasons for associating these two content characteristics with Wikipedia motivation.

#### *Sentiment characteristics*

*Sentiment* is defined as enduring emotional dispositions toward certain objects and topics (Munezero, Montero, Sutinen, & Pajunen, 2014). Emotions are mainly categorized based on two dimensions, *positive* and *negative*. Theorists put forward models with the attempt of explaining how people experience these two dimensions (Berrios, Totterdell, & Kellett, 2015). Dimensional theorists refer to positive and negative emotions as complete opposites of each other, meaning that a decrease in one dimension (e.g., sadness) leads to an increase in another (e.g., happiness) (Grühn,

Lumley, Diehl, & Labouvie-Vief, 2013). Co-activation models, on the other hand, suggest that people could experience positive and negative emotions at the same time (Cacioppo, Gardner, & Berntson, 1999; Norris, Gollan, Berntson, & Cacioppo, 2010). In spite of these debates, it is still agreed upon that feeling-related valences operate individuals' interest (Krapp, 2002).

Research has given considerable attention to detection of positive/negative sentiment of the written material to extract semantic orientation in a more systematic way. The specific field that uses lexical methods to analyze people's opinions, emotions, evaluations and attitudes toward particular topics or objects is called *sentiment analysis* (Liu, 2012). Content that refers to pleasant stimuli and positive emotions are considered as having a positive sentiment orientation whereas negative sentiment is associated with negative content that contains clues of unpleasant and undesirable experiences.

A wide range of research has been devoted to study the role of positive and negative content on activities in online communities. *Negativity* line of the research area has been concerned with the question of how negative content majorly influences online environments. Specifically, it was shown by various studies that negative content that contains patterns of controversies, conflicts and biases boosted more user activities (Buttliere & Buder, 2017; Chmiel et al., 2011; Mejova, Zhang, Diakopoulos, & Castillo, 2014). Content incorporated negative emotions plays important roles in online environments. For instance, anger is one of the most common negative emotions that influences reading and writing behaviors in the online discussion forums (Martin, Coyier, VanSistine, & Schroeder, 2013; Savolainen, 2015). Savolainen (2015) analyzed the conversations in an online discussion group and demonstrated that the most frequently expressed content was negative including disagreements, sarcasm, provocation and invective. In spite of the emphasis on negativity in the findings of such earlier studies, there is also supporting evidence for the significant role of *positive content* in online community activities. Berger and Milkman (2013) suggest that unlike the common sense that promotes the virality of negative content, positive content is generally more passed

on. Pappas and Popescu-Belis (2013)'s work that examined the discussion sections of TED talks identified the majority of the comments as containing positive sentiment.

Such mixed empirical results in terms of positivity-negativity pattern are also observed in Wikipedia research. Sentiment characteristics of Wikipedia articles that prompt editors' interest are mainly in the negative direction. For example, articles that were about controversial topics that could accompany negative references such as disagreements and societal disputes got more attention from the editors (Jirschitzka et al., 2017). On the other hand, Wikipedia editors were reported as adopting a positive attitude and expressing positive emotions (Iosub, Laniado, Castillo, Morell, & Kaltenbrunner, 2014). The aim of this dissertation was to shed light on this ambiguity and examine how positive and negative content could be associated with Wikipedia motivation, i.e., whether editors were more motivated to produce articles referring to positive or negative Wikipedia content.

### *Psychological characteristics*

Analysis of words is crucial to get insights into individuals' psychological worlds (Pennebaker, Mehl, & Niederhoffer, 2003). As participation in social media and other web communities (i.e., user-generated online content) increased, it has become a significant research field to examine the words that are used within the online environments (Hu & Liu, 2012). Natural Language Processing (NLP) methods provide options to identify the psychological granularity of the textual online material. The primary objective of these methods is to delve into the association between users' psychological experiences and online activities. One of the most frequently used NLP approaches is Linguistic Inquiry and Word Count (LIWC) text analyzer, which is also the main framework utilized within the scope of this dissertation to gain a robust understanding on psychological content in the Wikipedia articles (Gonçalves, Araújo, Benevenuto, & Cha, 2014; Pennebaker et al., 2003).

Wikipedia community's ultimate goal is to provide objective and free encyclopedic knowledge accessible for everyone. Thus, one of the leading policies of the community is to ensure the neutrality and accuracy by accommodating large numbers of diverse contributors from different backgrounds (i.e., wisdom of crowds)

(Kittur & Kraut, 2008). Although the 'Neutral Point of View (NPOV)' principle is strictly implemented (Wikipedia, 2018a), previous research suggests that editors' characteristics and experiences are reflected in the content (e.g., Greenstein & Zhu, 2012).

Wikipedia is a sociotechnical platform that combines the effect of human factor and technical tools (Niederer & van Dijck, 2010). While the technical features solidify the accuracy and neutrality of the content, the human factor is still distinctively influential on the formation of the knowledge. Studies have shown how editors' psychological characteristics could be traced within the Wikipedia articles. For instance, Greving and colleagues (Greving, Oeberst, Kimmerle, & Cress, 2017) showed that articles about terrorist attacks and earthquakes contained a considerable volume of anger and sadness-related content, even more frequently than the talk pages of the respective articles did. Emotional content in the form of anger and anxiety was also observed in another study wherein Metapedia articles (a far-right online encyclopedia) were richer in such content than Wikipedia articles (Oeberst, de Vreeze, & Cress, 2018). Several other studies also reported more specific psychological states, such as gender bias, group bias and cultural bias, that spilled over into the article content (Callahan & Herring, 2011; Graells-Garrido, Lalmas, & Menczer, 2015; Oeberst, von der Beck, Back, Cress, & Nestler, 2017).

In order to abide by a systematic approach on the definition of psychological content in the Wikipedia articles, I use the framework of LIWC software, which was particularly developed to identify linguistic and psychological processes in the textual material. LIWC's analysis context that is grounded on a wide range of dimensions provide insights into the underlying mechanisms of different social and cognitive behaviors such as thinking styles, social relationships, and group processes (Tausczik & Pennebaker, 2010; see also Pennebaker et al., 2003). Hence, previous investigations applied LIWC's dimensions to various contexts including academic performance (Robinson, Navea, & Ickes, 2012), relationships (Boals & Klein, 2005), personality traits (Mehl, Gosling, & Pennebaker, 2006), scientific metrics (Buttlere, 2017) as well as social media (De Choudhury & Gamon, 2013) and online forums (Stone & Pennebaker,

2002). Wikipedia textual corpus is another platform wherein LIWC framework has successfully been exploited. Su and Liu (2016)'s work that implemented all LIWC categories (linguistic and psychological) showed that psychological categories were particularly helpful for detecting featured (i.e., best articles determined by the Wikipedia editors based on standards of writing, presentation, and sourcing) and non-featured articles. Studies from Ferron and Massa (2012) and Greving et al. (2017) exemplify the identification of psychological states in the Wikipedia articles with LIWC. In both studies, different aspects of psychological processes (e.g., emotional content and cognitive processes) within the content of articles about traumatic events such as disasters and terrorist attacks were revealed. Another similar study showed the dynamics behind sensemaking activities within the Wikipedia articles about aircraft accidents (Keegan, 2011). This dissertation followed a similar research concern and associated LIWC's psychological framework with Wikipedia motivation. The main goal was to understand how different types of psychological content such as affective, social and cognitive processes would relate to the motivation to work on the articles.

## **1.2. Threat exposure**

Within the person-object-environment paradigm I base my dissertation project on (see above Figure 1), environment that surrounds the individual defines the outcome behavior by providing a variety of stimuli for her/him. Research shows that not only the conscious products of the environment but also the unconscious cues during engagement with a task are processed (Van Gaal & Lamme, 2012). In other words, even though people direct their primary attention on a particular task, they still absorb information from various other stimuli; and this processing potentially has impact on their preferences and decision making activities. There is also a close relationship between internet environment and online users' behavior patterns. For instance, Yoo (2008) demonstrated that web advertisements were unconsciously processed and affected participants' further preferences for product buying. One particular cue that affects online users' behaviors is threat. Threat exposure has the ability to change users' content preferences (Koutra, Bennett, & Horvitz, 2014). Wikipedia users are usually regular internet users who are likely to run into threat-related stimuli while surfing through internet or navigating through Wikipedia. Greving et al. (2017) revealed

the crucial role of threat on Wikipedia by demonstrating how Wikipedia content containing threatening events (e.g., terrorist attacks and earthquakes) influenced contributions. By extending on this approach, this dissertation examines the direct effect of threat during Wikipedia use.

Threat literature suggests that when people are exposed to threatening stimuli, they take compensation behaviors to dispel the unpleasant state that threat causes for them (Gawronski, 2012). This unpleasant state is caused by the feeling of dissonance when the available resources are not strong or sufficient to eliminate the source of the threat (Festinger, 1957; Harmon-Jones & Harmon-Jones, 2012). Compensation behaviors could take different forms as to be determining individuals' further preferences and behaviors (Duckitt & Sibley, 2010; Jost et al., 2007). Mortality salience and uncertainty salience are the key constructs of the threat framework that exemplify how threat-evoking conditions could affect human behavior. Earlier studies dealt with these two constructs in order to explain different outcomes triggered by death- and unpredictability-induced environmental cues (van den Bos, 2004). Below, I provide the definitions and relevance of these two concepts for the aims of this dissertation in relation to Wikipedia motivation.

### **1.2.1. Mortality salience**

*Mortality salience hypothesis* refers to the awareness of one's own death. It posits that this awareness leads to high levels of terror and discomfort by reminding the psychological and physical vulnerabilities of the human nature (Greenberg, Pyszczynski, & Solomon, 1986; Harmon-Jones et al., 1997). As a response to the overwhelming discomfort of the mortality awareness, people display some defense behaviors. These behaviors take literal (e.g., belief in afterlife) or symbolic forms (e.g., having children) depending on the extent that people are motivated to change or maintain their existing beliefs (Burke, Martens, & Faucher, 2010; Gawronski, 2012). There is evidence suggesting that mortality induction may create a hindering effect on behaviors by highlighting the insignificance of existence, and thus, of investments into the world (Dechesne & Kruglanski, 2004). It may also be manifested as a motivator for production and contribution in the form of concrete testaments (e.g., art, science) that

could transcend one's lifetime and represent their existence in the world (Solomon, Greenberg, & Pyszczynski, 2004).

Death-related cues are embedded in the daily life in various ways and affect attitudes and decision making processes (Mahoney, Saunders, & Cain, 2014). Reactions to explicit or implicit death cues could be observed on personal level (e.g., political decision making; Landau et al., 2004) and social level (e.g., initiation of social interactions; Mikulincer, Florian, & Hirschberger, 2004). Internet environment is also filled with cues that could evoke mortality salience. Chopik and Edelstein (2014) showed that induction of death cues in the online web advertisements had an impact on participants' product preferences directing them, for instance, to buy more luxury items. In spite of the highly relevant nature of mortality cues to the online environment, there is a scarcity in research directly linking mortality salience and Wikipedia. My work aims to pioneer such research by using mortality induction in the context of Wikipedia to understand how awareness of death would affect motivation to work with the articles.

### **1.2.2. Uncertainty salience**

People strive to maintain a certain level of clarity in their lives. Thus, when faced with uncertain situations or information, they desire to find answers to diminish the ambiguity (Kruglanski & Webster, 1996). In order to retain the consistency, the cognitive system attempts to evade the source of the uncertainty or suppress it to make the situation more tolerable (van den Bos, Poortvliet, Maas, Miedema, & van den Ham, 2005). While the cognitive system actively works with a focus on the uncertain information, the individual's motivation for other tasks would be hindered. In other words, cognitive preoccupation with hypotheses generation for the resolution of the uncertainty would deteriorate the engagement with new information (Kruglanski, 1990).

Uncertainty management is a significant factor that is confronted almost on a daily basis. Its influence on human behavior can be observed in personal, occupational, social and political worlds as a reflection of rapid changes and unpredictability (Van den Bos, 2001). Given the widespread use of internet, managing uncertainty is particularly relevant with the context of this dissertation as well. It is possible that during internet or Wikipedia use, people may come across content, such as news and online forum

threads, that could evoke the need for uncertainty management (Buttlere & Buder, 2017; Rubin, 2010). Effect of online uncertainty has been studied in the consumer research with the aim of associating uncertain online environments with the purchasing behaviors. For example, Lim and colleagues (Lim, Leung, Sia, & Lee Matthew, 2004) and Pavlou and colleagues (Pavlou, Liang, & Xue, 2007) suggested that uncertainty of the virtual environments hindered consumers' online buying activities.

A few earlier studies handled the uncertainty of Wikipedia in terms of semantics within Wikipedia articles (Farkas, Vincze, Móra, Csirik, & Szarvas, 2010; Vincze, 2013). Although these studies already suggest that Wikipedia content is uncertain to some extent, they do not provide an explanation for the direct link between uncertainty salience and Wikipedia use. In order to close this research gap and gain clear insights on the issue, I examined the impact of inducing a personal sense of uncertainty salience on motivation for Wikipedia (McGregor & Marigold, 2003).

### **1.3. Main objectives of the dissertation**

Main purpose of this dissertation was to understand motivation to engage with Wikipedia in relation to topic-related and threat factors that could be specified as following, (1) general characteristics of the topic as topic familiarity and controversiality, (2) characteristics of the content as sentiment and psychological orientation, (3) threat exposure as mortality salience and uncertainty salience. Motivation to work with Wikipedia was operationalized in two ways. The first operationalization concerns with users' willingness to engage with the articles. The second way of defining Wikipedia motivation is taken as producing article measures, such as length (see above Figure 1).

The research concerns were carried out through three studies (Yenikent, Holtz, & Kimmerle, 2017; Yenikent, Buttlere, Fetahu, & Kimmerle, unpublished manuscript). As these studies were conducted in collaboration with other researchers whose names and contributions are indicated in Appendix A, the word "we" is mainly used in the respective chapters to refer to the co-authors as well. In the following sections, I present these studies along with their findings (for the overview of study designs see Table 1).

Table 1

*Overview of studies with hypotheses (H), research questions (RQ), independent variables (IV), dependent variables (DV) and sample characteristics (N)*

Study	Hypotheses / Research Question	IV	DV	Sample
1	<p>H1: Participants are more willing to engage with familiar than unfamiliar articles.</p> <p>H2: Participants are more willing to engage with controversial than non-controversial articles.</p> <p>RQ1: Does exposure to mortality salience increase or decrease willingness to engage with Wikipedia?</p>	<p>Topic familiarity</p> <p>Topic controversiality</p> <p>Mortality salience</p>	Willingness to engage with articles	Laboratory participants, N=83
2	<p>H1: Participants are more willing to engage with familiar than unfamiliar articles.</p> <p>H2: Participants are more willing to engage with controversial than non-controversial articles.</p> <p>H3: Participants who are exposed to uncertainty salience are less willing to engage with Wikipedia articles than participants who are not.</p>	<p>Topic familiarity</p> <p>Topic controversiality</p> <p>Uncertainty salience</p>	Willingness to engage with articles	Laboratory participants, N=90
3	<p>RQ2: To what extent is positive and negative content in Wikipedia lead sections related to the article measures?</p> <p>RQ3: To what extent are different kinds of content based on psychological processes related to the article measures?</p> <p>RQ4: How do the content characteristics of the lead sections' in a specific time point (T1) predict future article measures (T2)?</p>	<p>Sentiment characteristics</p> <p>Psychological characteristics</p>	Article measures	Wikipedia articles, N=752,083

## **2. Examination of general topic characteristics and threat exposure on Wikipedia motivation**

With the aim of understanding the effects of two general topic characteristics (topic familiarity and topic controversiality) and threat exposure (mortality salience and uncertainty salience) on the willingness to work with Wikipedia articles, two experimental studies that followed the same methodological framework were conducted.

### **2.1. Study 1 – Effects of topic familiarity, topic controversiality and mortality salience**

The aim of Study 1 was to understand how topic familiarity, topic controversiality and mortality salience as exposed threat affected willingness to engage with Wikipedia articles in a laboratory setting. 97 participants were recruited to take part in the study; however, we had to exclude 14 participants, who indicated a country of origin other than Germany and a mother tongue and/or another language that they spoke at home other than German, before having run the analysis. The idea behind this was to make sure that all participants had similar experiences with the Wikipedia topics they engaged with (see below). Overall, 83 German participants were included in the data analysis (53 females;  $M_{age} = 26.4$ ,  $SD = 8.5$ ).

#### **2.1.1. Measures**

**Topic familiarity and controversiality.** In Study 1, participants were shown the lead sections (i.e., introduction paragraphs) of articles from the German Wikipedia and asked to rate each article based on familiarity (“How familiar are you with this topic?”) and controversiality (“How controversial do you think this topic is?”) on a 7-point Likert scale that ranged from 1 (not at all) to 7 (very much). The articles were selected based on a familiarity/controversiality criteria. Familiarity was based on the cultural schema approach (Ketchum, 2006): Familiar articles corresponded to topics from German society and culture as we had a German sample pool whereas unfamiliar articles addressed topics in another country, Turkey. Controversial articles included topics that created social and political disputes (Yasseri et al., 2013) in these two countries (e.g., Refugee crisis in Germany, Corruption scandal in Turkey) while neutral topics such as

geographical structures and historical facts were selected as non-controversial articles. In total, participants engaged with 20 different articles (see Table 2).

Table 2

*Wikipedia topics in Study 1*

	Familiar	Unfamiliar
Controversial	Refugee crisis in Germany 2015	Corruption scandal in Turkey 2013
	Social focal point	Alevism
	Thilo Sarrazin	Abdullah Ocalan
	Homosexuality in Germany	Homosexuality in Turkey
	Speed limits in Germany	Ergenekon
Non-controversial	Mainz	Yazilikaya
	Bavarian Forest	Cappadocia
	German navy history	Seljuq dynasty
	Elbe	Pontic Mountains
	Gerd Mueller	Baris Manco

*Note.* This table provides English translations of the German Wikipedia page titles.

**Mortality salience.** In order to test the effect of mortality salience, participants were asked to think of their own death (mortality salience condition) and write down their emotions as opposed to a control group whereby participants thought of a joyful memory (control condition). This was inspired by the classical mortality induction methods that exert death-related thoughts in subjects to simulate their own (meta) physical death in their minds (Burke et al., 2010; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989).

**Willingness to engage with Wikipedia articles.** Motivation to work with Wikipedia was measured as 'willingness to engage with articles' via a scale that contained four items (Cronbach's  $\alpha = 0.970$ ). Participants indicated their willingness in terms of (1) reading

more about the topic on Wikipedia, (2) editing the Wikipedia article, (3) joining the talk pages of the articles, and (4) delving into the topic in general using a 7-point Likert scale ranging from 1 (not at all) to 7 (very much).

### **2.1.2. Procedure**

Participants were recruited via an online participant pool and participated in the study on a provided computer in a laboratory. After having provided their consent and reported their demographics, in the first step of the study, participants were shown the lead sections of the Wikipedia articles one at a time and indicated their perceptions on the familiarity and controversiality of the topics. Following this section, they were randomly assigned to either mortality salience or control condition and carried out the instructions (see above). In the last step of the study, they were displayed again the same articles and asked to report their willingness to engage with each article. The entire study lasted about one hour.

### **2.1.3. Hypotheses and research questions**

Based on the theoretical considerations, the following hypotheses were stated with regards to the influence of topic familiarity and controversiality:

H1: Participants are more willing to engage with familiar articles than unfamiliar articles.

H2: Participants are more willing to engage with controversial articles than non-controversial articles.

Available literature on mortality salience suggests that death induction would be either discouraging in terms of engaging with tasks by reminding the inevitable finality of the existence or motivating by encouraging people to leave some testaments behind that could endure beyond the life time. Thus, these manifestations allowed us to construct an open research question:

RQ1: Does exposure to mortality salience increase or decrease willingness to engage with Wikipedia articles?

## 2.2. Study 2 – Effects of topic familiarity, topic controversiality and uncertainty salience

Study 2 concerned with the replication of effects of two general topic characteristics, familiarity and controversiality, and the examination of effect of uncertainty salience as exposed threat on willingness to engage with the articles. Initial number of participants who took part in the laboratory study was 100. With the same purpose as in Study 1, we excluded 10 participants before the analysis in order to have participants with similar experiences with the presented Wikipedia topics. We then ran the statistical analyses with 90 German participants (59 females;  $M_{age} = 23.87$ ,  $SD = 6.32$ ).

### 2.2.1. Measures

**Topic familiarity and controversiality.** Materials and the procedure followed for topic familiarity and controversiality in Study 2 were similar as in Study 1. However, this time participants were provided 12 articles (11 of which were selected from Study 1) with the purpose of eliminating topics that were rated as moderately familiar and controversial in Study 1 (see Table 3). Participants were asked to read the lead sections of these articles and indicate their familiarity with the topics and their perception on the controversiality of the topics on a 7-point Likert scale (1 – not at all, 7 – very much).

Table 3

#### *Wikipedia topics in Study 2*

	Familiar	Unfamiliar
Controversial	Refugee crisis in Germany 2015	Corruption scandal in Turkey 2013
	Thilo Sarrazin	Abdullah Ocalan
	Homosexuality in Germany	Homosexuality in Turkey
Non-controversial	Mainz	Yazilikaya
	Feldberg*	Cappadocia
	Elbe	Pontic Mountains

*Note.* This table provides English translations of the German Wikipedia page titles.

\* Newly added topic

**Uncertainty salience.** By following typical uncertainty salience methods from earlier literature (Van den Bos, 2001), we manipulated uncertainty induction in Study 2 by asking participants to think of an unresolved personal dilemma (uncertainty salience condition) and to write down their emotions about the dilemma. Other two control groups were asked to think respectively an easy personal decision (certainty salience condition) and watching television (non-salience condition) along with to report their emotions about these conditions.

**Willingness to engage with Wikipedia articles.** The same scale as in Study 1 was used in Study 2 as well. However, the third item was changed as to ask for the willingness to collaborate with other people on the topic instead of asking about joining the talk pages of the articles in Study 1 (Cronbach's  $\alpha = 0.949$ ).

### 2.2.2. Procedure

Following the same procedure of Study 1, participants who were recruited via an online participant pool took part in the study on a computer provided to them in a cubicle. They provided their consent as well as demographic information. First, they engaged with the 12 Wikipedia articles as means of rating the familiarity and controversiality of the topics. After completing the experimental tasks that they were randomly assigned to (uncertainty salience vs. certainty salience vs. non-salience), they filled out the willingness scale for each article. The study procedure lasted about an hour.

### 2.2.3. Hypotheses

With the aim of replicating Study 1, we constructed the following hypotheses on the general topic characteristics:

H1: Participants are more willing to engage with familiar articles than unfamiliar articles.

H2: Participants are more willing to engage with controversial articles than non-controversial articles.

Considering the hindering effect of uncertainty on human behavior (Webster & Kruglanski, 1994), uncertainty manipulation was predicted to be discouraging for engaging with Wikipedia articles:

H3: Participants who are exposed to uncertainty salience are less willing to engage with Wikipedia articles than participants who are not.

### 2.3. Results for Study 1 and Study 2

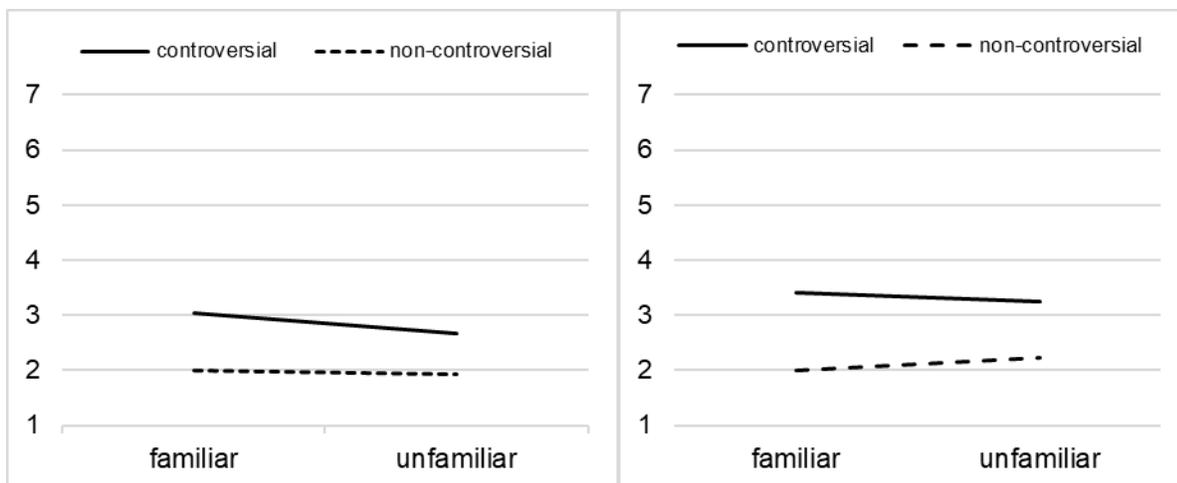
Hypotheses and research questions of Study 1 and Study 2 were tested via mixed ANOVA designs whereby topic familiarity and controversiality were taken as within-participants factors and mortality salience and uncertainty salience as between-participant factors. In both studies, the dependent variable was willingness to engage with articles. Design for Study 1 was 2 (familiar vs. unfamiliar) x 2 (controversial vs. non-controversial) x 2 (mortality salience vs. control). Design for Study 2 was 2 (familiar vs. unfamiliar) x 2 (controversial vs. non-controversial) x 3 (uncertainty salience vs. certainty salience vs. non-salience). The analyses were run on IBM Statistics SPSS 22. Below, findings are presented as results for general topic characteristics and results for threat exposure.

#### 2.3.1. General topic characteristics

**Topic familiarity.** In Study 1, familiarity was found to have a significant effect on willingness to engage with the Wikipedia articles, (H1),  $F(1, 81) = 11.704, p < .001, \eta_p^2 = .126$ . Participants were more willing to engage with familiar ( $M = 2.52, SD = 1.49$ ) than unfamiliar topics ( $M = 2.29, SD = 1.39$ ). However, the same effect was not observed in Study 2, (H1),  $F(1, 87) = 0.409, p = .524$ .

**Topic controversiality.** There was a significant difference in participants' willingness to engage with controversial and non-controversial articles in both studies (H2). Study 1 showed significant results, that participants were more willing to engage with controversial articles ( $M = 2.85, SD = 1.52$ ) than non-controversial articles ( $M = 1.96, SD = 1.20$ ),  $F(1, 81) = 71.245, p < .001, \eta_p^2 = .468$ . A significant difference was also found in Study 2,  $F(1, 87) = 86.999, p < .001, \eta_p^2 = .500$ , between controversial ( $M = 3.33, SD = 1.43$ ) and non-controversial articles ( $M = 2.12, SD = 1.14$ ).

**Interaction effect.** An interaction effect was observed between familiarity and controversiality in both studies (see Figure 2). In Study 1, it was found that participants were most willing to engage with articles that were familiar and controversial ( $M = 3.05$ ,  $SD = 1.21$ ),  $F(1, 81) = 9.844$ ,  $p < .01$ ,  $\eta_p^2 = .108$ . This was also replicated in Study 2,  $F(2, 87) = 8.670$ ,  $p < .01$ ,  $\eta_p^2 = .091$ . The highest level of willingness to engage with articles was observed for the familiar and controversial topics ( $M = 3.41$ ,  $SD = 1.07$ ).



*Figure 2.* Effects of familiarity and controversiality on willingness to engage with Wikipedia in Study 1 (left) and Study 2 (right).

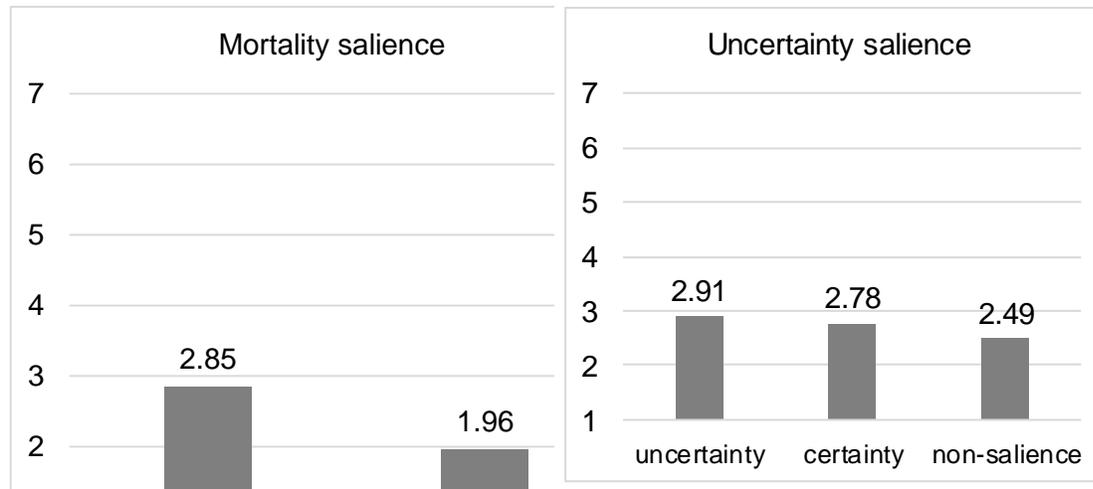
To sum up, these findings yielded supporting evidence for the impact of general topic characteristics on motivation to work with Wikipedia. We supported the literature in so far as people's motivation for participation in Wikipedia depends on their perception of familiarity and controversiality of the topics. By engaging with familiar and controversial topics, users are likely to get the chance to express their opinions on hotly debated social issues that are relevant to their personal lives (Yasseri et al., 2013).

### 2.3.2. Threat exposure

**Mortality salience.** The first threat type, mortality salience, did not show any significant effect on willingness to engage with Wikipedia (RQ1),  $F(1, 81) = 0.676$ ,  $p = .413$ .

Participants who were exposed to mortality induction reported more willingness than the ones in the control condition; nonetheless, the results were not statistically significant (see Figure 3).

**Uncertainty salience.** In Study 2, uncertainty salience had no significant effect on willingness, (H3),  $F(2, 87) = 1.949$ ,  $p = .149$ , although the uncertainty-exposed groups' willingness scores were the highest among the three groups (see Figure 3).



*Figure 3.* Means for the experimental and control groups of Study 1 (mortality salience) and Study 2 (uncertainty salience)

Contrary to expectations, threat induction in the form of mortality and uncertainty did not yield any significant results on willingness to work with Wikipedia. These non-significant effects could indicate that the manipulations might not have been strong enough to alter participants' willingness to engage with Wikipedia. Greenberg and colleagues (Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994) suggest that actual effects occur when the induced thoughts (i.e., mortality or uncertainty) are pushed out of consciousness. Thus, distractions, subtle cues or even time might have prompted the emergence of the manipulation effects. More research is needed to understand whether this could be the case to change Wikipedia users' contributions in the long run.

### 2.3.3. Analysis of mood states

Mood states are crucial factors that could influence internet users' surfing behaviors (Mastro, Eastin, & Tamborini, 2002). Therefore, we additionally took mood states into account in order to understand if mortality and uncertainty manipulations

elicited mood changes. In Study 1 and Study 2, participants were asked to report the emotions that the thought of the given situation, i.e., threat condition or control condition(s), created during the experimental tasks (see section 2.1.1 and 2.2.1). These texts written by the participants were analyzed with the German version of LIWC2001 software (Wolf et al., 2008). This software provides percentages for particular psychological categories by comparing the words in a given text with its own dictionary (for further information see section 3.1.2 and Pennebaker, Boyd, Jordan, & Blackburn, 2015).

In order to assess whether the mortality manipulation resulted in different mood states across conditions, we utilized 'death' and 'negative emotion' categories of LIWC2001 and compared the percentage of words that were expressed by the experimental and control groups. With regard to the death category, we found that mortality group ( $M = 5.74$ ,  $SD = 4.24$ ) wrote significantly more death-related words than the control group, ( $M = 0.96$ ,  $SD = 0.60$ ),  $t(81) = 8.333$ ,  $p < .001$ . A significant difference was also found for the negative emotion category,  $t(81) = 3.527$ ,  $p = .024$ . Mortality-induced group ( $M = 7.66$ ,  $SD = 11.34$ ) reported more words in negative emotion compared to the control group ( $M = 1.22$ ,  $SD = 2.28$ ). Evidently, mortality induction resulted in a negative mood state in the manipulation group.

The category of 'negative emotion' was also used to analyze the differences among groups of uncertainty manipulation. Accordingly, three groups differed significantly in terms of percentage of words they reported in the texts,  $F(2, 87) = 4.901$ ,  $p = .010$ . Uncertainty group ( $M = 4.13$ ,  $SD = 4.35$ ) wrote more negative emotion words than certainty group ( $M = 1.56$ ,  $SD = 2.55$ ,  $p < .01$ ) and non-salience group ( $M = 1.92$ ,  $SD = 3.07$ ,  $p = 0.048$ ). No significant difference was observed between the certainty and non-salience groups ( $p = 0.901$ ). These results suggest that the intended threat effects were actually created within participants. Apparently, though, they were not strong enough to change participants' willingness to work with the articles.

### **3. Wikipedia motivation in relation to characteristics of the content**

Both experimental studies provided strong emphasis on the effects of general topic factors on Wikipedia motivation. Hence, in order to deepen the insights on the topic factors, in the next study I focused on the specific characteristics of Wikipedia articles in relation to article production.

#### **3.1. Study 3 – Role of sentiment and psychological characteristics in article production**

Study 3 examined how specific sentiment and psychological orientations of the content were associated with Wikipedia articles' measures. With an exploratory approach, this study utilized real Wikipedia data extracted from the society portal of the English Wikipedia ( $N=752,083$ ) for two time points in 2015 and 2017. The dataset included lead sections of the articles that were textually analyzed and four descriptive article measures as article length in characters, number of links, number of sections and number of images (see below). The aim of obtaining data from two time points was to assess to what extent content characteristics in one specific time point would predict the future article measures.

##### **3.1.1. Dataset**

Two datasets that belonged to June 2015 (958,697 pages in total) and June 2017 (971,099 pages in total) were extracted from the society portal of the English Wikipedia (<https://en.wikipedia.org/wiki/Portal:Society>). Several filtering criteria were applied on these datasets to exclude pages that could not be considered as 'articles' within the framework of this study. Specifically, portal pages and lists, articles with less than 20 words in the lead sections, and pages that are not defined as article according to Wikipedia principles (i.e., disambiguation pages, file pages, templates, navigation boxes, user pages, Wikipedia policy pages, help pages; Wikipedia, 2018b) were removed. Next, the datasets were matched in order to remove the articles that did not survive from 2015 to 2017 and obtain the same articles in both years. After these procedures, the final dataset consisted of 752,083 articles for both years.

### 3.1.2. Textual analysis of the lead sections

The lead section of a Wikipedia article provides introductory and synoptic information on the topic and is considered as the most representative part of an article (Brändle, 2005). Thus, in order to identify the specific content characteristics of the articles, we ran the textual analysis on these sections. Two lexicon-based methods (i.e., the Hu and Liu approach and LIWC2015) were utilized to analyze the sentiment and psychological characteristics of the lead sections.

*Sentiment characteristics:* Positive-negative sentiment of the lead sections in 2015 and 2017 was measured via the two aforementioned textual analysis tools that are considered as efficient for capturing sentiment of the written material (Buttliere, 2017; Gonçalves et al., 2014). First, the Hu and Liu approach, that compares each word in a given text with its own dictionary compiling of English words, was utilized to obtain the raw number of positive and negative words in the texts (Hu & Liu, 2004). This procedure was run through an R script (Miner, Elder, & Hill, 2012). Positive and negative emotion categories of LIWC2015 software (Pennebaker et al., 2015) provided the percentage for positive and negative words (for detailed information on LIWC2015 see below). In order to have normal distributions, all scores were log-transformed and standardized before the data analysis.

*Psychological characteristics:* LIWC2015 textual analyzer was used to identify the psychological characteristics of the content in both years. LIWC2015 is an automatic linguistic text analysis software that compares the words in the text with its dictionaries and provides the percentage of words per category (Pennebaker et al., 2015, 2003). It has been cited numerous times and validated as an effective tool to identify granularity of textual expressions (Bantum & Owen, 2009; Iliev, Dehghani, & Sagi, 2015). The software mainly identifies the linguistic (e.g., prepositions, auxiliary words, conjunctions) and psychological features (e.g., affect, cognitive processes, social processes). As we were interested in the psychological orientations in the Wikipedia lead sections, we included 34 psychological construct categories of LIWC2015 in the analysis, as seven main and 27 sub-categories (see Table 4). Square-root transformations were applied to

Table 4

*LIWC2015 psychological main and sub-categories that were used in Study 3*

Category	Examples
<b>Affective processes</b>	<b>happy, cried</b>
Positive emotion	love, nice
Negative emotion	hurt, ugly
<b>Social processes</b>	<b>talk, they</b>
Family	daughter, uncle
Friends	neighbor
Female references	her, girl
Male references	his, boy
<b>Cognitive processes</b>	<b>cause, know</b>
Insight	think, know
Causation	because, effect
Discrepancy	should, would
Tentative	maybe, perhaps
Certainty	always, never
Differentiation	but, else
<b>Perceptual processes</b>	<b>look, feeling</b>
See	view, saw
Hear	listen, hearing
Feel	feels, touch
<b>Biological processes</b>	<b>blood, pain</b>
Body	hands, spit
Health	clinic, flu
Sexual	love, incest
Ingestion	dish, eat
<b>Drives</b>	<b>ally, success</b>
Affiliation	friend, social
Achievement	win, better
Power	superior, bully
Reward	prize, benefit
Risk	danger, doubt
<b>Relativity</b>	<b>area, bend</b>
Motion	arrive, car
Time	end, season
Space	down, thin

*Note.* Column 'Examples' consists of words that exemplify each category on LIWC2015 Language Manual.

all categories to produce normally distributed data (DeAndrea, Shaw, & Levine, 2010; Hirsh & Peterson, 2009).

### 3.1.3. Article measures

In Study 3, motivation to work with Wikipedia was measured based on four descriptive features of the articles: article length in characters, number of sections, number of links, and number of images. These article measures have been proposed as simple yet robust characteristics of Wikipedia articles that could provide solid information on the article quality (Blumenstock, 2008; De la Calzada & Dekhtyar, 2010; Wilkinson & Huberman, 2007; Zesch, Müller, & Gurevych, 2008). In order to create a single *article metric* that could represent these four measures, factor analyses were run by combining the measures in each year. Analysis yielded one component for each year; among the measures length was the most representative one that showed the highest correlation with the article metric in both years (see Table 5 and Figure 4).

Table 5

*Factor analysis results for article measures in 2015 and 2017*

	<i>r</i>		variance explained		component	
	<u>2015</u>	<u>2017</u>	<u>2015</u>	<u>2017</u>	<u>2015</u>	<u>2017</u>
Length	0.99	0.99	0.98	0.98	1	1
Sections	0.76	0.76	0.58	0.58	1	1
Links	0.88	0.88	0.77	0.78	1	1
Images	0.46	0.48	0.21	0.23	1	1

*Note.* In order to create normal distributions, standardizations were applied on the article measures. Standardized versions are included in the factor analysis. *r* is the strength of the relationship between the individual measures (e.g., length) and the overall metric.

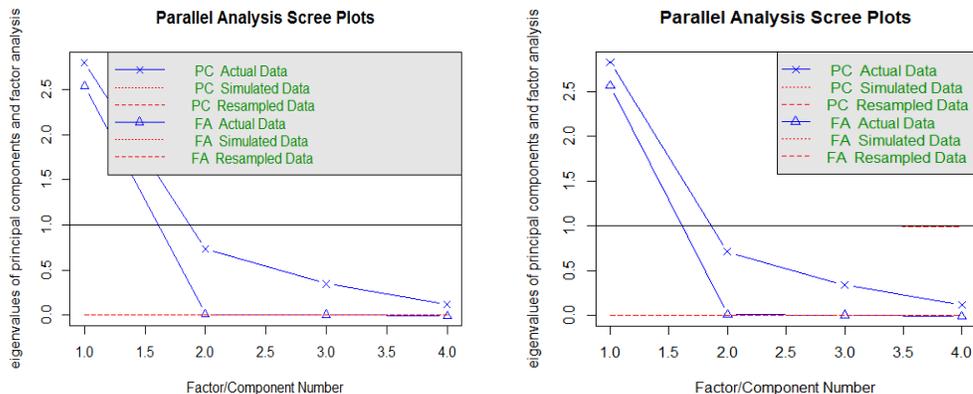


Figure 4. Plots for factor analysis of the article metric for 2015 (left) and 2017 (right).

### 3.1.4. Research questions

Study 3 aimed to answer three research questions. First, in order to understand Wikipedia editors' tendency to produce article measures in relation to positive and negative content, we aimed to identify the specific relationship between positive and negative sentiment, and article measures:

RQ2: To what extent is positive and negative content in Wikipedia lead sections related to the article measures in each year?

Basing upon previous literature that suggested a spillover of different psychological processes into articles, our goal was to capture potential psychological characteristics of the article content in a systematic way:

RQ3: To what extent are different kinds of content based on psychological processes related to the article measures in each year?

With the aim of providing a causal understanding on the relationship between content characteristics and article measures, the following research question was constructed by including characteristics from two time points:

RQ4: How do the content characteristics of the lead sections' in a specific time point (T1) predict future article measures (T2)?

### 3.2. Results for Study 3

Relationships between sentiment and psychological characteristics of the content and article metric (obtained via factor analysis) were examined within data extracted in 2015 and 2017. In these examinations, sentiment and psychological characteristics were taken as the predictor variables, and article metric was the outcome variable. Due to having a large dataset,  $p < .01$  was considered as the significance level for the analysis. All analyses were run on software “R Studio”.

#### 3.2.1. Sentiment characteristics

##### *Descriptive findings*

In order to examine the positivity-negativity patterns in the Wikipedia article production, we first ran the Hu and Liu and LIWC2015 methods on the lead sections of the articles, and compared numbers (obtained via the Hu and Liu approach) and percentages (obtained via LIWC2015) of positive and negative words that existed in these sections in both years. As all variables were positively skewed and non-normally distributed, Mann-Whitney U-tests were used for the comparisons. Table 6 provides the descriptive results and results of U-test comparisons. Specifically, number of positive words significantly outnumbered the number of negative words in both 2015 and 2017 ( $p < .001$ ). Percentage of positive words was also significantly higher than the percentage of negative words in both years ( $p < .001$ ). Thus, these findings demonstrate that positive content appeared more frequently than negative content in our dataset.

Table 6

*Differences between positive and negative content in 2015 and 2017*

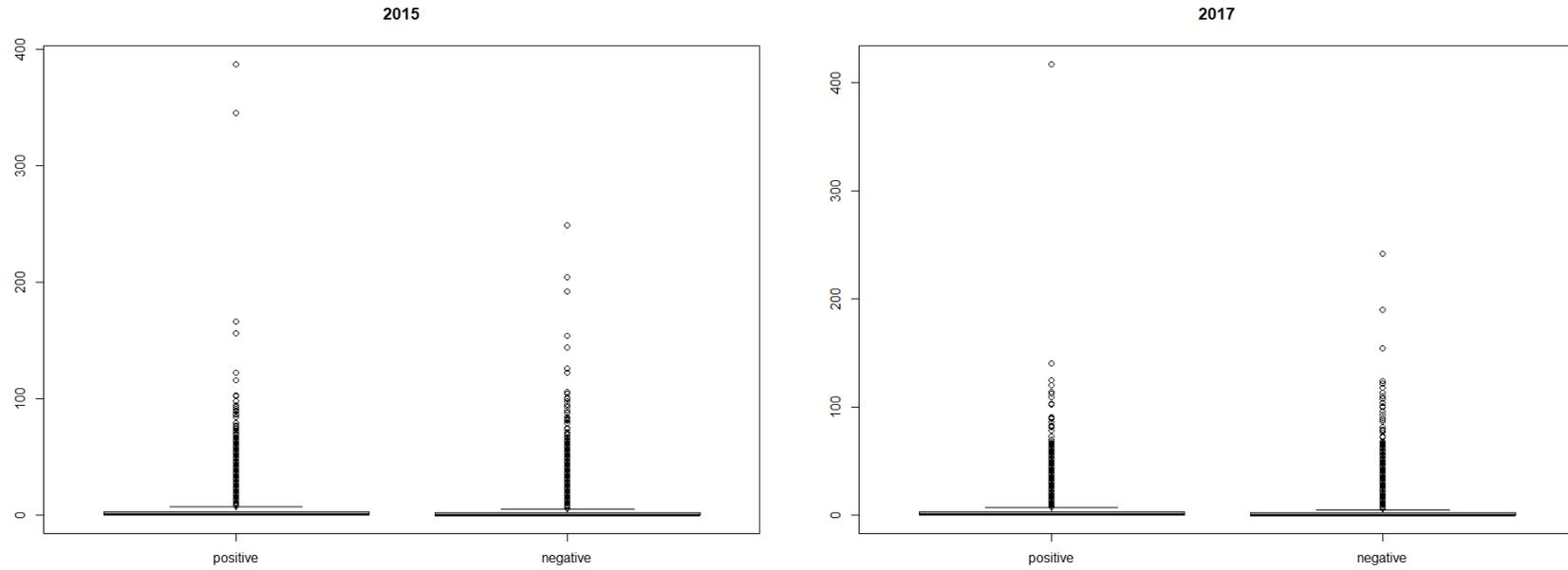
	Year	Positive sentiment <i>M (SD)</i>	Negative sentiment <i>M (SD)</i>	<i>U</i>
Difference in numbers (Hu and Liu approach )	2015	2.44 (3.69)	1.56 (2.99)	3.3839e+11
	2017	2.40 (3.63)	1.53 (2.94)	3.3817e+11
Difference in percentages (LIWC2015)	2015	1.69 (2.03)	0.69 (1.32)	3.7898e+11
	2017	1.69 (2.03)	0.68 (1.31)	3.791e+11

*Note.* Means (*M*), standard deviations (*SD*) and comparison analyses (*U*) were obtained based on the unstandardized versions. *p*-value is <.001 for all comparisons.

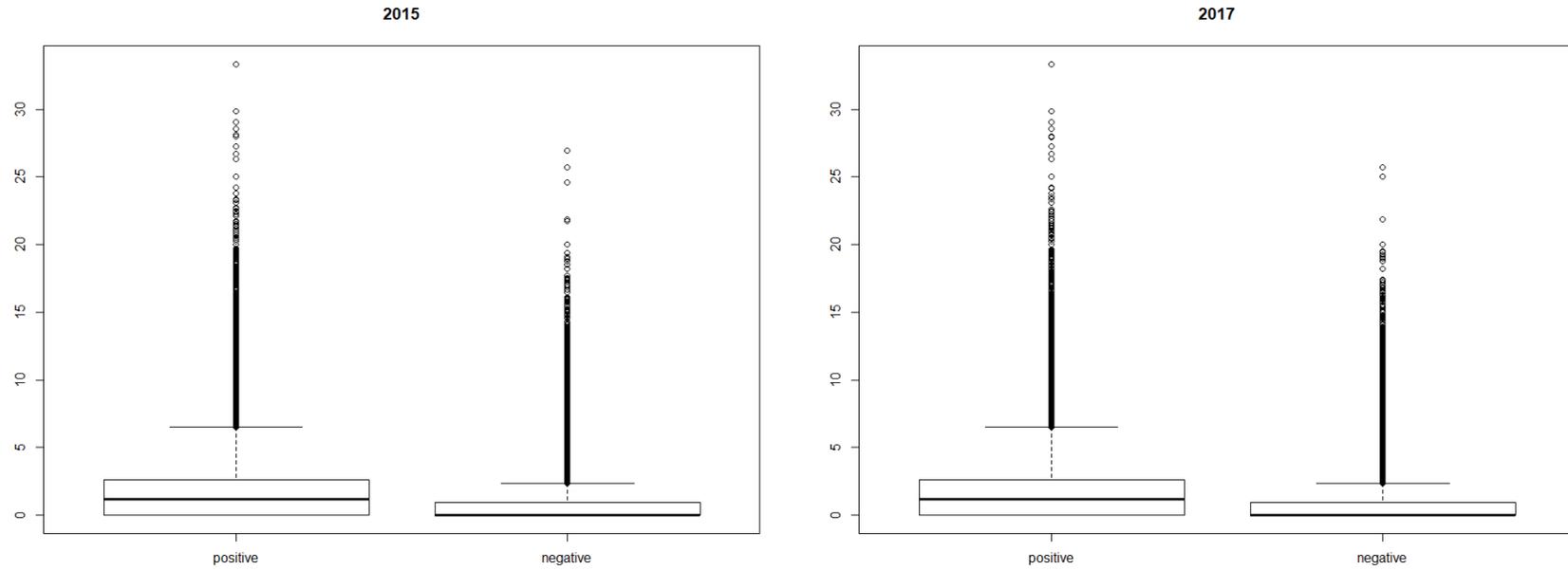
Figure 5 and Figure 6 illustrate the comparisons in boxplots. What Figure 5 shows is that in both years, scores for the number of positive words are centered at *Mdn (Median)* = 1 and negative words at *Mdn* = 0. In terms of percentages in Figure 6, positive scores are centered at *Mdn* = 1.18 and negative scores at *Mdn* = 0 in both years. The median score of 0 for the number and percentage of negative words in each year (i.e., the center of data is 0 for each variable) suggests that more than half of the articles did not have any negative sentiment in their lead sections. Articles whose lead sections did not contain any positive sentiment consisted of about 1/3 (~35%) of the dataset.

*Relationships between sentiment characteristics and article metric*

Next, correlation analyses were applied to measure the relationship between positive and negative sentiment and the article metric in two time points (RQ2; see Table 7). First, the results were obtained for the number of positive and negative words (obtained via the Hu and Liu approach). Specifically, number of positive words positively and significantly correlated with the article metric for 2015 and 2017. Number of negative words, however, did not show any significant relationships for 2015 or 2017. Article metric had positive significant relationships with the percentage of positive words as well as negative words in both years (obtained via LIWC2015).



*Figure 5.* This figure depicts the distribution of frequencies for number of positive and negative words in 2015 and 2017. In both years, scores for the number of positive words are centered at  $Mdn = 1$  and negative words at  $Mdn = 0$ , pointing out that more than half of the lead sections in 2015 ( $n=378,653$ , 50.3%) and in 2017 ( $n=381145$ , 50.68%) did not contain negative words at all.



*Figure 6.* This figure depicts the distribution of frequencies for percentage of positive and negative words in 2015 and 2017. In both years, scores for the percentage of positive words are centered at  $Mdn = 1.18$  and negative words at  $Mdn = 0$ , pointing out that more than half of the lead sections in 2015 ( $n= 469418$ , %62.41) and in 2017 ( $n= 471739$ , %62.73) did not contain negative words at all.

Table 7

*Correlations between positive and negative sentiment and the article metric in 2015 and 2017*

	<i>r</i> 2015	<i>r</i> 2017	<i>p</i> -value
Number of positive words*	0.070	0.069	< .001
Number of negative words*	0.000	-0.000	=0.57, 0.77
Percentage of positive words	0.100	0.102	< .001
Percentage of negative words	0.064	0.070	< .001

*Note.* *r* represents the strength of the correlation.

\*Partial correlation analyses were implemented controlling for the number of total words.

Overall, the findings suggest that the lead sections were neutral to some extent as ~35% of the articles did not contain any positive and ~50% did not contain any negative sentiments. While this finding is in line with the NPOV principle of Wikipedia, comparisons revealed statistical superiority for the positive sentiment rather than negative. This result supports the “Pollyanna hypothesis” that points out a universal human tendency to use more positive words (Boucher & Osgood, 1969). People prefer to communicate with positive words as they provide positive feelings for them (Garcia, Garas, & Schweitzer, 2012). Although Wikipedia articles (excluding the talk pages) are not means of communications per se, they still lend to knowledge transmission and exchange that is reinforced by the positive emotions among people. Thus, it would be reasonable to state that Wikipedia editors may also be more inclined to transmit positive (e.g., comedy awards) rather than negative information (e.g., battles).

Correlation results demonstrated small but significant relationships for the positive and negative sentiment and article measures. The only variable that did not correlate with the article metric was the number of negative words. In general, these results are consistent with the co-activation emotion theories that people experience positive and negative affective processes in parallel rather than separately (Berrios et al., 2015).

### 3.2.2. Psychological characteristics

#### *Descriptive findings*

Table 8 exhibits the descriptive results for the LIWC main psychological categories that were identified in the lead sections in 2015 and 2017. On average, the highest percentage was observed for the category of “relativity” with 14.88% for both years whereas the category of biological processes had the lowest average mean in both years.

Table 8

#### *Descriptive findings for the main LIWC categories in 2015 and 2017*

	2015 <i>M</i> ( <i>SD</i> )	2017 <i>M</i> ( <i>SD</i> )	LIWC examples
Relativity	14.88 (5.93)	14.88 (5.91)	area, bend
Drives	5.74 (4.12)	5.75 (4.12)	success, superior
Social processes	4.57 (3.78)	4.55 (3.75)	talk, they
Cognitive processes	4.13 (3.54)	4.11 (3.53)	cause, know
Affective processes	2.4 (2.45)	2.39 (2.45)	happy, cried
Perceptual processes	1.25 (1.97)	1.23 (1.96)	look, heard
Biological processes	0.89 (1.76)	0.88 (1.76)	eat, blood

*Note.* Means (*M*) and standard deviations (*SD*) were obtained based on the unstandardized versions. LIWC examples are the example words from the LIWC2015 Manual that represent each category.

All categories significantly differed from 0 in both years ( $p < .001$ ) suggesting that lead sections included words from all psychological categories to a particular extent (see Figure 7). Among them, more than half of the articles did not have any words about perceptual processes (50.38% in 2015 and 50.85% in 2017) and biological processes

(57.45% in 2015 and 57.82% in 2017) in their lead sections (i.e., the center of the datasets were  $Mdn=0$ ).

*Relationships between LIWC psychological categories and article metric*

Correlation analyses demonstrated significant positive relationships between seven main LIWC psychological categories and the article metric for both time points at  $p < .001$  (RQ3; see Table 9). The top two correlated categories, affective processes and drive, were further broken into their subcategories to provide a more fine-grained explanation for the relationship between psychological content and article measures. Two subcategories of the affective processes, positive and negative emotions, positively and significantly correlated with the article metric in both years. There were also positive significant relationships between article metric and five drive subcategories: achievement, reward, power, affiliation, and risk (see Table 10).

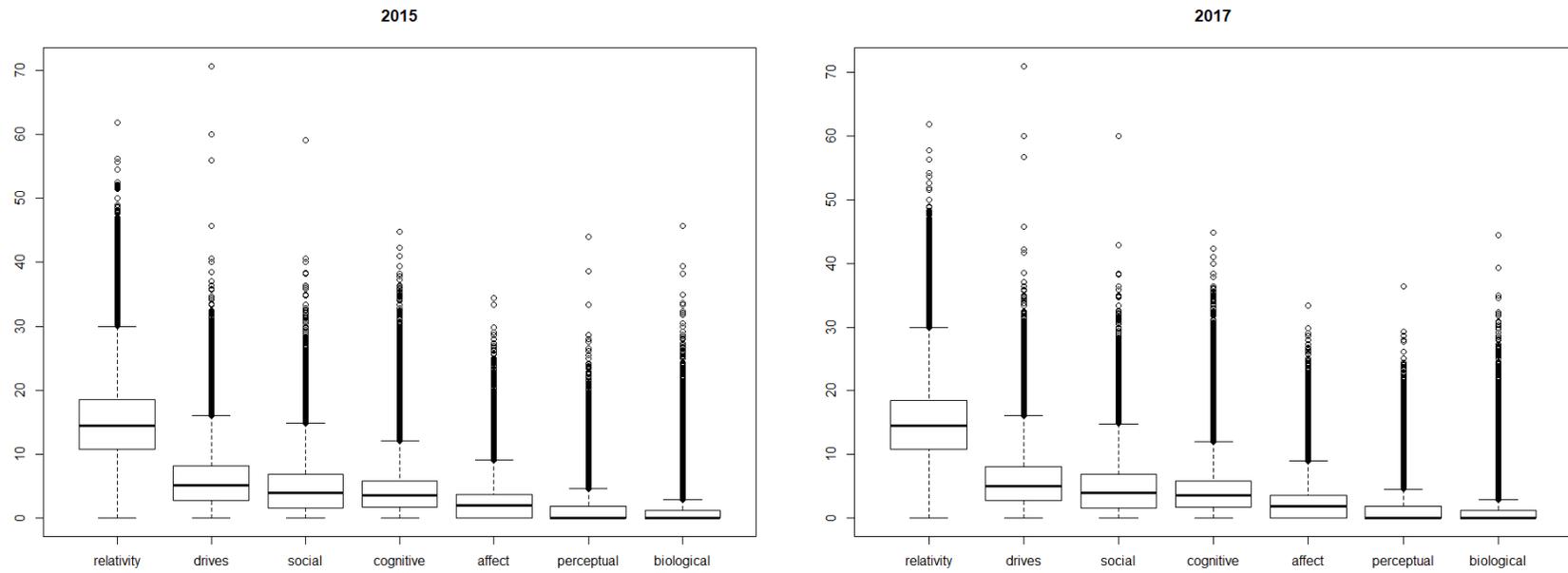
Table 9

*Correlations between LIWC main categories and the article metric in 2015 and 2017*

	<i>r</i> 2015	<i>r</i> 2017	<i>LIWC examples</i>
Affective processes	0.104	0.107	happy, cried
Drives	0.096	0.098	success, superior
Cognitive processes	0.070	0.078	cause, know
Relativity	0.026	0.029	area, bend
Social processes	0.021	0.015	talk, they
Perceptual processes	0.003	0.008	look, heard
Biological processes	-0.012	-0.007	eat, blood

*Note.* *r* represents the strength of the correlation. *p*-value is  $< .001$  for all correlations.

LIWC examples are the example words from the LIWC2015 Manual that represent each category.



*Figure 7.* This figure depicts the distribution of frequencies for each LIWC main category in 2015 and 2017. Median splits (*Mdn*) for respectively 2015 and 2017 are as following: relativity (14.49, 14.47), drives (5.08, 5.08), social processes (3.91, 3.9), cognitive processes (3.54, 3.51), affective processes (1.92, 1.91), perceptual processes (0,0) and biological processes (0,0).

Table 10

*Correlations between the most correlated subcategories and the article metric in 2015 and 2017*

	<i>r</i> 2015	<i>r</i> 2017	<i>Wikipedia article examples</i>
<i>Affective processes</i>			
Positive emotion	0.100	0.102	“Free Democratic Party”, “Romantic comedy film”
Negative emotion	0.064	0.070	“Intentional harassment, alarm or distress”, “Infiltration tactics”
<i>Drives</i>			
Achievement	0.107	0.111	“WCW World Tag Team Championship”, “First-mover advantage”
Reward	0.090	0.095	“Asian Footballer of the Year”, “Betting strategy”
Power	0.102	0.105	“Workers' Revolutionary Party”, “Master warrant officer”
Affiliation	0.035	0.037	“Communist Workers League”, “Social Christian Party”
Risk	0.038	0.045	“Ministry of Public Security”, “Problem finding”

*Note.* *r* represents the strength of the correlation. *p*-value is < .001 for all correlations. Article examples are among the top 100 articles listed in the respective categories.

### *Causal relationship*

In order to assess to what extent the content characteristics of a lead section in T1 could predict the article measures in T2, the key characteristics of 2015 were related to the article metric of 2017 (RQ4). Earlier analyses suggested that LIWC's categories of affective processes (positive emotion and negative emotion) and drive (achievement, reward, power, affiliation, and risk) were the most prominent characteristics. Thus, a correlation analysis was run between these seven subcategories in 2015 and article

metric in 2017, whereby significant positive correlations were observed (see Table 11). Also, multiple regression analysis showed that the model was a good fit and accounted for 2% of the variance in article metric,  $R^2 = 0.019$ ,  $F(7, 752075) = 2119$ ,  $p < .001$ .

Table 11

*Correlations between content in 2015 and the article metric in 2017*

	<i>r</i>	$\beta$	<i>SE</i>	<i>t</i> -value
Affective processes				
Positive emotion	0.095	0.046	.00	97.67
Negative emotion	0.062	0.032	.00	33.36
Drives				
Achievement	0.102	0.045	.00	26.06
Reward	0.087	0.020	.00	14.27
Power	0.098	0.060	.00	48.68
Affiliation	0.031	0.004	.00	4.00
Risk	0.038	0.007	.00	6.40

*Note.* *r* refers to the strength of the correlation with the article metric; *p*-value is  $< .001$  for all correlations.  $\beta$  refers to what extent each predictor affects the article metric if all other predictors are held constant, and *SE* represents the standard errors. *t* shows the contribution level of each predictor to the model; in this model, all contributions are significant with a *p*-value of  $< .001$ .

To sum up, the fact that lead sections included all psychological categories to a certain extent points out the spillover of editors' psychological characteristics into article production (Cress, Feinkohl, Jirschitzka, & Kimmerle, 2016; Greving et al., 2017). Among those, relativity-related words were the most prevalent to have been found in the lead sections. In our dataset, these articles were mainly about places, geographical regions and time periods (e.g., West Central District, Ballyhoura Mountains, Public holidays in Cyprus) that often contain descriptive information such as locations or dates. Hence, it is reasonable to have such content in an encyclopedic platform such as Wikipedia.

Significant relationships with the article metric also strengthened the spillover effect suggesting that as the lead sections' content increased in psychological characteristics, the articles became longer and contained more links, images and sections. Among these categories, affective and drive states yielded the strongest relationships, which shows that the Wikipedia community produced more article features related to emotional experiences and challenging notions that mainly direct people's life outcomes (Leung, Zhu, & Konstan, 2017; Rafaeli & Ariel, 2008; Siegling & Petrides, 2016). Furthermore, the subcategories of affective and drive states provided a more parsimonious explanation on article production, that is, these content characteristics at one specific time point could predict the variance in future article measures to some extent.

Results of Study 3 are limited with small statistical values. Also, having a big sample size made even small differences statistically significant by traditional measures. Although these issues make it difficult to generalize the findings, this study still provided solid insights about the extent that sentiment and psychological content in the lead sections played roles in the article measures created by the Wikipedia editors.

## **4. General Discussion**

### **4.1. Summary and conclusions**

The main goal of this dissertation was to explain Wikipedia motivation by grounding on the person-object-environment paradigm that defines human behavior as the product of associations of person-object and person-environment. The presented work made use of this paradigm within Wikipedia motivation context by taking general and content-specific factors of the topic as the object and threat exposure as the environmental factor. Results contribute to the understanding of what motivates people to take part in the Wikipedia knowledge construction process and more generally support that Wikipedia is a 'human-empowered' platform that mirrors people's psychological characteristics, and social and emotional experiences.

First, I was able to highlight the crucial role of topic factors (object) on Wikipedia motivation. Findings emphasize the importance of personal and community interests in

engagement with the platform (Nov, 2007). For instance, our German sample in Study 1 and Study 2 indicated more interest in Germany-related controversial topics that could have impacts on their lives on personal and social levels. This supports the reflection of sociopolitical concerns in the Wikipedia activities (Ferron & Massa, 2011; Yenikent & Kimmerle, 2018). Community interest could be inferred based on the most popular psychological content that was produced by the editors of Wikipedia's society portal. This portal includes articles about cultural, historical, and societal accomplishments, movements, and challenges; thus, an editor who is active on this portal is likely to be interested in such topics. It is then not surprising for my work to have demonstrated that content associated with drive notions such as achievements, rewards, and power, was significantly related to the higher levels of article production, for instance, in the form of longer articles. Motivation for Wikipedia was also highly linked to topics that had both positive and negative emotional references (Cacioppo et al., 1999). Although positive sentiment was more prevalent, it would be reasonable to state that an editor could participate in the knowledge creation process to engage with not only pleasant topics (e.g., championships, awards) but also negative and unpleasant ones (e.g., wars, problems).

Results with regards to the threat exposure does not confirm the environment aspect of the person-object-environment model. Findings suggest that being exposed to a threat during Wikipedia use was not a significant factor that could influence motivation to work with the articles. This is also quite contrary to the literature that suggests the embeddedness of threat cues in the daily life. One potential explanation would be that internet environment may be so virtual to create a real sense of threat. Thus, the threat-related cues might not be strong enough to change the levels of motivation in the online context where users could easily alienate themselves from the environment (Sobkowicz & Sobkowicz, 2010). In fact, we found that negative mood states occurred following the threat manipulations; however, they did not seem to be sufficient to trigger compensation behaviors in the face of an online threat. Further research could address the intensity of threat manipulations in terms of creating negative moods and to measure the effects in the presence of distractions or more indirect cues (e.g., threat-evoking pop-up ads).

## 4.2. Contributions and limitations

One strong contribution of this dissertation is the robust theoretical framework that is enriched by classical psychology theories based on person-object-environment paradigm, and interest and threat literatures. Earlier studies touched upon the issue by utilizing different motivational frameworks. This work, though, has adopted a more systematic approach by handling the Wikipedia motivation as a behavioral result of interest-based relations with concrete objects such as topics and contingent environmental cues. Apart from introducing a new examination platform for the issue of Wikipedia motivation, this approach solidifies the successful application of psychological approaches into the Wikipedia context.

Methodologies utilized in the studies also strengthens the research approach of the dissertation. The use of different types of methods (experimental and textual analysis) and settings (laboratory and actual Wikipedia data) provided a neat combination of classical and innovative methods. On one hand, experimental studies applied classical psychology methods basing the results on controlled conditions. Comprehensive textual analysis that encompassed recent NLP technologies, on the other hand, allowed to examine real and raw data from the natural setting of the Wikipedia environment. The studies also supported the use of lead sections as a distillation of an entire Wikipedia article (Wagner, Graells-Garrido, Garcia, & Menczer, 2016). I argue that lead sections could effectively be employed by future investigations that aim to handle Wikipedia articles in a rather compact way. This could give researcher(s) an easy, less-time consuming and practical examination of the article content.

One general limitation of the studies is the lack of examination of personal characteristics. Personal biases play significant roles in Wikipedia content creation (Oeberst et al., 2017). Thus, it would have been reasonable to take personal opinions (e.g., on topics, Wikipedia platform itself) into account in terms of comprehending the potential interactions with the motivation to participate in Wikipedia and also in terms of completing the person-object-environment paradigm. The work is also limited in handling the threat induction in a laboratory environment. Although experimental

manipulation of mortality and uncertainty saliences in controlled settings is consistent with earlier approaches, it may not be very well-matched with the Wikipedia case which contains more contingent and virtual environmental cues.

### **4.3. Implications**

Findings of the studies could have some implications in terms of personalized topic suggestions for boosting the motivation of the Wikipedia editors. Tailored queries and recommendations based on different types of familiar/controversial and community-specific topics would provide user-oriented and noise-free experiences for the editors. These suggestions could then lower editors' cognitive efforts on decision making and help channel their attention on topics that they are genuinely interested in, which in return would result in higher knowledge quality (Mele, 2013; Nguyen et al., 2014).

Another important implication would be related to the relevance of sociopolitical and affective topics as a simulation of the real life. Also in line with Wikipedia's role as a social movement activity and community aspect, it would be beneficial to promote the social, cultural and emotional aspects of the communication among the editors to keep the motivation alive. One specific suggestion would be to support regional and cultural networks by, for instance, encouraging editors to create more language-oriented articles (as language is usually specific to regions and countries) to enrich the content and social context of the platform. These experiences could create more functional irritations that would again foster a more effective knowledge construction process (Cress & Kimmerle, 2008).

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### Appendix A – Explanation concerning the details of the collaboration

Studies included in this dissertation were conducted in collaboration with other researchers other than the submitting PhD student. These researchers' names and contributions in the projects are indicated below:

Author	Author position	Scientific ideas %	Data generation %	Analysis & interpretation %	Paper writing %
Seren Yenikent (submitting PhD student)	1	40	80	60	70
Peter Holtz	2	30	20	30	15
Joachim Kimmerle	3	30	-	10	15
Title of paper:		The impact of topic characteristics and threat on willingness to engage with Wikipedia articles: Insights from laboratory experiments			
Status in the publication process:		Published			

Author	Author position	Scientific ideas %	Data generation %	Analysis & interpretation %	Paper writing %
Seren Yenikent (submitting PhD student)	1	75	25	60	85
Brett Buttlere	2	15	25	30	5
Besnik Fetahu	3	-	50	-	-
Joachim Kimmerle	4	10	-	10	10
Title of paper:		Textual Analysis of Wikipedia Lead Sections: Sentiment and Psychological Orientation of the Content and Their Relationships with Article Measures			
Status in the publication process:		Unpublished manuscript			

I/We certify that the above statement is correct.

19.11.2018 

Date, Signature of the doctoral committee or at least of one of the supervisors