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**READING NEWS ON SMARTPHONES: HOW DO MOOD, MODALITY
INTERACTIVITY, AND NEWS STORY LENGTH INFLUENCE USER
ENGAGEMENT?**

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ABSTRACT

Reading news on smartphones has become a primary activity among smartphone users. A 2 (Mood: Positive vs. Negative) x 2 (Modality Interactivity: Scrolling vs. Swiping) x 2 (Length: Long form vs. Short Form) x 2 (Topic: Zika vs. West Nile) between subject experiment ($N = 332$) was conducted to examine the effects of mood, modality interactivity, news story length, and topic on user engagement under the context of smartphone news reading.

Results showed mood, modality interactivity, or news story length had no direct impact on user engagement. However, there was a combinatory effect of mood, length, and topic on dimensions of user engagement. When reading stories about Zika, happy readers showed more curiosity toward the long form story than the short form story. Sad readers showed equal curiosity toward the long form Zika story and the short form Zika story. Participants in the sad mood condition reading stories about the West Nile virus showed more curiosity toward the long form news story compared with the happy readers. Participants in the happy mood condition showed more curiosity toward the short form news story compared with the sad readers.

A significant three-way interaction among mood, length, and topic on credibility was also discovered. The long form Zika story was generally perceived as more credible than the short form news story regardless of the mood condition. Sad readers perceived the short form story as more credible than the long form story about West Nile. Happy readers perceived the short form West Nile story as equally credible as the long form story.

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Chapter 1

Introduction

With the development of the Internet of Things (IoT), mobile devices have become ubiquitous in the United States with about 44 percent of US adults owning one. People use smartphones for a variety of reasons such as sending or receiving emails, reading news, playing games, checking social networking sites (SNSs), reading books, watching movies, shopping, and reading magazines (Mitchell, Rosenstiel, Santhanam, & Christian, 2012). Among these activities, reading news is the second most popular activity among mobile phone users (Mitchell et al., 2012).

Reading the news on mobile devices has become a habitual activity. Pew Research Center surveyed more than 9,500 U.S. adults from June to August 2012 to examine news consumption during the era of mobile digital technology. Research showed 62 percent of smartphone users read news weekly, and about 36 percent of them read news daily (Mitchell et al., 2012). Additionally, about 53 percent of users regularly check headlines on smartphones, and another 32 percent check headlines on smartphones sometimes (Mitchell et al., 2012). On average, people spend about 54 minutes each day checking news on their smartphones (Mitchell et al., 2012).

The popularity of mobile news reading has triggered many communication studies investigating the uses and gratifications of news consumption on mobile devices. Researchers have studied the motivations of reading, checking, and sharing news on social media (Choi, 2016; Lee & Ma, 2012); the motivations of news consumption on smartphones (Cham-Olmstad, Rim & Zerba, 2012; Shim, You, Lee & Go, 2015); and the motivations of consuming news through multiple media platforms such as newspaper and radio (Chan, 2015; Van Damme, Courtois,

Verbrugge & Marez, 2015). Additional research has examined news uses on social media, which is often accessed via a smartphone.

Choi (2016) examined three types of news uses – news reading, news posting, and news sharing on social media. She found “getting recognition” was a significant predictor of news posting. Getting recognition refers to the extent to which users can establish personal identity, gain respect, build confidence and publicize one’s expertise (Leung, 2009). The “entertainment” motivation was positively associated with news reading and news endorsing. Choi (2016) also found those who have an internet-based news repertoire, which refers to frequent users of the internet, were more likely to read, share, and post news on SNSs. Meanwhile, those who have many mobile devices were found to participate in news reading more frequently.

Lee and Ma (2012) found people’s prior experience of sharing and socializing on social media were the two most salient factors influencing the intention to share news on social media. Moreover, status seeking, which refers to one’s desire to establish or improve one’s credibility, self-confidence, and self-esteem, were strongly associated with intention to share news on social media.

Researchers have also examined motivations of news consumption on smartphones (Chan-Olmsted, 2012; Shim et al., 2015). Shim et al. (2015) explored the structural relationships among smartphone users’ perceptions of the suitability of political news and entertainment news, users’ motivations for consuming news on smartphones, and the users’ behavioral patterns. They discovered information-seeking determined mobile news usage.

A user’s perceived relative advantage of a new technology refers to the degree to which online news sources are capable of producing interactive, multimedia content such as online forums, searchable news archives, links to related stories, frequent updates, and web casting

(Chan-Olmsted, 2012). Perceived utility and ease of use refers to the degree to which mobile technology is useful and easy to use (Chan-Olmsted, 2012). Chan-Olmsted et al. (2012) found perceived relative advantage of a new technology and perceived utility and ease of use contributed to news adoption. Young adults' news consumption patterns and preferences, as well as media usage, all played roles in mobile news adoption.

Additional research examining mobile news studies checked the impact of using more than one medium for either hard news consumption or soft news consumption (Chan, 2015; Van Damme et al., 2015). Hard news refers to stories about events currently taking place in the world (e.g., disasters, war, or stories about international leaders); while soft news refers to more tabloid-like coverage, personality-centered and less time sensitive news. Chan (2015) found most individuals were multiplatform users, utilizing a mix of the television, the Internet, and a smartphone to access news content. In addition, information seeking was the primary gratification when people read mobile hard news while passing time was the strongest gratification for mobile soft news.

Van Damme et al. (2015) discovered three types of news consumers: the omnivores, the traditionals, and the serendips. Omnivores actively engaged with news originating from multiple sources, including online, broadcast, and mobile news (Van Damme et al., 2015). Traditionals were characterized by an intensive news diet, yet they stayed loyal to a traditional news pattern by seeking news updates via the radio, television, and newspapers (Van Damme et al., 2015). Serendips had less specific news routines. When they were engaged with news, the news were usually presented on digital outlets (Van Damme et al., 2015).

Mobile news reading studies in the field of Human Computer Interaction (HCI) have focused on improving the user experience of mobile news reading (Lu, Wang, & Ma, 2013;

Motamedi & Choe, 2015; Øie, 2012). For example, Øie (2012) examined the user experience of reading news based on the location of the reader. Results showed users found news selected based on the reader's location is more interesting and more informative than news not location based.

People consume news not only in different locations but also across multiple platforms. Lu et al. (2013) examined the user experience of news reading on three platforms: iPhones, iPads, and desktop computers. They found users across the three platforms had similar perspectives on the organizations of the news, the timeliness of the news, the need for more powerful image search functions and algorithms, and better visibility of menus/buttons. Compared with desktop users, iPhone users wanted more efficient use of space on web pages, less typing, more user control and flexibility, and more sharing options via social media.

Motamedi and Choe (2015) examined the effects of display mode (full screen vs. pop-out) and orientation (vertical vs. horizontal) on user experience of reading news on smartphones. The full screen mode displays news all at once, while the pop-out mode displays news in an additional window. They found the full screen mode is the most popular method for performing tasks such as finding, re-finding, and reading; while the pop-out mode is a better method for browsing. In addition, compared with reading news on a pop-out mode, reading news on a full screen mode is rated as having a higher level of efficiency and compatibility. Moreover, users enjoyed reading news vertically more than horizontally.

The latest findings from Pew Research Center indicate people prefer to read long-form articles (articles with a word count of more than 1,000 words) than short-form articles (articles with a word count of 101 to 999 words) on their smartphones (Mitchell, Stocking, & Matsa,

2016). Nearly 11 percent of smartphone owners read in-depth news regularly, and about 50 percent of the smartphone owners read in-depth news sometimes (Mitchell et al., 2012).

Since many people read long form articles on their smartphones, page-flipping interaction techniques such as scrolling and swiping are important. Page-flipping techniques such as scrolling and swiping could be conceptualized as modality interactivity, which refers to interface tools that afford users greater activity, resulting in greater depth and breadth of mentally representing and experiencing mediated content (Sundar, 2007).

HCI researchers have been trying to develop systems to recommend news stories based on people's mood by using affective computing, which refers to machines being able to recognize, express, model, communicate, and respond to emotional information (Picard, 2003). For example, Parizi and Kazemifard's (2015) system connected a news story's tone with the user's preferences so he/she received news based on his/her current moods. Additionally, Verhavert, Vanattenhoven, and De Groof (2013) developed four modes of stories in order to improve the reading experience with mood-based content selection. These four modes were: the latest stories mode displays news with quick and short facts; the couch mode displays more elaborate news stories explaining different opinions on the same subjects; the inspire mode displays thought-provoking articles; and the play mode displays news with fun and not-so-serious facts.

Given that both modality interactivity and mood can impact news reading experiences on smartphones, this dissertation examines the effects of mood, modality interactivity, and news story length on smartphone news reading experience by assessing user engagement with news. The second goal of this study is to extend the Interactivity Effects Model (IEM) (Sundar, 2007) by adding mood as an element to modality interactivity. Previous studies utilizing IEM explored

the combinatory effects of modality interactivity and arousal on persuasion (Xu & Sundar, 2014). Although arousal is closely related to mood, the difference between these two concepts is significant in that arousal is only one dimension of mood. Xu and Sundar (2014)'s study did not examine mood in terms of valence (positive vs. negative). Examining the interaction effects of mood from the valence perspective and modality interactivity could provide greater nuance to IEM.

Chapter 2

Interactivity

Interactivity is a multi-dimensional construct. Many scholars consider interactivity as a three-dimensional construct (Kiouisis, 2002; Liu & Shrum, 2002; McMillan & Hwang, 2002). Kiouisis (2002) conceptualized interactivity as the degree to which a communication technology can create a mediated environment; the degree to which participants can communicate both synchronously and asynchronously and participate in reciprocal message exchange; and the degree to which a user perceives the experience as a simulation of interpersonal communication and increases awareness of telepresence.

Liu and Shrum (2002) posited active control, two-way communication, and synchronicity were the three dimensions of interactivity. Active control refers to the voluntary and instrumental action that directly influences the controller's experience (Liu & Shrum, 2002). Two-way communication refers to the ability for reciprocal communication between companies and users, and users with other users (Liu & Shrum, 2002). Synchronicity refers to the degree to which users' input into a communication and the responses they receive from the communication are simultaneous (Liu & Shrum, 2002). Similarly, McMillan and Hwang (2002) conceptualized interactivity as two-way communication, humans have control toward the communication, and speed of communication.

Other scholars consider interactivity as having more than three dimensions (Burgoon, Bonito, Ramirez, Dunbar, Kam, & Fischer, 2002; Heeter, 1989; Johnson, Bruner, & Kumar, 2006; McMillan, 2000). For example, McMillan (2000) posited websites with interactivity should have five features: enable two-way communication, allow visitors to submit updates to records and schedules, use place based metaphors, use a sitemap, and have searchable records

and schedules.

Burgoon et al. (2002) posited interactivity could be viewed from two perspectives: **property** and **process**. From the **property** perspective, communication formats with high interactivity are dependent on prior contributions, interactants are physically co-present, participants are in the same location, interaction occurs in real time, all actors are both senders and receivers of verbal and nonverbal messages and feedback, participants have full access to a wide array of sensory information, the interaction interface mimic humans, and participants are known to each other.

From the **process** perspective, a communication format is perceived as more interactive to the extent it manifests high cognitive, sensory, visceral, and motor engagement; has a sense of “connectedness,” and has well-defined notions of “me,” “you,” and “us” (Burgoon et al., 2002).

Interactivity can also be viewed as **objective interactivity** versus **perceived interactivity**. **Objective interactivity** refers to the features of a medium or capability of creating interactive content or message (Hoffman & Novak, 1996). **Perceived interactivity** refers to the psychological state experienced by a site visitor during the interaction process (Wu, 2005). Wu (2005) posited perceived interactivity consisted of perceived control, perceived responsiveness, and perceived personalization. Perceived control refers to humans can control the interaction. Perceived responsiveness refers to the pace or rhythm of the interaction. Perceived personalization refers to the degree to which people can personalize the interaction (Wu, 2005).

Another way to view interactivity is from the **functional perspective** and the **contingency perspective** (Sundar, Kalyanaraman & Brown, 2003). The **functional perspective** stresses the idea interactivity is the information exchange between the users and the interface. The **contingency perspective** places interactivity as a process including users, media, and

message by emphasizing how messages relate to one another. Sundar (2007) later proposed IEM.

Interactivity Effects Model

According to IEM (Sundar, 2007), there are three types of interactivity: source interactivity, message interactivity, and modality interactivity. All three types of interactivity can lead to user engagement, which facilitates changes in cognition, attitude, and behavior (Sundar, 2007).

Source Interactivity

Source interactivity refers to the extent to which the user is able to serve as the source or gatekeeper of information (Sundar, 2007). A typical example of source interactivity is websites allowing users to customize the interface to present personalized information. For instance, many news websites allow users to select their preferred news topics so the system will recommend news based on users' interests (Lee & Park, 2007).

Sundar, Oh, Bellur, Jia, and Kim (2012) explored the effects of functional customization (no vs. low vs. high), cosmetic customization (absent vs. present), and blogging (active vs. filter) on a series of user-experience outcomes such as user engagement, sense of agency, sense of community, intrinsic motivation, and attitudes toward the interface. Functional customization refers to tailoring features mainly to fulfill task-based goals (Sundar et al., 2012). Cosmetic customization deals with changing the look of the website (Sundar et al., 2012). Active blogging refers to letting the users write their own blogs, while filter blogging refers to asking the users to share the blogs written by others (Sundar et al., 2012). Results showed self-expression in the form of making cosmetic changes to the interface and engaging in active, rather than filter blogging resulted in several favorable outcomes such as increased user engagement and increased sense of community.

Kim and Sundar (2012) examined whether creating self-resembling avatars, especially those that resemble ideal selves, could counteract the negative emotional states and unhealthy lifestyles caused by exposure to unrealistic images of others. Results showed avatar creators exhibited higher levels of general self-preservation and better perceptions toward their physical body. Furthermore, participants who created avatars to reflect their desired self showed higher visualizations of their ideal body images than those whose avatars reflected their actual self.

Message Interactivity

Message interactivity refers to the degree to which a website allows the exchange of messages between the user and the system (Sundar, 2007). Hyperlinks and buttons on the websites are usually examples of message interactivity. Message interactivity can influence contingency (Sundar, 2007). Contingency influences user engagement that leads to behavior and attitude change. Message interactivity has demonstrated its persuasive impact under a variety of contexts such as political candidate's websites (Sundar et al., 2003), movie search websites (Sundar, Bellur, Oh, Jia, & Kim, 2014), and organizational websites (Lee & Park, 2013).

Message interactivity effects on political candidate impressions were also studied (Sundar et al., 2003). Participants were randomly exposed to a website with no hyperlinks, a website with a single layer of related links, and a website with two hierarchical layers of related links. Results indicated medium message interactivity seemed to enhance the candidate's appeal as well as his character, but high message interactivity seemed to detract from it.

Another interactivity study examined the effects of two interface features of a website. The interaction history (the history record between users and the system) and synchronous chat feature (the one-on-one chatting function) on a movie search website were studied (Sundar et al., 2014). Results indicate interaction history heightened perceived contingency and dialogue, but

was less interactive than chatting. The chatting function did not increase perceived contingency or user engagement (Sundar et al., 2014). When looking at the message interactivity feature of an organizational websites and blogs, results revealed regardless of familiarity of the company, people evaluated organizations that responded to their comments as more trustworthy, committed, and more satisfaction, compared to organizations that did not respond (absence of message interactivity) (Lee & Park, 2013).

Modality Interactivity

Modality interactivity refers to “the variety of modalities that it offers for the user to experience the various parts of a website, from simple texts to graphics, animation, audio, and video”(Sundar, 2007, p. 90). Websites using multiple interaction techniques such as clicking, sliding, zooming, and hovering are examples of modality interactivity. These interaction techniques allow users to interact with a website.

In IEM, modality interactivity is studied most frequently. Modality interactivity has often been operationalized as interaction techniques. A series of studies examined the number of interaction techniques on user engagement (Sundar, Bellur, Oh, & Jia, 2011; Sundar, Bellur, Oh, Xu, & Jia, 2014; Sundar, Oh, Xu, Jia, & Bellur, 2011). Sundar et al. (2011) tested the relative contributions made by six interaction techniques (zoom-in/out, drag, slide, mouse-over, cover-flow and click-to-download) to user engagement with identical content. Results suggested the slide is better at aiding memory than the other interaction techniques; whereas, cover-flow and mouse-over generated more user actions. Mouse-over, click-to-download, and zoom-in/out tended to foster more favorable attitudes among power users, whereas cover-flow and slide generated more positive attitudes among non-power users.

Another study built on the number of interaction techniques (clicking, sliding, dragging, mouse-over) while adding a novel technique such as 3D carousel. Results showed the 3D carousel boosted perceptions of interactivity. The 3D carousel also stimulated user interaction. However, 3D carousel degraded users' memory and inhibited their tendency to visit the homepage. 3D carousel also negatively affected perceived ease of use and behavioral intentions when the website was saturated with four interaction techniques (Sundar et al., 2011).

Another modality interactivity related study examined the effects of six on-screen interaction techniques: clicking, sliding, zooming, hovering, dragging, and flipping on user assessment, engagement, attitude, and behavior with the website. They found although the 3D carousel generated more user action, the sliding technique was better at aiding memory. The zoom-in/out tool was the least favored, and the mouse-over feature fostered greater engagement (Sundar et al., 2014).

Users' assessments of the website interface: natural mapping, intuitiveness, and ease of use, had significant consequences for user engagement, attitudes, and behavioral outcomes. Users rated the website as higher quality and more credible when the interaction felt more natural, more intuitive, and easier to use. Cognitive absorption mediated the relationship between interface assessment and attitudinal outcomes (Sundar et al., 2014).

Other studies examined the effects of a particular interaction technique on user engagement (Dou & Sundar, 2016; Kim & Sundar, 2015; Oh, Robinson, & Lee, 2013; Oh & Sundar, 2015). Oh et al. (2013) examined the effects of two types of modality interactivity: page flipping and clicking. Results showed page flipping (a naturally mapped interface) was rated as having a higher level of usability and user engagement than clicking. In addition, page flipping generated a greater level of behavior intention toward the website than clicking. However,

participants in the page flipping condition showed less recall and recognition memory than participants in the clicking condition unless they perceive page flipping as more natural and intuitive to use.

Oh and Sundar (2015) investigated the effects of modality interactivity (slider vs. control) and message interactivity (high vs. medium vs. low) on user engagement. They discovered people in the slide condition had more positive assessment of the interface and greater cognitive absorption, contributing to more favorable attitudes toward the website. However, the slide condition reduced the amount of message-related thoughts. High message interactivity enhanced message elaboration and led to more positive attitudes toward the message among people with low issue involvement.

Dou and Sundar (2016) investigated how adding the swiping interaction technique to a tap-only mobile website influenced users' intentions to use the website. Results show compared with smartphones using the tapping-only interaction technique, smartphones using the combination of tapping and swiping interaction techniques had higher behavioral intention toward the website. Participants in the tapping and swiping condition felt higher levels of perceived enjoyment than participants in the tapping-only condition.

Xu and Sundar (2014) examined the effects of modality interactivity (low, medium, and high modality interactivity) and arousal on consumers' engagement, attitudes, and behavioral intentions with an e-commerce website. Level of modality interactivity was manipulated by varying the number of interaction techniques associated with the product image. Three websites displaying the same camera product were created. The low modality interactivity condition only showed one image of the camera (front). The medium modality interactivity condition showed four images of the camera (front, back, left side, right side). The high modality interactivity

condition displayed the camera in 360 degrees. Users could zoom in to see the details of the camera. Xu and Sundar (2014) also found higher level of modality interactivity generated more favorable attitude and behavioral intention toward both the website and the product.

This dissertation aimed to extend the IEM by extending modality interactivity. Previous modality interactivity studies have examined the effects of the number of interaction techniques on user engagement (Sundar et al., 2011; Sundar et al., 2011; Sundar et al., 2014); the effect of a specific interaction technique on user engagement (Dou & Sundar, 2016; Kim & Sundar, 2016; Oh et al., 2013; Oh & Sundar, 2015); and the combinatory effects of arousal and modality interactivity on user engagement (Xu & Sundar, 2014). However, few studies have examined the combinatory effects of mood, modality interactivity, and news story length on user engagement. Xu and Sundar (2014) examined the combinatory effects of arousal and modality interactivity on user engagement, but they didn't examine the effects of mood and modality interactivity on user engagement. Besides arousal, valence is another dimension of mood, which refers to the positive or negative state of mood (Shapiro & MacInnis, 2002). From the valence perspective, mood has been frequently studied in the field of advertising and persuasion. Thus, this dissertation examines mood from the valence perspective.

Chapter 3

Mood

Mood is a mild and generalized form of affect, which ranges on a continuum from positive to negative valence (Frijda, 1993). Unlike specific emotions such as joy and fear, which are short-lived and intense affective reactions, moods generally outlast their sources. Therefore, the impact of mood extends beyond the context that generated the mood (Clore, 1992; Clore, Gasper, & Garvin, 2001).

Mood has two dimensions: valence and arousal (Russell & Barrett, 1999). Valence (positive vs. negative) is defined in terms of pleasantness. Arousal (high vs. low) is defined as degree of energization, activation, inner tension, or alertness (Singh & Hitchon, 1989).

Previous literature suggests both positive mood and negative mood can impact persuasion. Forgas (2007) found people in negative moods produced higher quality and more effective interpersonal persuasive messages than people in positive moods. This effect was obtained for messages advocating both popular and unpopular positions. Arguments produced in negative moods actually induced greater attitude change in naïve recipients. Another study suggested a positive mood resulted in better persuasive message processing. Wegener, Petty, and Smith (1995) discovered a happy mood led to greater message scrutiny than a neutral mood when the message was not mood threatening and when an uplifting message was encountered.

Mood and Information Processing

Mood can impact how one processes information. Research in psychology, advertising, and marketing communication suggests people in a negative mood often use item-specific processing, whereas those in a positive mood tend to employ relational processing (Clore, Schwarz & Conway, 1994; Sar, Nan, & Meyers, 2010; Sar, Duff, & Anghelcev, 2011; Sar, 2013).

Sar et al. (2010) examined the joint effects of people's preexisting mood and advertising context on ad learning, evaluation, and judgement. They found a negative mood facilitates message learning and evaluation of a product attribute. On the contrary, a positive mood can trigger relational processing so as to facilitate product category information processing (e.g., comparing the product brand to other brands in the same category).

Another study examined the effects of mood, gender, and ad context on relational elaboration, product evaluation, and purchase intention (Sar, 2013). He found women in positive moods, who viewed ads with a competitive context, had more relational thoughts; whereas, men in negative moods, who viewed ads with a noncompetitive context, had more item-specific thoughts. Women in positive moods evaluated the product more favorably and were more likely to purchase the product when it was presented in a noncompetitive context. Women in negative moods had about the same type of product evaluation and purchase intention for the target product when the product was presented in both ad contexts. Men in negative moods had favorable product evaluation and higher purchase intention when the product was presented in a competitive context. Men in positive moods had about the same level of product evaluation and purchase intention when the product was presented in both ad contexts.

Besides mood's impact on item-specific processing or relational processing, mood can also influence information processing either systematically or heuristically. According to the negative state relief model (Cialdini, Darby, & Vincent, 1973), a person tends to process information heuristically when in a positive mood and process information systematically when in a negative mood. Systematic processing is when people have formed or updated their attitudes by actively attending to and cognitively elaborating persuasive arguments; whereas, heuristic

processing refers to people processing messages by relying on simple heuristic cues such as “experts can be trusted,” or “long messages are valid messages” (Chaiken & Maheswaran, 1994)

Kuykendall and Keating (1990) examined the influence of mood on reactions to persuasive communication. They assigned people to read magazine articles inducing positive, negative, or neutral moods. After mood induction, participants were asked to read and evaluate an argument. Results showed people in neutral and negative moods have more favorable attitudes toward strong arguments. This suggests systematic processing is reduced by positive moods and not by negative moods.

People in positive moods process news stories heuristically and rely on information already known instead of gaining new information from the news story. People in negative moods process information more systematically and rely on the information available in the news story. Moreover, people in negative moods deem news stories more credible than those in positive moods regardless of story frame (Haigh, Brubaker, & Heresco, 2009).

Also, happy individuals recognized more global or general news but less local or detailed information than those in a sad or neutral mood (Zhong, 2011). Conversely, Mitchell (2000) found people in positive moods do have the cognitive capacity to process information systematically, but that message strength is the major predictor of attitude.

Myrick and Wojdyski (2015) explored the impact of the presence and valence of a “mood meter” (people’s emotional response toward a news) and intentions to share a news story. Results showed the presence of a mood meter led to lower recall of story content, more negative attitudes toward the story, and less positive emotional responses.

Previous research has also examined the joint effects of mood and modality on information processing (Ravaja, Saari, Kallinen, & Laarni, 2006). Ravaja et al. (2006) found

both mood and the emotional tone of a message could influence the emotional response to the message. A strong valence-related mood-congruency effect emerged in predicting involvement. Text modality elicited higher involvement, arousal ratings, and orbicularis oculi EMG activity when people are in depressed moods.

Video modality elicited higher involvement, arousal ratings, and orbicularis oculi EMG activity when people are in joyful, relaxed, or fearful moods (Ravaja et al., 2006). The results suggest people in negative moods process information better when they are presented with the text modality message, whereas people in positive moods process information better when they are presented with the video modality message.

All of these studies suggest mood has a significant impact on information processing. Mood can also interact with message framing or modality to influence information processing. Thus, it is possible that mood may also interact with modality interactivity and news story length to influence information processing.

Chapter 4

Hypotheses

The IEM (Sundar, 2007) suggests modality interactivity, source interactivity, and message interactivity are key precursors of user engagement. Oh and Sundar (2016) defined user engagement with media as the degree to which users become cognitively and affectively focused on media content. In IEM (Sundar, 2007), user engagement is often conceptualized as cognitive absorption.

Modality interactivity refers to the different interaction techniques people use to interact with a website (Sundar, 2007). For example, Dou and Sundar (2016) found websites using a combination of the tapping and swiping interaction techniques increased higher behavioral intention toward the website than websites using the tapping interaction technique only. Meanwhile, participants in the tapping and swiping condition felt higher levels of perceived enjoyment compared to participants in the tapping only condition.

Research in psychophysiology detected a linkage between the hand contraction and the frontal lobe activation. Hand contraction refers to the process in which a muscle becomes or is made shorter and tighter (Harmon-Jones, 2006). Frontal activation refers to the activation of the left brain or the right brain (Harmon-Jones, 2006). For example, Harmon-Jones (2006) found right-hand contractions produced greater left than right frontal activity. Left-hand contractions produced greater right than left frontal activity. Another study found leaning forward with arms extended caused greater left frontal cortical activation as compared to reclining backwards (Price & Harmon-Jones, 2011). Both studies implied the causal relationship between body movement and frontal activation. Since both swiping and scrolling are related to hand contractions, which

are associated with frontal activation, it can be postulated whether people choose to scroll or swipe to read news may also influence people's user engagement with the news story.

Choi, Krishner, and Wu (2016) examined the effects of swiping versus scrolling in mobile shopping applications. Swiping and scrolling are two primary interfaces among smartphone users (Choi et al., 2016). Scroll-based interfaces allow users to view items using a scrolling gesture; while swipe-based interfaces allow users to view items by using a swiping gesture (Choi et al., 2016). A mobile application that required swiping as a major interaction technique led to greater cognitive absorption and playfulness compared with a mobile application that required scrolling as a major interaction technique. It is because swiping is perceived as a more intuitive and natural interaction technique compared with scrolling (Choi et al., 2016). The natural mapping ability and intuitiveness of an interface positively influenced the engagement process and cognitive absorption (Choi et al., 2016). People who use the swiping interface to read news may have a higher level of user engagement than people who use the scrolling interface to read news on their smartphones. Thus, the following hypothesis is raised:

H1: Participants in the swiping condition will indicate higher levels of user engagement than those in the scrolling condition.

News story length may also have an impact on user engagement. Research showed story length affected the number of statements accurately recalled, but did not affect the organization of recall (Glenn, 1978). Short stories were too underdeveloped to be recalled.

Research also showed people were more engaged with long form news articles than with short form news articles (Mitchell et al., 2016). Despite the small screen space and multitasking often associated with the smartphones, people spent more time on average with the long-form news articles than with the short-form news articles. The total engaged time with long form news

articles averaged about twice that of the engaged time with short-form news articles: 123 seconds compared with 57 seconds because people spent more time reading the long form news article than with the short form news article.

Another study found length of networked narratives (i.e. a Facebook post with a picture and a caption) was positively associated with social media engagement represented by the number of likes and the number of shares (Wang, Kim, Xiao, & Jung, 2016). Long form articles tend to be shared the most among the global executives (Quartz, 2016). Long form news articles may trigger higher user engagement compared with short form news articles. A Pew Research Center study also showed news readers were more engaged with the long form news articles than with the short form news articles (Mitchell et al., 2016). Hence, the following hypothesis is posed:

H2: Participants in the long form condition will indicate higher user engagement than those in the short form condition.

Previous studies indicated mood influenced information processing (Clore et al., 1994; Sar et al., 2010; Sar et al., 2011; Sar, 2013). However, the effect of mood on user engagement is unknown. Previous literature found people in negative moods process information better when the information is presented in text rather than video (Ravaja et al., 2006) suggesting people in negative moods are engaged in systematic processing. Since the news story stimuli will be mostly text, it is possible people in negative moods are more likely to have a higher user engagement. Thus, the following hypothesis is raised:

H3: Participants in the negative mood condition will indicate higher levels of user engagement compared to those in a positive mood.

Chapter 5

Method

This study examined how mood, modality interactivity, story topic, and news story length impacted user engagement. A 2 (mood: positive vs. negative) x 2 (modality interactivity: scrolling vs. swiping) x 2 (news story length: long form vs. short form) x 2 (topic: Zika vs. West Nile) factorial between subject experiment was conducted to test the proposed hypotheses.

Procedures

A recruitment email with a brief introduction of the study procedures and a sign-up link was distributed to several communication classes. Participants completed the study in a computer lab. After entering the lab, participants were randomly assigned to either the positive mood condition or the negative mood condition. Participants' moods were manipulated using the Life Event Inventory (Bless, Bohner, Schwarz, & Strack, 1996). To induce positive or negative moods, participants were asked to write down one happy or sad life event on a piece of paper. After mood induction, participants were asked to assess their current mood and issue involvement toward the news topic on Qualtrics, which could be accessed on their smartphones.

After completing the pre-questionnaire, participants were randomly assigned to one of the sixteen news conditions. After reading the news article, a "next" button displayed on the bottom of the web page directed participants to Qualtrics asking them to finish a post-questionnaire. After completing the post-questionnaire, participants were debriefed. The study took approximately 20 minutes to finish.

Participants

A total of 332 ($N = 332$) undergraduate students recruited from ten different communication classes participated in the study. Two cases were removed because two

participants only answered two out of the four fact check questions wrong. This left the sample with 330 students ($N = 330$). Seventy-nine percent of the participants were female, and 21.4 percent of the participants were males. Participants' ages ranged from 18 to 30 ($M = 20.28$, $SD = 1.51$). The majority of the participants were Caucasian (67.5%), followed by Asian or Pacific Islander (19.9%), Spanish or Hispanic Origin (5.1%), African American (4.2%), Multi-racial or mixed race (2.7%), and Native American (.6%).

Experimental Materials

Two long form news stories were selected from *The New York Times*. One story discussed the Zika virus, and the other discussed the West Nile virus. Editing the length of the long form news stories developed the two short form news stories. Word count for the long form news articles was 1,028, and ranged from 504 and 512 words for the short form stories.

Appendix A includes the stimuli.

A total of eight web pages were created: Zika long form news article + scrolling; Zika long form news article + swiping; Zika short form news article + scrolling; Zika short form news article + swiping; West Nile long form news article + scrolling; West Nile long form news article + swiping; West Nile short form news article + scrolling; and West Nile short form news article + swiping.

Independent Variables

The independent variables in this study are mood (positive vs. negative), modality interactivity (scrolling vs. swiping), topic (Zika vs. West Nile), and news story length (long form vs. short form).

Manipulation Check

To check whether the mood manipulation was successful or not, two seven-point Likert questions asked, “how happy are you right now?” ($M = 4.69, SD = 1.36$) and “how sad are you right now?” ($M = 2.98, SD = 1.64$). The two questions were used to make a scale measure ($\alpha = .79, M = 4.86, SD = 1.37$).

Fact Check

Fact check statements were created to make sure the participants read the articles. The statements were answered either true or false based on the information provided in the story. Zika statements stated: “There is a vaccine for Zika;” “Zika is transferred by two different types of mosquitos;” “Only female mosquitos bite people;” and “Zika virus can be sexually transmitted.”

West Nile statements included: “West Nile symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis;” “Several factors such as the weather and the number and types of mosquitoes may cause a West Nile outbreak;” “Anyone who is outdoors during times when mosquitoes are active is at a higher risk;” and “People should use insect repellents and wear long sleeves when go outdoors to protect themselves.”

Control Variable

Participant’s time spent on reading online news was employed as a control variable. One question asked participants about how many minutes they spent reading news online each day ($M = 34.26, SD = 39.07$).

Other Variables

Issue Involvement. Issue involvement was measured with five items from Zaichkowsky (1985) on a seven-point semantic differential scale: unimportant/important, of no concern to me/of concern to me, irrelevant/relevant, means nothing to me/means a lot to me, and trivial/fundamental. Participants were asked how involved they were with the issues ($\alpha = .94$, $M = 3.61$, $SD = 1.65$ _{Zika}; $\alpha = .93$, $M = 2.81$, $SD = 1.46$ _{West Nile}).

News Reading Habits. News reading habits were measured with seven questions adapted from Mitchell and Holcomb (2016). Participants were asked to indicate the number of minutes they spent watching news on TV per day (excluding online streaming TV) ($M = 17.01$, $SD = 37.05$), watching news online per day (include streaming) ($M = 26.30$, $SD = 45.08$), reading news from a print newspaper per day (excluding the online version of the newspaper) ($M = 3.19$, $SD = 8.56$), reading news online per day (include reading news from apps on smartphones) ($M = 34.08$, $SD = 39.01$), listening to news on radio per day (excluding streaming news from an online radio channel or smartphone) ($M = 5.21$, $SD = 22.06$), and consuming news on social media per day (include social media consumed on phones, tablets, and etc.) ($M = 86.81$, $SD = 136.22$).

Dependent Variables

The dependent variable of this study was user engagement. User engagement with news was measured with four scales: cognitive absorption (Agarwal & Karahanna, 2000) ($\alpha = .86$, $M = 4.28$, $SD = .68$), user engagement (O'Brien & Cairns, 2015) ($\alpha = .87$, $M = 4.55$, $SD = .96$), news evaluation (Bucy, 2004) ($\alpha = .90$, $M = 5.23$, $SD = .89$), and medium credibility (Ohanian, 1990) ($\alpha = .70$, $M = 4.91$, $SD = .74$).

Cognitive Absorption. Cognitive absorption was measured with 17 items adapted from Agarwal and Karahanna (2000). Cognitive absorption consisted of five dimensions: *temporal*

dissociation, focused immersion, heightened enjoyment, control, and curiosity. Participants rated their agreement with these statements on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree).

Temporal dissociation consisted of four items: “Time appeared to go by very quickly when I was reading the news story,” “Time flew when I was reading the news story,” “When reading the news story, I was able to block out most other distractions,” and “I lost track of time when I was reading the news story” ($\alpha = .65, M = 3.97, SD = .88$).

Focused immersion consisted of three items: “When reading the news story, I was absorbed in what I was reading,” “When reading the news story, I got distracted by other things very easily,” and “When reading the news story, my attention was not diverted very easily” ($\alpha = .82, M = 4.39, SD = 1.20$).

Heightened enjoyment consisted of four items: “I was having a lot of fun while reading the news story,” “The news story provided a lot of enjoyment,” “I enjoyed reading the news story,” and “Reading the news story was boring” ($\alpha = .83, M = 3.51, SD = .67$).

Control consisted of three items: “I felt in control while reading the story,” “I had no control when reading the news story,” and “The news story allowed me to control my interaction with my phone” ($\alpha = .67, M = 4.24, SD = .63$).

Curiosity consisted of two items: “Reading the news story excited my curiosity,” and “Reading the news story aroused my imagination” ($\alpha = .81, M = 4.14, SD = 1.23$).

User Engagement. Three dimensions of user engagement from O’Brien and Cairns (2015) were adapted to measure user engagement. The three dimensions were *aesthetics, durability, and perceived usability*. Participants rated their agreement with these statements on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree).

Aesthetics consisted of four items: “The news website was attractive,” “The news website was aesthetically appealing,” “The news website appealed to my visual senses,” and “The screen layout of this news website was visually appealing” ($\alpha = .92, M = 4.44, SD = 1.27$).

Endurability consisted of four items: “Reading news on this news website was worthwhile,” “My experience of reading news on this news website was a success,” “Reading news on this news website was rewarding,” and “I would recommend this news website to my friends and family” ($\alpha = .79, M = 4.66, SD = .98$).

News Evaluation. Two dimensions of the news evaluation scale adapted from Bucy (2003) assessed news evaluation. The two dimensions were *informativeness* and *credibility*. Bucy’s (2004) original five-point scale was adapted to be a seven-point scale for the current study. Participants rated their agreement with these statements on a seven-point Likert scale (1 = not at all; 7 = very).

Informativeness consisted of five items: “The news article I read was in-depth,” “The news article I read was useful,” “The news article I read was informative,” “The news article I read was relevant,” and “The news article I read was trustworthy” ($\alpha = .79, M = 5.12, SD = .95$).

Credibility consisted of five items: “The news article I read was believable,” “The news article I read was reliable,” “The news article I read was fair,” “The news article I read was accurate,” and “The news article I read was credible” ($\alpha = .90, M = 5.33, SD = 1.00$).

Medium Credibility. Medium credibility was measured with two dimensions adapted from Ohanian (1990). Participants were asked to rate the degree to which they perceive the online news to be trustworthy and current. Participants rated on a seven-point Likert scale (1 = strongly disagree; 7 = strongly agree). *Trustworthiness* consisted of six items: “trustworthy,” “believable,” “accurate,” “reports the whole story,” “balanced,” “fair,” and “dishonest” ($\alpha = .68$,

$M = 5.95, SD = .91$). *Currency* consisted of three items: “timely,” “current,” and “up-to-date” ($\alpha = .84, M = 5.95, SD = .91$).

All measures can be found on Appendix D: Measurement.

Manipulation Checks

A one-way ANOVA test was conducted on the independent variable mood and the scale. The result was significant, $F(1, 328) = 18.48$, partial $\eta^2 = .05, p < .001$. Those assigned to the happy mood condition ($M = 5.18, SD = 1.25$) were significantly happier than those assigned to the sad mood condition ($M = 4.55, SD = 1.42$).

To check whether the news story topic (Zika vs. West Nile) would have any impact on user engagement, **two** one-way ANOVA tests were conducted. Results showed the West Nile short story and the Zika short story had no impact on *cognitive absorption* $F(1,163) = 2.28$, partial $\eta^2 = .01, p = .13$; *user engagement* $F(1,163) = 1.00$, partial $\eta^2 = .01, p = .32$; *news evaluation* $F(1,163) = 2.57$, partial $\eta^2 = .02, p = .11$; and *medium credibility* $F(1,163) = .17$, partial $\eta^2 = .00, p = .68$.

However, there were significant differences between the Zika long story and the West Nile long story on *cognitive absorption* $F(1,163) = 8.39$, partial $\eta^2 = .05, p < .01$; *user engagement* $F(1,163) = 5.43$, partial $\eta^2 = .03, p < .05$; and *news evaluation* $F(1,163) = 15.07$, partial $\eta^2 = .09, p < .001$.

Those reading the long form Zika story scored higher on *cognitive absorption* than those reading the long form West Nile story ($M = 4.14, SD = .76_{\text{long West Nile story}}$; $M = 4.46, SD = .64_{\text{long Zika story}}$). Those reading the long form Zika story indicated higher *user engagement* scores than those reading the long form West Nile story ($M = 4.41, SD = 1.00_{\text{long West Nile story}}$; $M = 4.74, SD = .84_{\text{long Zika story}}$). Finally, those reading the long form Zika story indicated higher *news evaluation*

scores than those reading the long form West Nile story ($M = 5.04$, $SD = .81_{\text{long West Nile story}}$; $M = 5.54$, $SD = .85_{\text{long Zika story}}$), There was no difference between the stories when looking at medium credibility $F(1,163) = .02$, partial $\eta^2 = .00$, $p = .88$. Thus, topic of the news story (Zika vs. West Nile) was left as an independent variable.

Table 1 depicts the zero order correlation of all the independent variables and the dependent variables.

Table 1. Zero order correlation table of all the independent variables and the dependent variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Mood															
2. Length	0.04														
3. MI	-0.03	-0.01													
4. Topic	0.05	-0.02	0.01												
5. TD	-0.03	0.05	-0.02	-0.03											
6. FI	-0.04	-0.01	0.02	-0.06	.51**										
7. HE	-0.07	-0.01	0.04	-0.02	.28**	.28**									
8. Control	0.02	0.05	0.03	-0.03	.25**	.27**	.23**								
9. Curiosity	-0.02	-0.07	0.05	-.12*	.28**	.39**	.46**	.18**							
10. Aesthetics	-0.03	0.01	-0.06	-0.04	0.09	0.11	.19**	.14*	.18**						
11. Endurability	-0.02	-0.04	0.01	-0.04	.29**	.34**	.32**	.18**	.41**	.46**					
12. Informativeness	0.05	-0.11	0.07	-0.09	0.09	.23**	.21**	.15**	.32**	.24**	.38**				
13. Credibility	-0.05	-0.01	0.06	-0.05	0.03	0.02	0.06	.16**	0.04	.21**	.27**	.66**			
14. Trustworthiness	0.02	0.09	0.00	-0.04	.12*	0.08	0.07	.22**	0.02	.13*	.16**	.12*	.24**		
15. Currency	-0.02	0.03	-0.05	0.07	0.04	0.03	0.01	0.10	0.01	.19**	.22**	.22**	.34**	.17**	
M	-	-	-	-	3.97	4.40	3.51	4.24	4.15	4.44	4.66	5.13	5.33	4.48	5.95
SD	-	-	-	-	0.88	1.23	0.67	0.62	1.23	1.26	0.97	0.95	1.00	0.93	0.91

Notes: MI stands for modality interactivity, TD stands for temporal dissociation, FI stands for focused immersion, and HE stands for heightened enjoyment. ** $p < .001$. * $p < .05$.

Chapter 6

Results

To assess Hypothesis 1, Hypothesis 2, and Hypothesis 3, a MANCOVA test was conducted with the independent variables: mood, modality interactivity, length, and topic. The dependent variable was user engagement measured by the following dimensions: temporal dissociation, focused immersion, heightened enjoyment, control, curiosity, aesthetics, durability, informativeness, credibility, trustworthiness, and currency. Online news reading was employed as a covariate.

Hypothesis 1 predicted that participants in the swiping condition would indicate higher levels of user engagement than that in the scrolling condition. Result showed modality interactivity did not have any impact on user engagement, Wilks' $\lambda = .96$, $F(12, 302) = .99$, $p > .05$, partial $\eta^2 = .04$. There was no significant differences for *temporal dissociation* ($M = 4.01$, $SE = .07_{scrolling}$; $M = 3.40$, $SE = .07_{swiping}$); *focused immersion* ($M = 4.40$, $SE = .09_{scrolling}$; $M = 4.42$, $SE = .09_{swiping}$); *heightened enjoyment* ($M = 3.51$, $SE = .05_{scrolling}$; $M = 3.51$, $SE = .05_{swiping}$); *control* ($M = 4.23$, $SE = .05_{scrolling}$; $M = 4.26$, $SE = .05_{swiping}$); *curiosity* ($M = 4.09$, $SE = 1.00_{scrolling}$; $M = 4.17$, $SE = 1.00_{swiping}$); *aesthetics* ($M = 4.55$, $SE = .10_{scrolling}$; $M = 4.38$, $SE = .10_{swiping}$); *durability* ($M = 4.69$, $SE = .08_{scrolling}$; $M = 4.67$, $SE = .08_{swiping}$); *informativeness* ($M = 5.06$, $SE = .07_{scrolling}$; $M = 5.19$, $SE = .07_{swiping}$); *credibility* ($M = 5.29$, $SE = .08_{scrolling}$; $M = 5.41$, $SE = .08_{swiping}$); and *currency* ($M = 5.97$, $SE = .07_{scrolling}$; $M = 5.90$, $SE = .07_{swiping}$). Thus, Hypothesis 1 was not supported.

Hypothesis 2 predicted participants in the long form condition would indicate higher user engagement than those in the short form condition. Result showed length did not impact user engagement, Wilks' $\lambda = .96$, $F(12, 302) = 1.04$, $p > .05$, partial $\eta^2 = .04$. There were no

significant differences between long form and short form stories on the dimensions of user engagement measured as: *temporal dissociation* ($M = 3.96$, $SE = .07_{\text{long form}}$; $M = 4.04$, $SE = .07_{\text{short form}}$); *focused immersion* ($M = 4.44$, $SE = 1.00_{\text{long form}}$; $M = 4.39$, $SE = 1.00_{\text{short form}}$); *heightened enjoyment* ($M = 3.51$, $SE = .05_{\text{long form}}$; $M = 3.51$, $SE = .05_{\text{short form}}$); *control* ($M = 4.22$, $SE = .05_{\text{long form}}$; $M = 4.26$, $SE = .05_{\text{short form}}$); *curiosity* ($M = 4.22$, $SE = 1.00_{\text{long form}}$; $M = 4.04$, $SE = 1.00_{\text{short form}}$); *aesthetics* ($M = 4.46$, $SE = .10_{\text{long form}}$; $M = 4.46$, $SE = .10_{\text{short form}}$); *endurability* ($M = 4.73$, $SE = .08_{\text{long form}}$; $M = 4.63$, $SE = .08_{\text{short form}}$); *informativeness* ($M = 5.25$, $SE = .07_{\text{long form}}$; $M = 5.00$, $SE = .07_{\text{short form}}$); *credibility* ($M = 5.38$, $SE = .08_{\text{long form}}$; $M = 5.32$, $SE = .08_{\text{short form}}$); and *currency* ($M = 5.91$, $SE = .07_{\text{long form}}$; $M = 5.95$, $SE = .07_{\text{short form}}$). Thus, Hypothesis 2 was not supported.

Hypothesis 3 predicted participants in the negative mood condition would indicate higher levels of user engagement compared to those in a positive mood. Result showed mood did not impact user engagement, Wilks' $\lambda = .96$, $F(12, 302) = .99$, $p > .05$, partial $\eta^2 = .04$. Specifically, for *temporal dissociation* there was no difference for mood ($M = 4.02$, $SE = .07_{\text{positive mood}}$; $M = 3.97$, $SE = .07_{\text{negative mood}}$); *focused immersion* ($M = 4.43$, $SE = .09_{\text{positive mood}}$; $M = 4.40$, $SE = .09_{\text{negative mood}}$); *heightened enjoyment* ($M = 3.54$, $SE = .05_{\text{positive mood}}$; $M = 3.48$, $SE = .05_{\text{negative mood}}$); *control* ($M = 4.23$, $SE = .05_{\text{positive mood}}$; $M = 4.26$, $SE = .05_{\text{negative mood}}$); *curiosity* ($M = 4.12$, $SE = .09_{\text{positive mood}}$; $M = 4.14$, $SE = .09_{\text{negative mood}}$); *aesthetics* ($M = 4.49$, $SE = .10_{\text{positive mood}}$; $M = 4.43$, $SE = .10_{\text{negative mood}}$); *endurability* ($M = 4.67$, $SE = .08_{\text{positive mood}}$; $M = 4.68$, $SE = .08_{\text{negative mood}}$); *informativeness* ($M = 5.23$, $SE = .07_{\text{positive mood}}$; $M = 5.01$, $SE = .07_{\text{negative mood}}$); *credibility* ($M = 5.37$, $SE = .08_{\text{positive mood}}$; $M = 5.33$, $SE = .08_{\text{negative mood}}$); and *currency* ($M = 5.94$, $SE = .07_{\text{positive mood}}$; $M = 5.93$, $SE = .07_{\text{negative mood}}$). Thus, Hypothesis 3 was not supported.

There was a main effect for the covariate, online news reading habits, Wilks' $\lambda = .90$, $F(12, 302) = 2.92$, $p < .01$, partial $\eta^2 = .10$. The subsequent univariate tests showed significant results for the dimensions of user engagement including: *heightened enjoyment* $F(1, 313) = 12.84$, $p < .001$, partial $\eta^2 = .04$; *control* $F(1, 313) = 4.78$, $p < .05$, partial $\eta^2 = .02$; *curiosity* $F(1, 313) = 7.44$, $p < .01$, partial $\eta^2 = .02$; and *informativeness* $F(1, 313) = 4.16$, $p < .05$, partial $\eta^2 = .01$.

A significant three-way interaction among mood, length, and modality interactivity on user engagement was obtained, Wilks' $\lambda = .93$, $F(12, 302) = 1.77$, $p < .05$, partial $\eta^2 = .07$. The univariate tests failed to find statistically significant results for the following dimensions of user engagement: *temporal dissociation* $F(1, 313) = 3.16$, $p = .07$, partial $\eta^2 = .01$; *focused immersion* $F(1, 313) = .04$, $p = .85$, partial $\eta^2 = .00$; *heightened enjoyment* $F(1, 313) = .32$, $p = .57$, partial $\eta^2 = .01$; *control* $F(1, 313) = .41$, $p = .52$, partial $\eta^2 = .01$; *curiosity* $F(1, 313) = .70$, $p = .40$, partial $\eta^2 = .01$; *aesthetics* $F(1, 313) = .29$, $p = .59$, partial $\eta^2 = .01$; *endurability* was not significant, $F(1, 313) = 3.05$, $p = .08$, partial $\eta^2 = .01$; *informativeness* $F(1, 313) = 2.12$, $p = .15$, partial $\eta^2 = .01$; *credibility* $F(1, 313) = .18$, $p = .67$, partial $\eta^2 = .00$; *trustworthiness* $F(1, 313) = .09$, $p = .76$, partial $\eta^2 = .00$; or *currency* $F(1, 313) = 1.81$, $p = .18$, partial $\eta^2 = .01$.

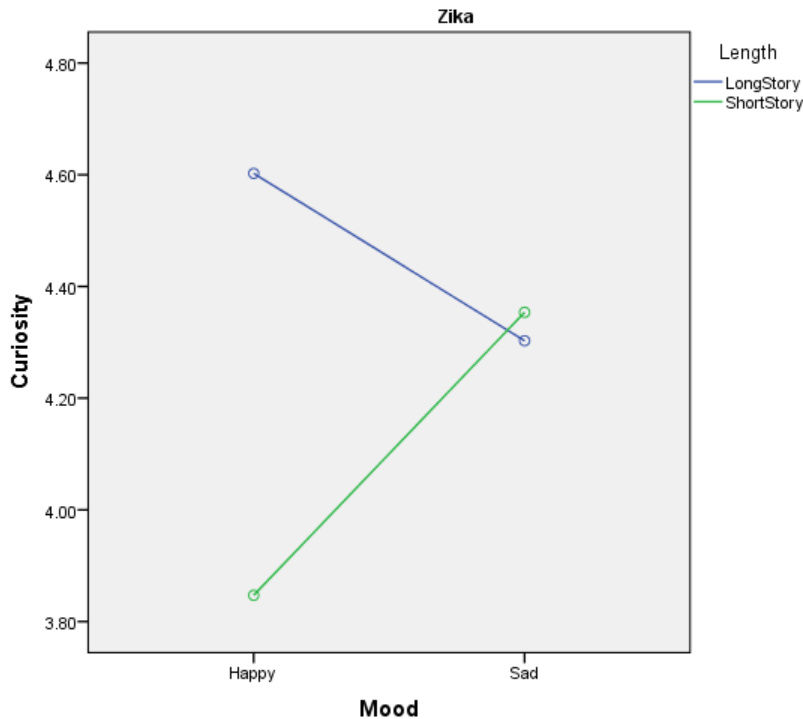
A significant three-way interaction among mood, length, and topic on user engagement was obtained, Wilks' $\lambda = .93$, $F(12, 302) = 2.04$, $p < .05$, partial $\eta^2 = .08$. Specifically, the univariate tests depicted a significant mood x length x topic interaction for the user engagement dimensions of: *curiosity*, $F(1, 313) = 4.36$, $p < .05$, partial $\eta^2 = .01$; and *credibility* $F(1, 313) = 5.63$, $p < .05$, partial $\eta^2 = .02$.

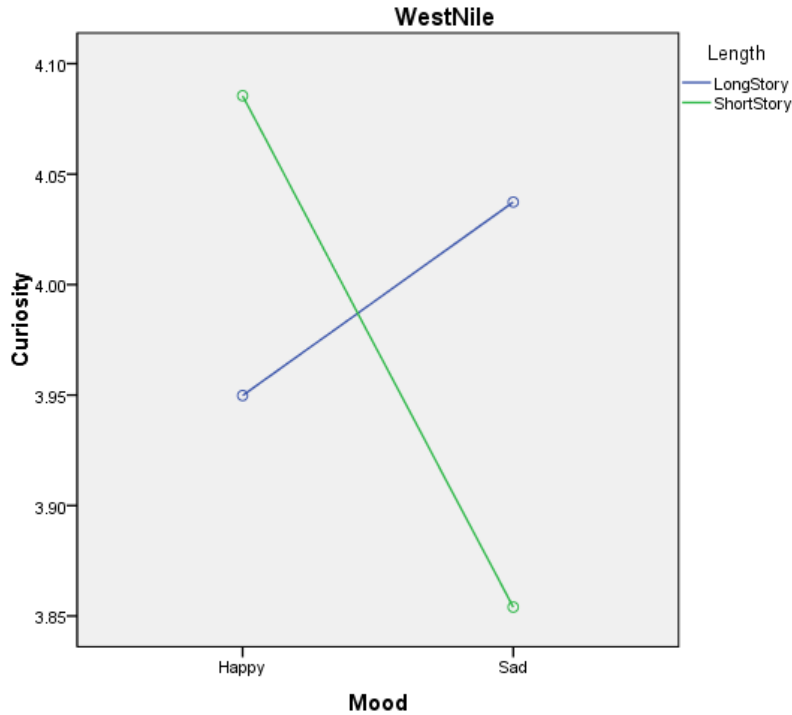
As Figure 1 indicates, for people who read the Zika news story, those reading long stories tend to have a higher level of curiosity when they were in a positive mood ($M = 4.60$, $SE = .18$)

compared with a negative mood ($M = 4.30, SE = .21$). Those reading short stories tend to have a higher level of curiosity when they were in a negative mood ($M = 4.35, SE = .18$) compared with a positive mood ($M = 3.85, SE = .20$).

Under the West Nile news story condition, those reading long stories tend to have higher level of curiosity when they were in a negative mood ($M = 4.04, SE = .18$) compared with the positive mood ($M = 3.95, SE = .20$). Those reading short stories tend to have a higher level of curiosity when they were in a positive mood ($M = 4.09, SE = .20$) compared with a negative mood ($M = 3.85, SE = .19$).

Figure 1. Three-way interaction of mood, length, topic on curiosity





As Figure 2 indicates, under the Zika news story condition, those reading long stories tend to perceive the news story to be more credible when they were in a negative mood ($M = 5.74$, $SE = .17$) compared with the positive mood ($M = 5.53$, $SE = .14$). Those reading short stories tend to perceive the news story to be more credible when they were in a positive mood ($M = 5.25$, $SE = .16$) compared with the negative mood ($M = 5.09$, $SE = .16$).

Under the West Nile news story condition, those reading long stories tend to perceive the news story to be more credible when they were in a positive mood ($M = 5.35$, $SE = .16$) compared with the negative mood ($M = 4.90$, $SE = .15$). Those reading short stories tend to perceive the news story to be more credible when they were in a negative mood ($M = 5.58$, $SE = .16$) compared with a positive mood ($M = 5.35$, $SE = .16$).

Figure 2. Three-way interaction of mood, length, topic on credibility

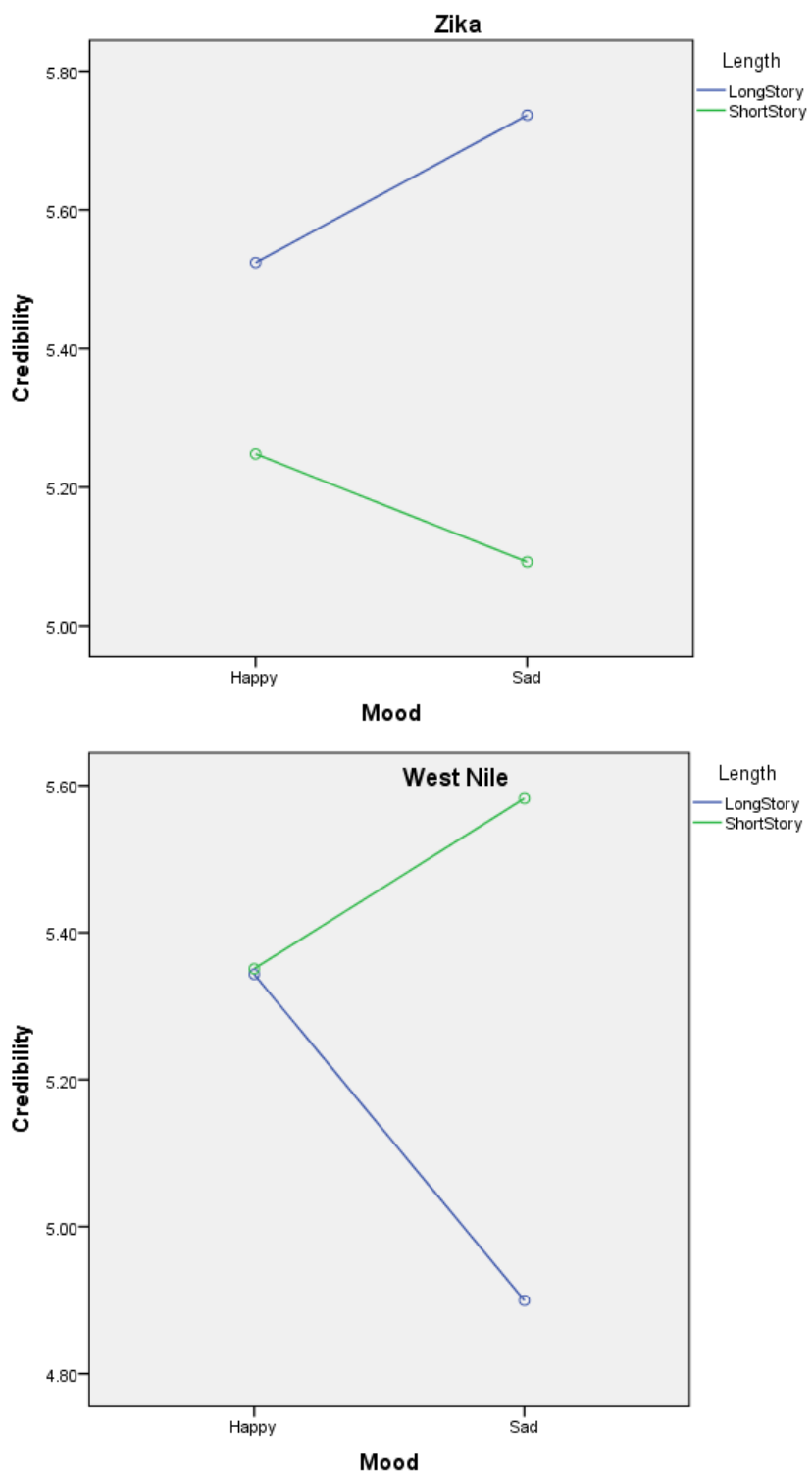


Table 2. Summary of cell means for mood x length x topic on curiosity

			<i>Curiosity</i>	
			<i>M</i>	<i>SE</i>
<i>Positive Mood</i>	Long Form	Zika	3.93*	.13
		West Nile	4.00	.14
	Short Form	Zika	4.00	.14
		West Nile	4.17	.14
<i>Negative Mood</i>	Long Form	Zika	4.22	.15
		West Nile	3.67	.12
	Short Form	Zika	3.92	.13
		West Nile	4.06	.14

$F(1, 313) = 4.36, p < .05, \text{partial } \eta^2 = .01$

Note: Tukey's test was utilized as a post hoc comparison. Curiosity is one dimension of the cognitive absorption scale from Agarwal and Karahanna (2000). There were two items rated on a one to seven point scale.

* = negative mood long form Zika vs. positive mood long form Zika varies at $p < .05$

Table 3. Summary of cell means for mood x length x topic on credibility

			<i>Credibility</i>	
			<i>M</i>	<i>SE</i>
<i>Positive Mood</i>	Long Form	Zika	5.52	.14
		West Nile	5.34	.16
	Short Form	Zika	5.25	.16
		West Nile	5.35	.17
<i>Negative Mood</i>	Long Form	Zika	5.74*	.15
		West Nile	4.90*	.15
	Short Form	Zika	5.09*	.15
		West Nile	5.58*	.16

$F(1, 313) = 5.63, p < .05, \text{partial } \eta^2 = .02.$

Note: Tukey's test was utilized as a post hoc comparison. Credibility is one dimension of the news evaluation scale from Bucy (2004). There were five items rated on a one to seven points scale.

* = negative mood long form Zika vs. negative mood long form West Nile varies at $p < .05$
 negative mood short form Zika vs. negative mood short form West Nile varies at $p < .05$

Table 4. Means and Standard Deviations Associated with the Positive Mood Condition

	<i>Positive Mood</i>							
	Long Form				Short Form			
	Scrolling		Swiping		Scrolling		Swiping	
	Zika <i>n</i> = 22	West Nile <i>n</i> = 21	Zika <i>n</i> = 20	West Nile <i>n</i> = 20	Zika <i>n</i> = 20	West Nile <i>n</i> = 20	Zika <i>n</i> = 20	West Nile <i>n</i> = 20
<i>Temporal Dissociation</i>	3.78(.84)	3.83(.91)	4.08(.79)	4.16(.89)	4.08(.75)	4.44(.68)	3.90(.83)	3.89(.80)
<i>Focused Immersion</i>	4.57(1.18)	4.24(1.46)	4.57(1.29)	4.19(1.64)	4.51(1.09)	4.43(1.22)	4.36(1.22)	4.62(1.28)
<i>Heightened Enjoyment</i>	3.59(.65)	3.60(.60)	3.71(.65)	3.40(.69)	3.43(.57)	3.73(.78)	3.35(.67)	3.62(.70)
<i>Control</i>	4.10(.52)	4.17(.75)	4.28(.79)	4.29(.35)	4.28(.54)	4.22(.66)	4.20(.73)	4.32(.46)
<i>Curiosity</i>	4.57(1.14)	4.02(1.22)	4.64(1.15)	3.90(1.14)	4.09(1.05)	3.91(1.20)	3.68(1.31)	4.29(1.23)
<i>Aesthetics</i>	4.44(1.19)	4.73(1.06)	4.66(1.04)	4.38(1.56)	4.39(1.14)	4.93(1.22)	4.06(1.51)	4.38(1.30)
<i>Endurability</i>	4.60(1.08)	4.80(1.04)	4.86(.90)	4.60(.94)	4.61(.84)	4.82(.84)	4.35(1.02)	4.77(.71)
<i>Informativeness</i>	5.31(.87)	5.10(.67)	5.33(1.01)	4.91(1.04)	4.74(1.22)	4.68(1.20)	5.03(.72)	5.26(.70)
<i>Credibility</i>	5.48(.93)	5.15(1.00)	5.57(1.04)	5.54(.77)	5.08(1.10)	5.27(.92)	5.45(1.15)	5.45(.82)
<i>Trustworthiness</i>	4.56(1.09)	4.07(.94)	4.21(.79)	4.82(.98)	4.46(.74)	4.61(.82)	4.66(1.04)	4.44(.89)
<i>Currency</i>	6.08(.89)	6.10(.75)	5.93(.78)	5.96(.55)	5.78(.94)	5.76(.78)	5.82(1.28)	6.13(.65)

Notes: Means and standard deviations (in parenthesis) are shown for each dependent variable. *Temporal dissociation*, *focused immersion*, *heightened enjoyment*, *control*, and *curiosity* were dimensions of **cognitive absorption**, all measured on seven-point Likert scales (Agawal & Karahanna, 2000). *Aesthetics* and *endurability* were dimensions of **user engagement**, both measured on seven-point Likert scales (O'Brien & Cairns, 2015). *Informativeness* and *credibility* were dimensions of **news evaluation**, both measured on seven-point Likert scales (Bucy, 2003). *Trustworthiness* and *currency* were dimensions of **medium credibility**, both measured on seven-point Likert scales (Ohanian, 1990).

Table 5. Means and Standard Deviations Associated with the Negative Mood Condition

	<i>Negative Mood</i>							
	Long Form				Short Form			
	Scrolling		Swiping		Scrolling		Swiping	
	Zika	West Nile	Zika	West Nile	Zika	West Nile	Zika	West Nile
	<i>n</i> = 20	<i>n</i> = 20	<i>n</i> = 20	<i>n</i> = 23	<i>n</i> = 22	<i>n</i> = 20	<i>n</i> = 22	<i>n</i> = 20
<i>Temporal Dissociation</i>	4.28(.50)	3.68(1.24)	4.18(.96)	3.66(.99)	3.93(1.09)	4.09(.77)	3.92(.74)	4.03(.88)
<i>Focused Immersion</i>	4.89(1.19)	4.05(1.24)	4.84(1.24)	4.14(1.24)	4.00(1.49)	4.46(1.02)	4.26(1.01)	4.45(1.45)
<i>Heightened Enjoyment</i>	3.53(.65)	3.26(.75)	3.46(.52)	3.51(.66)	3.38(.85)	3.44(.61)	3.69(.77)	3.44(.58)
<i>Control</i>	4.40(.44)	3.88(.96)	4.41(.56)	4.22(.51)	4.28(.68)	4.43(.41)	4.22(.77)	4.17(.56)
<i>Curiosity</i>	4.10(1.49)	3.72(1.48)	4.43(.98)	4.35(.43)	4.25(1.17)	3.95(.89)	4.45(1.14)	3.69(1.46)
<i>Aesthetics</i>	4.75(1.18)	4.03(1.10)	4.75(1.01)	3.97(1.28)	4.52(1.38)	4.56(1.29)	4.47(1.43)	4.39(1.36)
<i>Endurability</i>	5.38(.66)	4.34(1.21)	4.34(.89)	4.59(.82)	4.72(.90)	4.51(1.05)	4.93(.96)	4.61(1.38)
<i>Informativeness</i>	5.78(.74)	4.70(.93)	5.67(.91)	5.16(.86)	4.89(.97)	5.20(.90)	5.11(1.04)	5.09(1.03)
<i>Credibility</i>	6.00(.90)*	4.75(1.00)*	5.47(1.02)	5.04(1.89)	5.00(.89)	5.56(.90)	5.18(1.06)	5.60(1.27)
<i>Trustworthiness</i>	4.35(1.18)	4.35(1.14)	4.38(1.04)	4.47(.86)	4.76(.86)	4.58(.87)	4.69(.80)	4.18(.68)
<i>Currency</i>	6.06(.93)	5.62(1.30)	5.65(.78)	5.90(.77)	6.01(.87)	6.33(.94)	5.64(1.13)	6.17(.82)

Notes: Means and standard deviations (in parenthesis) are shown for each dependent variable. *Temporal dissociation*, *focused immersion*, *heightened enjoyment*, *control*, and *curiosity* were dimensions of **cognitive absorption**, all measured on seven-point Likert scales (Agawal & Karahanna, 2000). *Aesthetics* and *endurability* were dimensions of **user engagement**, both measured on seven-point Likert scales (O'Brien & Cairns, 2015). *Informativeness* and *credibility* were dimensions of **news evaluation**, both measured on seven-point Likert scales (Bucy, 2003). *Trustworthiness* and *currency* were dimensions of **medium credibility**, both measured on seven-point Likert scales (Ohanian, 1990).

* = $p < .05$ comparing negative mood, Zika, long form, scrolling vs. negative mood, West Nile, long form, scrolling

Chapter 7

Discussion

This experiment was designed to examine how mood, modality interactivity, news story length, and topic would impact user engagement when reading news on smartphones. Previous research has examined the combinatory effects of arousal and modality interactivity on user engagement under the context of an e-commerce website (Xu & Sundar, 2014). This study attempted to extend the IEM by adding mood to the modality interactivity branch. Past research states that arousal is one dimension of mood (Gasper, 2014). Since mood is a broader concept than arousal, the current study attempted to capture the broader concept.

Hypothesis 1 predicted that individuals who swipe to read news on their smartphones would have a higher level of user engagement compared with individuals who scroll to read news on their smartphones. Results showed modality interactivity did not affect user engagement. This result is contradictory to what previous literature had suggested. Past research suggested swiping elicited higher levels of cognitive absorption than the scrolling technique when people were interacting with mobile apps on their smartphone (Choi et al., 2016). However, the current study did not find any differences in cognitive absorption when someone swiped or scrolled to read news. Results showed people scored almost the same level of cognitive absorption when they swiped to read news ($M = 4.29$, $SD = .65$) compared to scrolling ($M = 4.27$, $SD = .71$). Reading news on smartphones is different than interacting with mobile applications on smartphones, which is what Choi et al. (2016) studied. One could argue reading the news requires more cognitive energy than interacting with an app on a phone. The current findings indicate the interaction technique (swiping or scrolling) is not something to be concerned about when examining user engagement with news.

Previous research also found tapping and swiping interaction techniques increased behavioral intention toward the website than websites using the tapping interaction technique only (Dou & Sundar, 2016). The results of the current study indicate regardless of whether people scroll or swipe to read news did not influence their cognitive absorption, user engagement, news evaluation, or medium credibility scores. Previous studies (Choi et al., 2016; Dou & Sundar, 2016) examined the user experience of interaction techniques on mobile applications. People experienced higher levels of enjoyment when they used the swiping interaction technique to interact with mobile apps (Choi et al., 2016; Dou & Sundar, 2016). Perceived enjoyment was the mediator between the interaction technique and user engagement (Dou & Sundar, 2016). In the current study, heightened enjoyment scores were relatively low ($M = 3.57, SD = .61$). Participants in the current study indicated the exact same level of heightened enjoyment regardless of interaction technique ($M = 3.51, SE = .05_{\text{scrolling}}; M = 3.51, SE = .05_{\text{swiping}}$). The interactions techniques used to read the news do not impact levels of enjoyment as they do when using a mobile application.

Hypothesis 2 predicted individuals who read the long form news articles on their smartphones would have a higher level of user engagement compared with individuals who read the short form news articles. Previous literature suggested people were more engaged with the long form news articles than with the short form news articles when reading on their smartphones (Mitchell et al., 2016). Previous research also found Facebook posts with longer captions received significantly more likes and shares compared with Facebook posts with shorter captions (Wang et al., 2017). However, the current study did not find support for the idea user engagement would increase when participants read long form news articles rather than the short form news articles. Results of the current study suggest news story length does not impact user

engagement. One reason the current study may not have found length as a predictor of user engagement is because it employed a different method than the Pew Research study (Mitchell et al., 2016). The current study utilized an experimental method while the Pew study used a web analytics method. In addition, the Pew study (Mitchell et al., 2016) measured user engagement by counting how long people spent on reading either the long form news article or the short form news article, which is different from how the current study measured user engagement. The current study measured user engagement through scale measures tapping into four dimensions: cognitive absorption, user engagement, news evaluation, and medium credibility rather than aggregate data. Thus, this might be the reason length did not influence the user engagement.

Hypothesis 3 predicted individuals who were in a negative mood would indicate higher levels of user engagement than those in a positive mood. Results showed mood did not affect user engagement. Previous literature suggested participants in negative moods tend to process information better when the information was presented in text rather than in video suggesting individuals in negative moods employed more systematic processing (Ravaja et al., 2006). However, the results of the current study suggest mood does not impact user engagement.

The current study showed there was a significant three-way interaction effect among mood, news story length, and topic on user engagement. It is found that mood, news story length, and topic could influence *curiosity*. When reading the Zika news story, positive mood readers showed more curiosity toward the long form story than with the short form story. However, negative mood readers showed almost the same level of curiosity toward the long form story and the short form story ($M = 4.16, SE = .14_{\text{long form}}$; $M = 4.11, SE = .13_{\text{short form}}$). This is probably because positive mood readers tend to use the heuristics when considering a persuasive message so that they judge the short form news story as more interesting than the long form news story

(Gasper, 2004). When people are sad, they tend to engage in systematic processing and process the persuasive message thoroughly (Gasper, 2004).

When people read the West Nile news story, the opposite result appeared. Positive mood readers showed lower curiosity toward the long form news story than the with short form news story. This suggested the West Nile short story was more appealing to the positive mood readers. This might be explained by the fact that the positive mood induced heuristic processing (Gasper, 2014). The short story was matching with the positive mood so as to enhance the persuasion effect. The negative mood readers showed higher curiosity toward the long form news story than with the short form news story. This implied that the West Nile long form news story was more appealing to the negative mood readers.

It was also found that mood, news story length, and topic could influence *credibility*. When people read the Zika story, they considered the long form news story more credible than the short form news story despite their mood state. This might be a demonstration of the phenomenon called effort heuristics – individuals tend to judge products that need more time and effort to accomplish as having higher quality (Kruger, Wirtz, Van Boven & Altermatt, 2014). Since it took more time to read the long form news story, readers may assign higher credibility to the long form news story than to the short form news story just because of the length.

When people read the news story about West Nile, negative mood readers considered the short form news story more credible than the long form news story. The results indicated participants scored low on issue involvement with West Nile ($M = 2.81$, $SD = 1.46$), indicating they had little interest in the West Nile. Elaboration motivation can be influenced by involvement (O'Keefe, 2013). As involvement increases, elaboration motivation increases. As involvement decreases, elaboration motivation decreases (i.e. Petty, Cacioppo, & Schumann,

1983). In the current study, participants had low issue involvement toward the West Nile topic, thus, they had relatively low elaboration motivation.

Positive mood readers considered the short form news story as equally credible as the long form news story. The Pew study (2016) found people were more engaged with the long form news article than with the short form news article. However, they conducted the study by analyzing the user behavior of smartphone news readers through a web analytics service, which is different from an experiment. The Pew study (2016) indicated the total engaged time with the long form news story averaged about twice that of the engaged time with the short-form news story: 123 seconds compared with 57.1 seconds. However, it is common sense that it takes more time to read a long form news article than with a short form news article. Thus, the way the Pew study (2016) measured user engagement (time spent on reading a news story) is different from how user engagement (cognitive absorption, user engagement, news evaluation, medium credibility) is measured in the current study. Hence, it is reasonable that news story length would not influence people's judgment toward the news story when they were in a positive mood because they may have employed heuristic processing.

In addition, previous research found the source and the content of the news story could influence news credibility (i.e. Austin & Dong, 1994). Few studies have detected the association between the news story length and news credibility. The current study indicated news story length did not influence credibility no matter if the reader was in a positive mood or a negative mood. Previous studies have consistently shown that the positive mood individuals were more likely to employ heuristic processing; whereas, the negative mood individuals were more likely to employ the systematic processing (i.e. Wegener et al., 1995). Research has also shown individuals in a positive mood during the encoding process reduced the systematic processing of

the message content, but there was no evidence that a sad mood increased systematic processing (Bohner & Apostolidou, 2004). Meanwhile, Mitchell (2000) found people in a positive mood lacked the motivation to process information. However, they did not lack the cognitive ability to process information. It is unclear if individuals in a positive mood always employ heuristic processing when they process information. Additional research is needed to determine how mood and story length interact when using smartphones to read news.

Limitations and Future Directions

This study bears several limitations. Although the mood manipulation was successful in this study, it did not influence user engagement. It is probably because some external factors influenced participants' moods. The mood manipulation was conducted using a pencil/paper method, but then participants were asked to pick up their phones in order to complete the rest of the study. The mood manipulation may have dissipated during the study period. The mood might have been intense at the start of the study, but then eased.

Asking participants to use their phones and answer questions may have also impacted the mood effects. Using phones and answer questions on phones may be considered as a form of multitasking. A previous multitasking study found that multitasking could lead to decreased efficiency (i.e. Subrahmanyam, Michikyan, Clemmons, Carrillo, Uhls, & Greenfield, 2013). In the current study, students were asked to use their phones to answer questions. They may be distracted from reading the story or answering survey questions because text messages or other notifications appeared on their phones. Thus, answering questions on smartphones may also decrease people's efficiency so that their user engagement suffers.

The timing of the study could also influence participants' moods. All sessions took place between 5 p.m. and 9 p.m. Previous research indicates the pleasantness component of the

positive affect of human beings increased from morning to evening (Egloff, Tausch, Kohlmann, & Krohne, 1995). Thus, people tend to be in a pleasant mood from 5 p.m. to 9 p.m. period. As indicated by the results of the current study, people scored an average of 4.69 on the question of “how happy are you right now?” This showed people were in a neutral mood. Also, time of the day could impact message processing or cognitive ability. Asking someone to participate in a cognitive task at the end of a long day of classes, meetings, and work could have impacted their engagement with news. Previous research found students’ engagement alternated between attention and non-attention in shorter and shorter cycles as class lecture proceeds (Bunce, Flens, & Neiles, 2010). Although students were not attending a lecture during the study, the same principle could apply.

This study forced participants to read a particular news story – participants were randomly assigned to one of the eight news story conditions. Letting participants to choose to read a news story they like may generate a different level of user engagement compared with forcing participants to read a news story. For example, Schlosser and Shavitt (2009) found when participants were given a sense of choice when reading product information, being able to choose the information produced more favorable company evaluations and product judgments. Future research could allow participants to choose the news story they want to read to see if this would increase their user engagement with the news story.

This study measured user engagement with four major concepts: cognitive absorption, user engagement, news evaluation, and medium credibility. The former two concepts were borrowed from the HCI literature while the latter two concepts were borrowed from the communication literature. The concept of user engagement is quite messy in the field of HCI, Researchers have been trying to come up with a better scale to capture this concept (i.e. O’Brien

& Toms, 2013). HCI researchers have defined user engagement as people's experience with technology, which is a process comprised of four distinct stages: point of engagement, period of sustained engagement, disengagement, and reengagement (i.e. O'Brien & Toms, 2008).

Communication concepts such as "flow" and "transportation" have been borrowed to measure the concept of user engagement. However, when it comes to user engagement with news stories, there is no established scale measure. Thus, future research could close this gap by developing a new scale to measure the concept of user engagement with news stories. From another standpoint, this study is an exploratory study that tested user engagement from both the HCI and communication perspectives.

Conclusion

This study examined the effects of mood, modality interactivity, news topic, and news story length on user engagement under the context of news reading on smartphones. Results showed mood, modality interactivity, or news story length did not impact user engagement directly. However, there was a combinatory effect of mood, length, and topic on dimensions of user engagement. This study shows that news topic does matter, which may provide a good implication for the news industry to take topic seriously when it comes to designing news for smartphone news consumers.

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Appendix A: Stimuli

News #1 (Story One + Long Form)

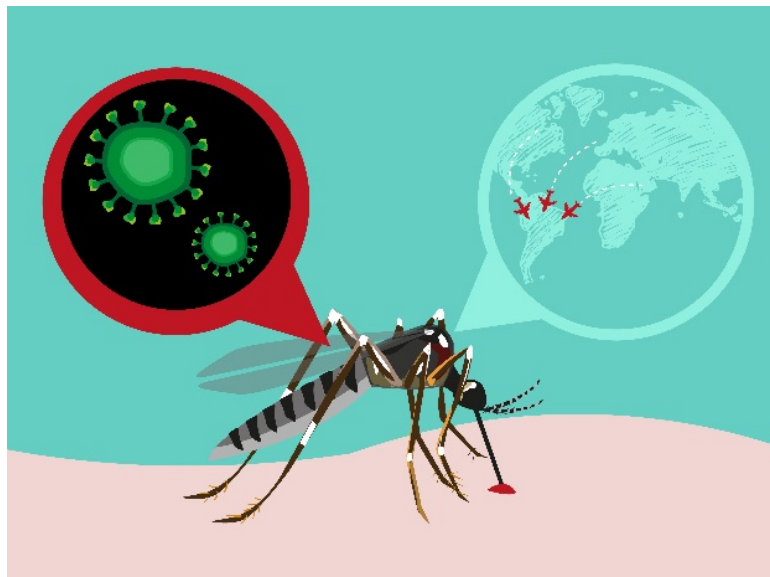
Questions and Answers on West Nile Virus

By Anahad O'Connor

Source: New York Times

Length: 1,028 words

Date: August 23, 2016



The outbreak of West Nile virus this year has spread to nearly every state and is shaping up to be the largest one on record since the first human cases were reported in the United States in 1999. But for all the fear and concerns in some parts of the country, health officials say the reality is that most people who become infected will not have any symptoms, and of those who do, only a fraction will develop severe illness. To find out more about the disease and the factors fueling the current outbreak, we spoke with Dr. Erin Staples, a medical epidemiologist at the Centers for Disease Control and Prevention.

Is it true that many of the symptoms of West Nile are easily overlooked? How many people probably have it and don't know it?

From studies we know that only about one in every five people who get infected with West Nile will actually develop symptoms. The most common ones are fever, headaches, body ache, joint pain, vomiting, diarrhea and rash. A lot of people who develop symptoms usually just wait it out at home. Or they'll go to a medical doctor and end up recovering from their illness and feeling much better within several weeks. Sometimes, people will complain of fatigue or report feeling not quite themselves for several months.

How does a person know if he or she has a more serious form of the illness? What symptoms should prompt you to see a doctor?

Symptoms of severe neurological disease due to West Nile virus infection can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.

Less than 1 percent of people who are infected will develop such symptoms of more serious neurological illness, like encephalitis or meningitis, which is inflammation of the brain or surrounding tissue.

How do you find out if you have West Nile? Is there a test?

People who have symptoms that concern them should see a health care provider. If they think they have West Nile, they can have their blood tested for the presence of antibodies or, in more severe cases that affect the central nervous system, a doctor can take samples of the cerebrospinal fluid that surrounds the brain and spinal cord.

Are certain groups at higher risk?

Anyone who is outdoors during times when mosquitoes are active is at a higher risk — so that means people who go outside at dusk and dawn who haven't done anything to prevent getting bitten, like using repellents or wearing pants and long sleeves.

We do know that there are certain groups that are also at risk of having more severe disease. The groups we've identified include people over the age of 50, and people who have medical conditions like cancer, diabetes, hypertension, kidney disease and organ transplants.

We know this from data we've collected from state health departments. For a lot of these high-risk groups, it probably deals with their ability to fight infection. You may have people with cancer, for example, who are receiving drugs that inhibit their immune cells. Someone with diabetes may not be able to fight the infection as well as an otherwise healthy person.

With people over the age of 50, it's most likely that as you age your immune cells are not as robust. We do have a larger proportion of people with encephalitis in the older age group. But anybody who's out there and not using measures to prevent mosquito bites could be at risk for getting West Nile.

What is the regional breakdown of cases? Are most in Texas?

Almost half of our cases have been reported in Texas, so that is the most affected region at this point. But about 75 percent of our cases have been reported from five states. The first is Texas, the next is Mississippi, Louisiana, then South Dakota and Oklahoma. The central region of the United States is the main area reporting the most cases, but most states are being affected, just to varying degrees.

How does this compare with other West Nile outbreaks?

We definitely have received reports from state health departments of earlier and greater West Nile activity, particularly in the central states. It's more than we've seen in recent years, and we're not quite sure why. Essentially there are several factors that play a role, including the weather, the number and types of mosquitoes that spread the virus, birds that also spread the virus, what people are doing to prevent it, and whether there's community-based spraying. All of those things may determine the size and location of an outbreak.

Why is this outbreak so severe? Is it the biggest?

There is some thought that the unusual mild winter we had, the early spring and the hot summer, may have fostered some conditions that are favorable to breeding mosquitoes that spread West Nile virus.

What we can say right now is this is the biggest outbreak. If we look at the number of cases reported to the C.D.C. over the last 10 years, through the third week of August, we've had an average of 390 West Nile cases reported each year, and that ranged from a low last year of 77 cases to a high in 2004 of 832 cases.

So now, having more than 1,000 cases reported to us this year through the third week of August, we're up from what we've traditionally seen in the past. However, we don't know how this is going to translate in the end of the year, for instance, if there's going to be significant changes. Let's say New York goes into an early frost this year. That could truncate transmissions.

What steps can people take to protect themselves?

Use insect repellents when you go outdoors. Wear long sleeves and pants to prevent mosquito bites at dusk and dawn. Install or repair screens on windows to prevent mosquitoes from getting inside your home. Empty any containers of standing water around your home - things like flower pots, kiddie pools, buckets and sometimes even gutters, which can have standing water in them.

News #2 (Story One + Short Form)

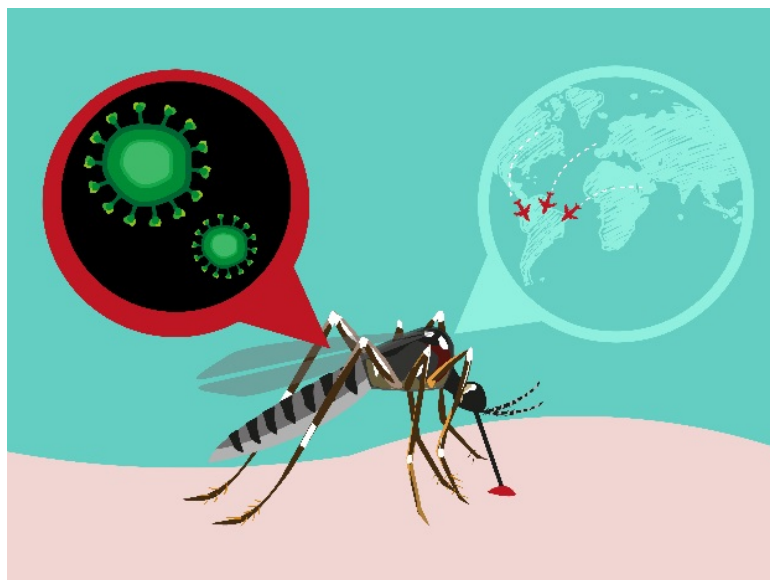
Questions and Answers on West Nile Virus

By Anahad O'Connor

Source: New York Times

Length: 504 words

Date: August 23, 2016



The outbreak of West Nile virus this year has spread to nearly every state and is shaping up to be the largest one on record since the first human cases were reported in the United States in 1999. To find out more about the disease and the factors fueling the current outbreak, we spoke with Dr. Erin Staples, a medical epidemiologist at the Centers for Disease Control and Prevention.

Is it true that many of the symptoms of West Nile are easily overlooked? How many people probably have it and don't know it?

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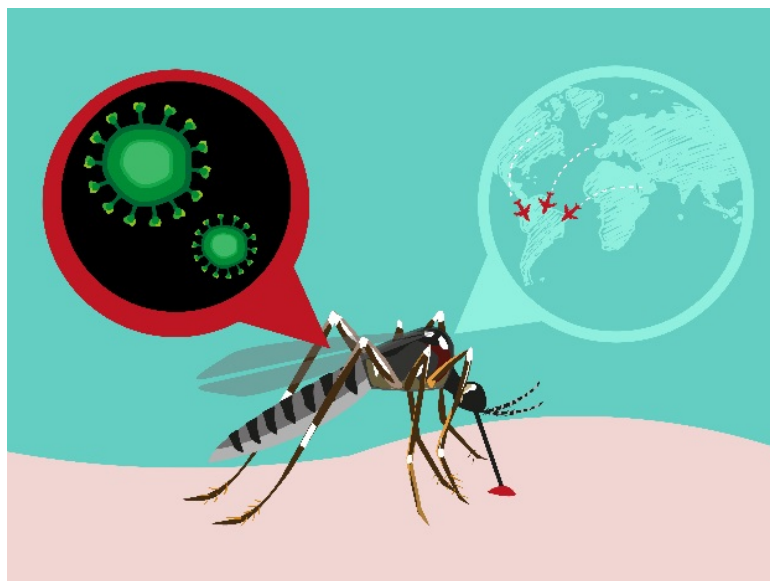
News #3 (Story Two + Long Form)

Short Answers to Hard Questions About Zika Virus

By Donald G. McNeil

Source: New York Times

Length: 1,028 words



The World Health Organization has declared an international health emergency over the spread of the Zika virus, now known to cause devastating birth defects. The agency expects the virus to spread from northern Argentina to the southern United States by the end of the year, infecting many millions of people. In late July, Florida officials announced what appeared to be the first locally transmitted cases of Zika infection in the continental United States.

The W.H.O. and the Centers for Disease Control and Prevention have urged pregnant women against travel to more than 45 countries in which the Zika virus is spreading, mostly in the Caribbean and Latin America. All pregnant women who have been to these regions should be tested for the infection, health officials have said, and should refrain from unprotected sex with partners who have visited these regions.

Here are some answers and advice about the outbreak.

What is the Zika virus?

The Zika virus is a mosquito-transmitted infection related to dengue, yellow fever and West Nile virus. Although it was discovered in the Zika forest in Uganda in 1947 and is believed to be common across Africa and Asia, it did not begin spreading widely in the Western Hemisphere until recently — perhaps sometime in 2013, although its presence was not confirmed until May 2015, when it was identified as the “mystery disease” sweeping across northeast Brazil.

Almost no one in the Americas is immune, so it has spread rapidly.

About four in five victims have no symptoms, and those who do usually recover within a week. Common symptoms include a fever rarely higher than 102 degrees, an itchy pink rash, bloodshot eyes, sensitivity to light, headaches and joint pains.

How does a mosquito transmit Zika?

Only female mosquitoes bite people: they need blood to lay eggs, while males drink plant nectar. In the female, the virus travels from the gut to the salivary glands and is injected into the next human victim. When a mosquito bites, it first injects an anticoagulant saliva so blood does not clog its strawlike proboscis.

What area is Zika likely to reach?

Zika is spread by mosquitoes of the *Aedes* genus, which can breed in a pool of water as small as a bottle cap and usually bite in daytime. The yellow fever mosquito, *Aedes aegypti*, takes several bites for each blood meal and prefers biting people; it accounts for most Zika infections. This mosquito is common in the United States typically only in Florida and along the Gulf Coast, although it has been found as far north as Connecticut in hot weather.

The Asian tiger mosquito, *Aedes albopictus*, also can transmit the virus, but not as effectively. It bites many kinds of animals and is found as far north as Maine and Minnesota in summer, and also in Hawaii.

Can the Zika virus be sexually transmitted?

Yes.

Although experts believe that the vast majority of Zika infections are transmitted by mosquitoes, sexual transmission has been reported in 10 countries, including the United States, France, Germany, Italy and New Zealand.

In all known cases as of late June, transmission has been from a man to a woman or to another man, not from a woman to anyone else. The Zika virus has clearly been transmitted by vaginal and anal sex, and possibly by oral sex.

Viral RNA has been found in semen more than two months after symptoms disappeared. Scientists believe the prostate or testes serve as a reservoir, sheltering the Zika virus from the immune system. In at least one case, a man who never had Zika symptoms transmitted it sexually.

How do I know if I've been infected? Is there a test?

Only one of five infected people develop symptoms. There is currently no rapid test that can be done in a doctor's office; tests must be sent to sophisticated laboratories, which delays diagnosis.

The surest way to detect the virus itself is with a blood or urine sample gathered in the first two weeks or less after symptoms appear. Antibody tests can be done later but, because the disease is closely related to dengue and yellow fever, false positives and false negatives may occur, especially in areas where those diseases circulate. More complex "neutralization assay testing" can lower the false-positive rate, but not eliminate it.

Is there a treatment?

No. The C.D.C. does not recommend a particular antiviral medication for people infected with the Zika virus. The symptoms are mild – when they appear at all – and usually require only rest, nourishment and other supportive care.

Is there a vaccine? How should people protect themselves?

Protection is difficult in mosquito-infested regions.

There is no vaccine against the Zika virus. Efforts to make one have just begun, and creating and testing a vaccine normally takes years and costs hundreds of millions of dollars.

Because it is impossible to completely prevent mosquito bites, the C.D.C. has advised pregnant women to avoid going to regions where the virus is being transmitted, and has advised women thinking of becoming pregnant to consult doctors before going.

Travelers to these countries are advised to avoid or minimize mosquito bites by staying in screened or air-conditioned rooms or sleeping under mosquito nets; wearing insect repellent at all times; and wearing long pants, long sleeves, shoes and hats.

I'm a man and have returned from a place where the Zika virus is spreading. How long until I can be sure that I won't infect a sexual partner?

It is not known how long the Zika virus remains infectious in semen, but viral RNA has been found in semen more than two months after symptoms subsided. The testes are somewhat shielded from the immune system, so it may take longer for the body to eliminate an infection there.

The C.D.C. recommends that men who have traveled to Zika-infected areas, but had no symptoms, wait eight weeks before having unprotected sex. Men who have had a positive Zika test or any symptoms of infection, on the other hand, should wait six months.

At least one gay man has infected his male partner through anal sex. Another man is believed to have infected his female partner through oral sex.

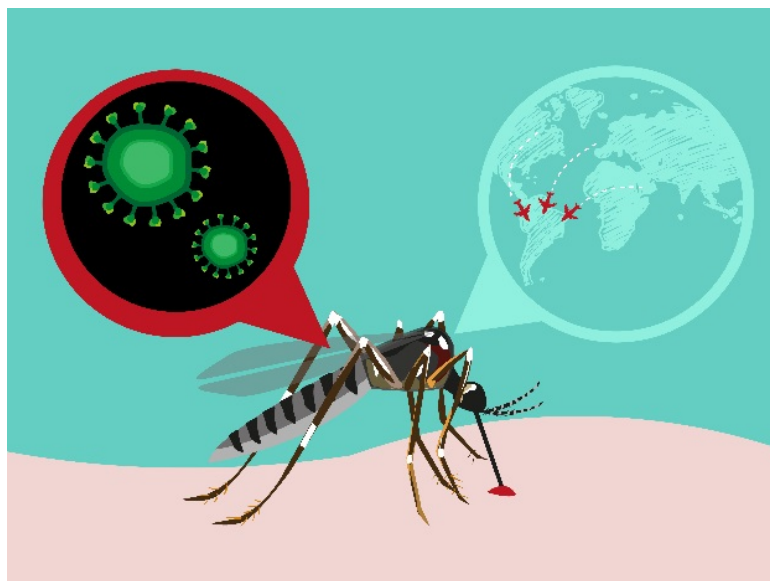
News #4 (Story Two + Short Form)

Short Answers to Hard Questions About Zika Virus

By Donald G. McNeil

Source: New York Times

Length: 512 words



The World Health Organization has declared an international health emergency over the spread of the Zika virus, now known to cause devastating birth defects. The agency expects the virus to spread from northern Argentina to the southern United States by the end of the year, infecting many millions of people.

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Can the Zika virus be sexually transmitted?

Yes.

Although experts believe that the vast majority of Zika infections are transmitted by mosquitoes, sexual transmission has been reported in 10 countries, including the United States, France, Germany, Italy and New Zealand.

How do I know if I've been infected? Is there a test?

Only one of five infected people develop symptoms. There is currently no rapid test that can be done in a doctor's office; tests must be sent to sophisticated laboratories, which delays diagnosis.

The surest way to detect the virus itself is with a blood or urine sample gathered in the first two weeks or less after symptoms appear. Antibody tests can be done later but, because the disease is closely related to dengue and yellow fever, false positives and false negatives may occur, especially in areas where those diseases circulate. More complex "neutralization assay testing" can lower the false-positive rate, but not eliminate it.

Is there a treatment?

No. The C.D.C. does not recommend a particular antiviral medication for people infected with the Zika virus. The symptoms are mild – when they appear at all – and usually require only rest, nourishment and other supportive care.

Is there a vaccine? How should people protect themselves?

Protection is difficult in mosquito-infested regions.

There is no vaccine against the Zika virus. Efforts to make one have just begun, and creating and testing a vaccine normally takes years and costs hundreds of millions of dollars.

Appendix B: Smartphone News Reading

Story One + Long Form + Scroll

<http://www.personal.psu.edu/rxw274/news/1.html>

Story One + Long Form + Swipe

<http://www.personal.psu.edu/rxw274/news/2.html>

Story One + Short Form + Scroll

<http://www.personal.psu.edu/rxw274/news/3.html>

Story One + Short Form + Swipe

<http://www.personal.psu.edu/rxw274/news/4.html>

Story Two + Long Form + Scroll

<http://www.personal.psu.edu/rxw274/news/5.html>

Story Two + Long Form + Swipe

<http://www.personal.psu.edu/rxw274/news/6.html>

Story Two + Short Form + Scroll

<http://www.personal.psu.edu/rxw274/news/7.html>

Story Two + Short Form + Swipe

<http://www.personal.psu.edu/rxw274/news/8.html>

Note: These websites function the best if they are opened on an iPhone 6 Plus.

Appendix C: Mood Manipulation

The following was used for either the happy or sad condition. This is the happy condition. The sad condition operated the same, except the word happy was replaced with sad.

Task One: Writing Task

Remember a specific social event that occurred in your life that made you very **happy**. Imagine the situation as vividly as you can. Try to experience the details of the situation ... think through the thoughts that occurred to you ... feel the same feelings you felt ... Please describe the event you remembered as vividly as you can and please include all the important details in the space provided on this page.

Task Two: Survey

Please enter the following URL to the browser on your phone: <http://bit.ly/2dl7tKU>

Appendix D: Measurement Instrument

[Pre-Questionnaire]

Manipulation Check – Mood

How happy are you right now?

Not at all 1 2 3 4 5 6 7 Very

How sad are you right now?

Not at all 1 2 3 4 5 6 7 Very

Issue involvement (Zaichkowsky, 1985)

How important is West Nile to you?

Unimportant 1 2 3 4 5 6 7 Important

Of no concern 1 2 3 4 5 6 7 Of concern to me

Irrelevant 1 2 3 4 5 6 7 Relevant

Means nothing to me 1 2 3 4 5 6 7 Means a lot to me

Trivial 1 2 3 4 5 6 7 Fundamental

How important is Zika to you?

Unimportant 1 2 3 4 5 6 7 Important

Of no concern 1 2 3 4 5 6 7 Of concern to me

Irrelevant 1 2 3 4 5 6 7 Relevant

Means nothing to me 1 2 3 4 5 6 7 Means a lot to me

Trivial 1 2 3 4 5 6 7 Fundamental

[Post-Questionnaire]

Fact Check

Zika

There is a vaccine for Zika True False

Zika is transferred by two different types of mosquitos. True False

Only female mosquitoes bite people. True False

Zika virus can be sexually transmitted. True False

West Nile

West Nile symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis.

True False

Several factors such as the weather and the number and types of mosquitoes may cause a West Nile outbreak. True False

Anyone who is outdoors during times when mosquitoes are active is at a higher risk.

True False

People should use insect repellents and wear long sleeves when go outdoors to protect themselves.

True False

Cognitive Absorption (Agarwal & Karahanna, 2000)

Please think about the article you just read. Think about interacting with the article when you answer the following questions (1 = strongly disagree; 7 = strongly agree)

Temporal Dissociation

Time appeared to go by very quickly when I was reading the news story

Time flew when I was reading the news story

When reading the news story, I was able to block out most other distractions

I lost track of time when I was reading the news story

Focused Immersion

When reading the news story, I was absorbed in what I was reading

When reading the news story, I got distracted by other things very easily

When reading the news story, my attention was not diverted very easily

Heightened Enjoyment

I was having a lot of fun while reading the news story

The news story provided a lot of enjoyment

I enjoyed reading the news story

Reading the news story was boring

Control

I felt in control while reading the story

I had no control when reading the news story

The news story allowed me to control my interaction with my phone

Curiosity

Reading the news story excited my curiosity

Reading the news story aroused my imagination

User Engagement (O'Brien & Cairns, 2015)

Please indicate your agreement with the following statements (1 = Strongly Disagree; 7 = Strongly Agree)

Aesthetics

The news website was attractive

The news website was aesthetically appealing

The news website appealed to my visual senses

The screen layout of this news website was visually appealing

Endurability

Reading news on this news website was worthwhile
 My experience of reading news on this news website was a success
 Reading news on this news website was rewarding
 I would recommend this news website to my friends and family

News Evaluation (Bucy, 2004)

Please indicate your agreement with the following statements (1 = not at all; 7 = very)

Informativeness

The news article I read was in-depth
 The news article I read was useful
 The news article I read was informative
 The news article I read was relevant
 The news article I read was trustworthy

Credibility

The news article I read was believable
 The news article I read was reliable
 The news article I read was fair
 The news article I read was accurate
 The news article I read was credible

Medium Credibility (Ohanian, 1990)

Online news _____ (1 = strongly disagree; 7 = strongly agree)

Trustworthiness

Is Trustworthy
 Is Believable
 Is Accurate
 Reports the whole story
 Is balanced
 Is fair
 Is dishonest

Currency

Is timely
 Is current
 Is up-to-date

News Reading Habits

Please indicate the number of minutes you spend watching news on TV per day. DO NOT include streaming of any kind in this total (e.g., online or phone) _____

Please indicate the number of minutes you spend watching news ONLINE per day (include streaming) _____

Please indicate the number of minutes you spend reading news from a PRINT NEWSPAPER per day. DO NOT include reading the online version of the newspaper or any other online news in the total _____

Please indicate the number of minutes you spend reading news ONLINE per day. Please include reading news from apps on smart phones in this total _____

Please indicate the number of minutes you spend listening to news on RADIO per day. DO NOT include streaming news from an online radio channel or smart phone in this total _____

Please indicate the number of minutes you spend listening to news online per day. Please include streaming news from an online radio channel or smart phone in this total _____

Please indicate the number of minutes you spend consuming news on social media per day. This total can include social media consumed on phones, tablets, etc. _____

Demographics

What is your gender?

Male
Female

Please indicate your age _____

What race do you consider yourself?

African-American
Asian or Pacific Islander
Native American
Non-Hispanic
White
Spanish or Hispanic Origin
Multi-racial or mixed race

Extra Credit

Please enter your full name

Please enter your student ID

Please enter the class number you are taking

Vitae

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Education

Ph. D. in Mass Communications, Penn State University, 2017

M.S. in Mass Communications, North Dakota State University, 2013

B.A. in Journalism, Broadcasting, & Mass Comm Tech, North Dakota State University, 2010

Teaching

Penn State University

COMM297: Media Graphics, Spring 2017

COMM428D: Research and Analytics, Fall 2016

COMM420: Research in Ad/PR (Lab), Fall 2015

North Dakota State University

COMM110: Fundamentals in Public Speaking, Fall 2011, Spring 2012, Fall 2012, Spring 2013

Professional Experience

Downtown State College Improvement District

PR Intern, August 2016 – December 2016

Samsung Research America

User Experience Research Intern, May 2014 – August 2014

NDSU Instructional Services

Web Developer & Graphic Designer, October 2009 – July 2012

Sample Publications

Wang, R., Yang, F., & Haigh, M. M. (2017). Let me take a selfie: Exploring the psychological effects of posting and viewing selfies and groupies on social media. *Telematics and Informatics*, 34(4), 274 -283.

Wang, R., Kim, J, Xiao, A., & Jung, Y. J. (2017). Networked narratives on Humans of New York: A content analysis of social media engagement on Facebook. *Computers in Human Behavior*, 66, 149-153.

Wang, R., Yang, F., Zheng, S., & Sundar, S. S. (2016). Why do we pin? New gratifications explain unique activities in Pinterest. *Social Media + Society*, 2(3), 1-9.

Award

The Brigham Young University Top Ethics Paper Award, International Public Relations Research Conference (IPRRC), 2016