

**Emotional Personalization in Immersive Journalism: Exploring the Influence of
Emotional Testimonies and Modality on Emotional Valence, Presence, Empathy and
Recall**

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Abstract

Immersive journalism (IJ), where individuals engage in a news story from a first-person perspective using interactive technologies, has become increasingly popular in recent years. Such stories may improve the impact of journalism on the audience by enhancing feelings and emotions associated with the news content. Studies have shown that rather than undermining rationality, emotion could increase engagement towards news pieces, and improve knowledge of social issues. Emotional personalization (EP), a strategy where the production of news content involves the emotional testimony of ordinary citizens at the heart of the story, is therefore increasingly employed. This study explores how EP, as well as the modality of IJ content, influences our perceptions and cognitions with regards to an IJ piece on war and conflict. 193 participants took part in a 2 (EP: present vs. absent) × 2 (modality: VR vs. desktop) experiment. Participants in the EP-present condition reported stronger feelings of presence and greater story recall, while those in the VR condition experienced lower emotional valence and stronger feelings of empathy. Our results support current literature on IJ and EP and suggest that with the rising interest in immersive technologies, sustained investigation on the implications of EP strategies in IJ is crucial.

Introduction

The advent of new technologies such as virtual reality (VR) has given rise to new possibilities in the realm of journalism. Immersive journalism (IJ), which refers to a form of journalism where individuals consume news from a first-person perspective, has become increasingly popular in recent years, with prominent examples including *Project Syria* and *The Displaced* (de la Peña et al., 2010; Harvey, 2013; Sundar, Kang, & Oprean, 2017). Because IJ stories can be viewed on more immersive systems such as head-mounted displays (HMD), viewers may become actively engaged in experiencing the sights and sounds of the news story for themselves. Such stories may therefore improve user experience of journalism by enhancing feelings and emotions associated with the news content (de la Peña et al., 2010; Shin & Biocca, 2018).

However, the role of emotion in current-day journalism remains a point of debate. It has been traditionally accepted that the purpose of journalism is to educate through reason. As a result, evaluations of journalism are often centered around the notion of objectivity (Pantti, 2010), and news that are deemed “unobjective” are seen as unprofessional and often regarded in a negative light under umbrella terms such as “sensationalism” or “tabloidization” (Pantti, 2010; Peters, 2011). Yet journalism today appears to be undergoing a paradigmatic shift away “from the cold-hard-facts-only standard of objectivity to an approach that provokes emotion” (Bas & Grabe, 2015, pp. 160). Research has shown benefits in evoking emotions in journalistic pieces, demonstrating that rather than undermining rationality, emotion (used with the right intention) could increase engagement towards news pieces (Pantti, 2010), and improve knowledge of social issues (Bas & Grabe, 2015). Emotional personalization (EP), a strategy where the production of news content involves the emotional testimony of ordinary citizens at the heart of the story, is therefore increasingly employed (Bas & Grabe, 2015).

Current literature on VR effects often describes VR as the “ultimate empathy machine”, focusing on how the experience evokes specific emotions such as fear, sadness and happiness, and how aspects such as immersion and presence may contribute to these emotions (e.g., Baños, Botella, Alcañiz, Liaño, Guerrero, & Rey, 2004; Baños, Botella, Rubió, Quero, García-Palacios, & Alcañiz, 2008). Research has also found that these evoked emotions, in an IJ context, lead to more positive news attitudes (Jeong, Yum, & Hwang, 2020) and increased story recall (Sundar et al., 2017). However, existing research has not explicitly related these emotions to what one might feel if one were in similar circumstances in the real world, in other words, the emotional accuracy of the experience. de la Peña et al. (2010) suggested that a successful IJ story should result in a “response-as-if-real”, meaning that individuals respond to the virtual scenario like how they would in real life, despite knowing it is not real. Rather than undermine the ability of traditional journalism to deliver facts to the public, IJ should more effectively duplicate the real-world situation and allow audiences to experience actual happenings for themselves (de la Peña et al., 2010). The emotions elicited should, by extension, be reflective of what one would actually feel if they were physically present as well. However, to our knowledge, the “response-as-if-real” concept has not been applied to emotional responses and has not been clearly measured in current research.

To the extent that VR may enhance emotional responses, could these feelings be reflective of what one would feel if they were physically in an environment, and therefore influence outcomes such as empathy and story recall? Extending the “response-as-if-real” concept, we test the influence of EP in two modalities of IJ, investigating its effects on users’ emotional valence, empathy, and recall.

Literature Review

Immersion and Presence

Two concepts related to VR may guide our understanding of the effects of EP – immersion and presence. The concept of immersion is frequently discussed in VR research. Immersion refers to “the technical capability of the system to deliver a surrounding and convincing environment with which the participant can interact” (Sanchez-Vives & Slater, 2005, pp. 333). In this study, we adopt Slater’s (2009) concept of immersion, wherein the level of immersion is defined by the valid actions that are possible within the system. That is, one system is more immersive than another if it has greater ability for the user to carry out physical actions that meaningfully affect the way the virtual environment is depicted. For example, the ability of a VR head-mounted display to induce perceptual changes in the virtual environment through one’s head movements makes the system more immersive than a desktop display of a 360-degree video.

Presence, on the other hand, refers to the subjective “sense of being there” in the virtual environment, meaning that one feels as if one is in the virtual environment (Sanchez-Vives & Slater, 2005; Slater, 2009). While immersion is objective and dependent on the system (i.e., a VR system is more immersive than a 360-degree desktop video), presence is a subjective psychological response. Although definitions of presence have been a topic of controversy amongst scholars (Heeter, 1992; Lee, 2004; Lombard & Ditton, 1997), it is generally accepted that immersion is necessary for an individual to experience presence. Sundar et al. (2017) further suggest that presence related to IJ contexts may be guided by at least two heuristics: the being-there heuristic (“I am part of the experience, thus I am present”), and the interaction heuristic (“More interaction is better”). An immersive medium such as VR, which affords users greater interactivity and total immersion in a mediated environment, would hence trigger presence-related heuristics and facilitate an enhanced sense of presence.

In the context of an IJ story, both immersion and presence may be mechanisms by which individuals truly connect with the news story (de la Peña et al., 2010). The immersive virtual environment is said to block out the surrounding world and truly place individuals in the story, allowing them to experience the news content from a first-person perspective (de la Peña et al., 2010). Furthermore, when individuals experience a greater sense of presence, they may start to perceive a more realistic experience and therefore experience emotions more similar to what they would feel if they were present in the environment in real life (Baños, Liaño, Botella, Alcañiz, Guerrero, & Rey, 2006; Susindar, Sadeghi, Huntington, Singer, & Ferris, 2019). To this end, the strategy of personalizing emotions in a news story may add to these elements and help create a more fulfilling and effective news experience.

Emotional Personalization

Emotional personalization (EP) is an emotionalization strategy used in traditional journalism that involves “giving a non-expert face to social issues through the emotional testimony of ordinary citizens who experienced them personally” (Bas & Grabe, 2015, pp. 165). The EP strategy is meant to “increase the vividness and emotional charge of news” (Kim, Hale, Grabe, & Bas, 2020), triggering an emotional response in the viewer. However, it is crucial to note that EP is neither reliant on arousing packaging or content that might evoke automatic responses, nor similar to unnecessary sensationalism of news; rather its aim is to activate one’s emotions through empathy and identification with ordinary citizens (Grabe, Kleemans, Bas, Myrick, & Kim, 2017). EP is based on emotional contagion theory (Hatfield, Cacioppo, & Rapson, 1992), which posits that humans tend to “automatically mimic or synchronize facial expressions, vocalizations, postures, and movements with those of another person and, consequently, to converge emotionally” (pp. 153-154). Individuals who experience audio-visual personalized news are therefore able to become exposed to the

emotions of other ordinary individuals, and perhaps may even take on those emotions in feeling a sense of empathy for others (Bas & Grabe, 2016).

Empathy

While definitions of empathy differ across contexts, empathy is often conceptualized as the ability to understand and take on another person's emotions (Herrera, Bailenson, Weisz, Ogle, & Zaki, 2018). Although some scholars identify empathy as a trait and have found that trait empathy may be a moderator of media effects (Davis, 1983b; Kobach & Weaver, 2012), we focus on empathy as a state to understand individuals' automatic responses that are activated after exposure to an immersive virtual environment. Cohen (2001) suggests that emotionally personalized news may allow individuals to temporarily adopt another's perspective and "feel with the character, rather than about the character" (pp. 251). Indeed, emotionally personalized content in news stories often results in higher levels of empathy compared to non-EP news (Grabe et al., 2017; Wald, Johnston, Wellman, & Harlow, 2021). Wald et al. (2021) found that a personalized news story about farmers suffering from drought was more likely to increase readers' state empathy and intentions to donate towards these farmers.

As increased levels of empathy often lead to positive outcomes such as more altruistic and prosocial intentions (Stocks, Lishner, & Decker, 2009), immersive mediums such as IJ also often strive to evoke such feelings (de la Peña et al., 2010; Sánchez Laws, 2020; Seijo, 2017; Steinfeld, 2020; Sundar et al., 2017). In fact, the effects of EP on empathy may be strengthened in a VR IJ context. de la Peña et al. (2010) contends that being present with a first-person view of another's narrative in an IJ story is what enables one to connect empathetically to the events portrayed, and Silverstein (2015) further argues that an immersive medium "enables an uncanny feeling of connection with people whose lives are far from our own," adding that a VR experience is "uniquely suited to projects ... that speak

to our senses of empathy and community.” Sundar et al. (2017) found that participants who watched an IJ piece on VR reported stronger feelings of empathy than those who read the same story in a text-with-image format. The ability to embody the experience, rather than passively view the content, may therefore increase empathy (Herrera et al., 2018). More immersive systems such as VR should therefore enhance empathy towards news content and victims where EP is involved.

Emotional Valence

Correspondingly, research has also found that intentionally presenting emotion-eliciting content through VR may increase emotional response (Susindar et al., 2019). By placing individuals into a news event using immersive mediums such as VR, IJ stories can enhance the emotional responses that individuals feel towards the issue (Sánchez Laws, 2020). In the context of both IJ and EP, a story’s emotional aspects may therefore have differing effects on the valence of emotions evoked in its viewers. A story centered around an individuals’ hardships and challenges might be more likely to evoke feelings of unpleasantness such as sadness, unhappiness, rather than those of pleasantness, and current IJ studies thus often measure emotional valence as an affective dimension resulting from the IJ experience (Sundar et al., 2017). As the focus of this study is to assess the effectiveness of EP in IJ, it seems only natural that individuals who watch news stories about war and conflict with personalized emotion-eliciting content may be more likely to feel for others like they would if they were physically present and experience lower, or more negative, emotional valence.

Knowledge and Recall

Research on personalized content in the context of news has also generally found positive effects on recall (Bas & Grabe, 2015; Mujica & Bachmann, 2018). Knowledge is often seen as a necessary condition for meaningful political participation in a democratic

society, and most societies see the news media as having the responsibility to ensure adequate dissemination of information to create an informed citizenship (Bas & Grabe, 2015). Several studies in both IJ and EP contexts have thus tested one's recall of the news story content as a measure of their knowledge, albeit to different degrees of support (Barnidge et al., 2022; Bas & Grabe, 2015; Sundar et al., 2017). Notably, Bas and Grabe (2015) found that an emotionally personalized news story increased story recall for both more and less educated individuals, demonstrating that EP aided in both one's storing and retrieval of information. It therefore seems likely that an EP strategy in an IJ context would similarly aid recall, and by extension, one's knowledge about the topic.

In summary, this study aims to investigate how the presence of EP and the IJ modality may affect affective responses such as empathy and emotional valence, as well as cognitive responses such as presence and recall. Results from this study will contribute to existing literature on the use of VR technologies in journalism and provide insight on the effectiveness of EP as a news strategy in IJ. Based on existing concepts in the field of VR and journalism, we propose the following research hypotheses:

H1_{a,b,c,d}: When viewing an IJ piece about war and conflict, participants in the emotional personalization present condition will report lower (a) emotional valence, and higher (b) presence, (c) empathy and (d) recall as compared to those in the emotional personalization absent condition.

H2_{a,b,c,d}: When viewing an IJ piece about war and conflict, participants in the VR modality condition will report lower (a) emotional valence, and higher (b) presence, (c) empathy and (d) recall as compared to those in the desktop modality condition.

Method

Sample and Design

The study employed a 2 (EP: present vs. absent) X 2 (modality: VR vs. desktop) between-subjects experiment. The study was approved by the Institutional Review Board of Nanyang Technological University. Participants comprised of undergraduates from the university who were approached through a campus mailing list. A total of 193 participants took part in the study, with 114 males (59.1%). Participants were aged between 20 and 27 years old ($M = 22.8$, $SD = 1.32$), and randomly assigned to the four experimental conditions: EP-present/VR ($n = 52$), EP-present/desktop ($n = 44$), EP-absent/VR ($n = 48$), EP-absent/desktop ($n = 49$).

Stimuli and Procedure

The 360-degree investigative journalism piece *Congo: War and Disease*, produced by *BBC News*, was selected as the stimulus. The video illustrated the hardships Congolese faced in their everyday lives, in particular conflict from war and spread of the Ebola virus. Based on previous experimental studies on EP (Bas & Grabe, 2015; Grabe et al., 2017; Sundar et al., 2017), EP-present and EP-absent versions of the 360-degree piece were used in the study. In the EP-present condition, the video piece was shown in its entirety. In the EP-absent condition, segments where Congolese were interviewed and gave personal accounts of their lives were edited out. Both versions were identical in every other way. The duration of the clips were 10 minutes 7 seconds and 8 minutes 15 seconds respectively.

In the VR condition, participants sat on a swivel chair which allowed them to rotate around if they wished to. Participants watched the 360-degree video piece using an *HTC Vive Pro* HMD and were able to explore their surroundings by changing the direction the HMD was facing. In the desktop condition, participants watched the 360-degree video on a computer. They were free to control the direction of the video using the keyboard. In both conditions, participants wore headphones to listen to the narrative.

After providing consent, participants were briefed that they were going to watch a 360-degree news story, followed by filling out a post-questionnaire. Participants were also informed that they are free to stop the viewing anytime should they become nauseous. After filling out the questionnaire, participants were thanked, debriefed and received \$5 as remuneration. Each session lasted around 30 minutes.

Measures

Emotional valence ($M = 2.55$, $SD = 0.98$, $\alpha = .88$) was assessed using seven adjective pairs on a seven-point scale (Burgoon & Hale, 1987). Example items include “Unhappy-happy”, “Down-upbeat” and “Melancholy-positive”.

Two sub-components of presence, sense of being there and interaction, were measured. Being there ($M = 4.83$, $SD = 1.75$, $\alpha = .96$) was assessed with three items on a seven-point scale (Sundar et al., 2017). Example items include “I felt as though I was physically present in the story environment” and “I thought I experienced the story event in person without actually being there”. Interaction ($M = 4.40$, $SD = 1.63$, $\alpha = .87$) was measured with three items on a seven-point scale (Sundar et al., 2017). An example statement that participants were asked to rate is “There were times during which I felt like I was directly interacting with characters in the story”.

Empathy ($M = 5.02$, $SD = 1.22$, $\alpha = .81$) was measured by asking participants the extent to which they felt five emotions on a seven-point scale after watching the 360-degree clip (Batson, Early, & Salvarani, 1997; Herrera et al., 2018). Example items include “Compassionate” and “Moved”.

Recall ($M = 2.44$, $SD = .84$) was assessed via four cued-recall questions, which were conceptualized based on factual information contained in both versions of the 360-degree clip (Sundar et al., 2017). Participants scored one point for each correct answer. The sum total of

correct questions resulted in the score for recall. Table 1 shows the measurement items and their respective Cronbach's alpha values.

[Table 1 about here]

Results

We first checked for randomization by comparing the conditions in terms of age and gender and found no significant group differences. With randomization deemed as successful, we then examined the effects of emotion personalization and modality on emotional valence, presence, empathy, and recall using two-way multivariate analysis of variance (MANOVA).

H1 proposed that EP will result in lower (a) emotional valence, and higher (b) presence, (c) empathy and (d) recall. Results showed that participants in the EP-present condition reported higher scores for the two sub-components of presence, sense of being there, $M_{present} = 5.09$, $SD = 1.64$ vs. $M_{absent} = 4.56$, $SD = 1.83$, $F(1, 189) = 4.65$, $p = .03$, partial $\eta^2 = .02$, and interaction, $M_{present} = 4.65$, $SD = 1.62$ vs. $M_{absent} = 4.14$, $SD = 1.61$, $F(1, 189) = 4.55$, $p = .03$, partial $\eta^2 = .03$. Significant differences were also found for recall, with higher scores in the EP-present condition, $M_{present} = 2.58$, $SD = 0.84$ vs. $M_{absent} = 2.31$, $SD = 0.82$, $F(1, 189) = 4.79$, $p = .03$, partial $\eta^2 = .03$. These results provided support for H1b and H1d. No significant differences between conditions were found for emotional valence and empathy, hence H1a and H1c were not supported.

With regards to modality, H2 proposed that participants in the VR condition will report lower (a) emotional valence, and higher (b) presence, (c) empathy and (d) recall compared to the desktop condition. Result showed a significant effect of modality on emotional valence, with lower scores in the VR condition as compared to the desktop condition, $M_{VR} = 2.39$, $SD = 1.02$ vs. $M_{desktop} = 2.70$, $SD = 0.92$, $F(1, 189) = 5.00$, $p = .03$, partial $\eta^2 = .03$. Significant differences were also found for empathy, with the VR condition scoring higher than the desktop condition, $M_{VR} = 5.21$, $SD = 1.21$ vs. $M_{desktop} = 4.84$, $SD =$

1.20, $F(1, 189) = 4.42$, $p = .04$, partial $\eta^2 = .02$. Therefore, H2a and H2c were supported. No significant results were detected between the conditions for presence and recall, hence H2b and H2d were not supported. No interaction effects were detected between EP and IJ modality. A summary of the results is presented in Table 2.

[Table 2 about here]

Discussion

This study sought to explore the effects of EP in two IJ modalities: VR and desktop. We propose that emotions evoked from an EP experience would be true to what one would feel if they were physically in the environment, therefore testing the effects of emotion-eliciting news stories on emotional valence, presence, empathy, and recall across the two modalities. Our findings not only support the effectiveness of EP as a journalism strategy and affirm our current understanding of VR, but also suggest a need for more research on EP to better leverage immersive technologies across various contexts in future.

While our study found that EP had no significant effects on affective responses such as emotional valence and empathy, participants in the EP-present condition reported a significantly higher sense of recall and presence. These findings support previous studies which found positive effects of EP on recall (Bas & Grabe, 2015), pointing to the benefits of EP as a journalism strategy. If the role of the media is to educate, providing emotion-inducing testimonies of ordinary people may help leave a deeper impression of the story on individuals by emotionally involving individuals in the story and allowing them to personally identify with the issues present, aiding in their encoding of the news event. It may be worthwhile to further explore how exactly this occurs, perhaps exploring moderators or mediators of the relationship between EP and recall.

With regards to presence, when emotions were evoked in the EP-present condition, participants were more likely to feel as if they were part of the experience (being-there

heuristic) and as if they were interacting with the characters and the environment (interaction heuristic). Riva et al. (2007) suggests that there may be a “circular interaction between presence and emotions” (pp. 45), meaning that both a stronger sense of presence and emotions would influence the other. Current literature generally supports the view that presence may influence one’s emotions – when individuals experience a greater sense of presence, they may perceive a more realistic experience and therefore experience stronger emotions as if they were present in real life (Baños et al., 2006; Susindar et al., 2019). Our findings contribute to the alternative dimension and suggest that the reverse is true as well, that is, when emotions are elicited in a news story, one’s sense of presence is likely to increase as well. Given our understanding of “response-as-if-real” in IJ contexts (de la Peña et al., 2010), it seems only natural that the psychological sense of being in the experience and therefore responding as one would in real life extends to one’s emotions as well.

It is interesting that EP had no significant effects on empathy, a finding which contradicts past studies exploring the effects of EP and goes against the very nature of empathy-inducing testimonies within the EP strategy (Sundar et al., 2017; Wald et al., 2021). One reason for this may be the differing conceptualizations and operationalizations of empathy across current studies. While we defined empathy as the ability to understand and vicariously take on another person’s emotions, proposing that emotion-eliciting news stories may lead to greater emotional identification with characters, some scholars have suggested that empathy may also contain a cognitive dimension, such as the ability to cognitively put themselves in the shoes of another person (Davis, 1983a; Shen, 2010). In line with the perspective-taking view of empathy, others have also drawn associations between empathy and personal distress, proposing that feelings of uneasiness and distress may also result from media experiences and affect prosocial outcomes in different ways (Batson et al., 1997). It may therefore be necessary for future research to consider the various conceptualizations of

empathy and their implications in order to deepen our understanding of how EP may induce feelings of empathy.

In exploring the effects of modality, our results generally supported our current understanding of VR technologies. Regardless of whether EP was present or absent, participants experienced lower emotional valence, or more negative emotions, when they viewed the news story on VR compared to on a 360-desktop video. This finding supports previous research on emotional elicitation in VR, which mostly found that an immersive VR environment can increase one's emotional response, influencing one's positive or negative emotions according to the content presented (Estupiñán, Rebelo, Noriega, Ferreira, & Duarte, 2014; Susindar et al., 2019). In line with the general literature on VR (e.g., Herrera et al., 2018; Shin, 2018; Sundar et al., 2017), it is also not surprising that participants in the VR condition reported higher levels of empathy.

Furthermore, we found that the VR modality had no significant effects on recall. While this was not what we had predicted, it is not exactly a surprising finding either, and instead suggests future directions to explore the effects of VR. Current VR research has generally found inconsistent effects of the medium on recall measures. Although some studies show that presence is the link between immersion and recall (Sundar et al., 2017), other studies found that IJ did not increase recall (Barnidge et al., 2022). To this end, existing research on knowledge and learning in immersive technologies also suggests that learning may be inhibited if users are overloaded with extraneous information (Mayer, 2005). In a VR environment where users may require additional cognitive processing to make sense of the immersive environment, learning and encoding of the content may therefore be hindered. Given that no significant effects were found in our study, it is thus unclear how exactly an immersive medium such as VR may affect learning and recall.

However, given that participants in the EP-present condition reported higher levels of recall than those in the EP-absent condition, we can perhaps consider the efficacy of the EP strategy in overcoming the cognitive limitations in VR. Sundar et al. (2017) presented emotion-evoking news stories to participants and found increased recall in his study, whereas Barnidge et al. (2022) used a more fact-based stimulus that contained discrete facts about climate change and saw no significant differences between VR and desktop video formats. Following these findings, it is possible that emotion-eliciting content helped to counter the cognitive limitations of one's VR experience and increase recall of the story content. How exactly this occurs may be a possible consideration for future studies.

Lastly, despite our findings on EP and IJ respectively suggesting that one might moderate the effect of another, we found no interactive effects between modality and EP. One reason, and a limitation of our study, is that we conceptualized immersion as a modality-specific trait, meaning that one medium is more immersive than another if the user can carry out more meaningful actions in the environment. However, some scholars see immersion as a subjective experience and define it as one's perceived level of engagement and involvement with the medium (Jennett et al., 2008). It may hence be useful to explore if one's perceived level of immersion, rather than the medium itself, might have effects on one's affective and cognitive responses such as presence, empathy and recall to better understand whether IJ would enhance the effects of an EP story.

Aside from the conceptualization of immersion, our study contains other limitations as well. One major consideration is that we did not measure participants' knowledge and attitudes towards war and disease in Congo beforehand. Due to the lack of pre-testing, we were unable to tease out if our study conditions led to improvements in knowledge and attitudes, and whether the medium or the EP strategy, had an additive effect. That said, because Singaporeans generally have a low interest in political affairs (Matthews, Teo, Tay,

& Wang, 2021), it is possible to assume that most of our participants had low knowledge or neutral attitudes towards the content of our study. Furthermore, with our participants being Singaporean, they may not be as knowledgeable about affairs in the African region.

Our study also used different versions of the same video clip by editing out interviews of Congolese in the EP-absent condition. While this allowed greater similarities between participants' experience in all conditions, the removal of certain portions in the EP-absent condition could have led to participants being unable to fully follow the investigative journalism story as well, which may have affected sense of presence. Furthermore, this study measured participants' responses immediately after exposure to the videos, yet previous studies have found that EP may have long-term effects on recall (Bas & Grabe, 2015). It may therefore be useful for future studies to explore longer-term measurements of participants' responses to understand if there is lasting value in such strategies.

All in all, despite its limitations, this study provides insights into the application of EP strategies to new immersive mediums, supporting the benefits of using IJ and EP as strategies in journalism today. It is no doubt that research on EP and IJ is still in its early stages, and our study merely forms a starting point in exploring the effects of modality, immersion, and EP. We hope that future work can further explore the intricacies of the relationship between emotion-eliciting content and immersive mediums to better leverage immersive technologies for educational and persuasive purposes in the future.

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References

- Baños, R. M., Botella, C., Alcañiz, M., Liaño, V., Guerrero, B., & Rey, B. (2004). Immersion and emotion: their impact on the sense of presence. *Cyberpsychology & Behavior*, 7(6), 734-741. <https://doi.org/10.1089/cpb.2004.7.734>
- Baños, R. M., Botella, C., Rubió, I., Quero, S., García-Palacios, A., & Alcañiz, M. (2008). Presence and emotions in virtual environments: The influence of stereoscopy. *Cyberpsychology & Behavior*, 11(1), 1-8. <https://doi.org/10.1089/cpb.2007.9936>
- Baños, R. M., Liaño, V., Botella, C., Alcañiz, M., Guerrero, B., & Rey, B. (2006). Changing induced moods via virtual reality. *International Conference on Persuasive Technology*. https://doi.org/10.1007/11755494_3
- Barnidge, M., Sherrill, L. A., Kim, B., Cooks, E., Deavours, D., Viehouser, M., Broussard, R., & Zhang, J. (2022). The Effects of Virtual Reality News on Learning about Climate Change. *Mass Communication and Society*, 25(1), 1-24. <https://doi.org/10.1080/15205436.2021.1925300>
- Bas, O., & Grabe, M. E. (2015). Emotion-provoking personalization of news: Informing citizens and closing the knowledge gap? *Communication Research*, 42(2), 159-185. <https://doi.org/10.1177/0093650213514602>
- Bas, O., & Grabe, M. E. (2016). Personalized news and participatory intent: How emotional displays of everyday citizens promote political involvement. *American Behavioral Scientist*, 60(14), 1719-1736. <https://doi.org/10.1177/0002764216676247>
- Batson, C. D., Early, S., & Salvarani, G. (1997). Perspective taking: Imagining how another feels versus imagining how you would feel. *Personality and Social Psychology Bulletin*, 23(7), 751-758. <https://doi.org/10.1177/0146167297237008>

- Cohen, J. (2001). Defining identification: A theoretical look at the identification of audiences with media characters. *Mass Communication & Society*, 4(3), 245-264.
https://doi.org/10.1207/S15327825MCS0403_01
- Davis, M. H. (1983a). The effects of dispositional empathy on emotional reactions and helping: A multidimensional approach. *Journal of Personality*, 51(2), 167-184.
<https://doi.org/10.1111/j.1467-6494.1983.tb00860.x>
- Davis, M. H. (1983b). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*, 44(1), 113. <https://doi.org/10.1037/0022-3514.44.1.113>
- de la Peña, N., Weil, P., Llobera, J., Spanlang, B., Friedman, D., Sanchez-Vives, M. V., & Slater, M. (2010). Immersive journalism: immersive virtual reality for the first-person experience of news. *Presence: Teleoperators and Virtual Environments*, 19(4), 291-301. https://doi.org/10.1162/pres_a_00005
- Estupiñán S., Rebelo F., Noriega P., Ferreira C., Duarte E. (2014) Can Virtual Reality Increase Emotional Responses (Arousal and Valence)? A Pilot Study. In: Marcus A. (Ed.), *Design, User Experience, and Usability. User Experience Design for Diverse Interaction Platforms and Environments*. Springer, Cham.
https://doi.org/10.1007/978-3-319-07626-3_51
- Grabe, M. E., Kleemans, M., Bas, O., Myrick, J. G., & Kim, M. (2017). Putting a human face on cold, hard facts: Effects of personalizing social issues on perceptions of issue importance. *International Journal of Communication*, 11, 907-929.
- Harvey, K. (2013). *Encyclopedia of Social Media and Politics*. Sage Publications.
<https://doi.org/10.4135/9781452244723.n267>

- Hatfield, C., Cacioppo, R., & Rapson. (1992). Primitive emotional contagion. In M. S. Clark (Ed.), *Review of Personality and Social Psychology: Vol 14. Emotion and Social Behavior* (pp. 151-177). Newbury Park, CA: Sage.
- Heeter, C. (1992). Being there: The subjective experience of presence. *Presence: Teleoperators & Virtual Environments*, 1(2), 262-271.
- Herrera, F., Bailenson, J., Weisz, E., Ogle, E., & Zaki, J. (2018). Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PloS One*, 13(10), e0204494. <https://doi.org/10.1371/journal.pone.0204494>
- Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tjies, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies*, 66(9), 641-661. <https://doi.org/10.1016/j.ijhcs.2008.04.004>
- Jeong, S.-H., Kim, S., Yum, J.-Y., & Hwang, Y. (2020). Effects of virtual reality news on knowledge gain and news attitudes. *International Journal of Mobile Communications*, 18(3), 300-313. <https://doi.org/10.1504/IJMC.2020.107098>
- Kim, M., Hale, B. J., Grabe, M. E., & Bas, O. (2020). Who is responsible? The impact of emotional personalization on explaining the origins of social problems. *Atlantic Journal of Communication*, 1-14. <https://doi.org/10.1080/15456870.2020.1752693>
- Kobach, M. J., & Weaver, A. J. (2012). Gender and empathy differences in negative reactions to fictionalized and real violent images. *Communication Reports*, 25(2), 51-61. <https://doi.org/10.1080/08934215.2012.721087>
- Lee, K. M. (2004). Presence, explicated. *Communication Theory*, 14(1), 27-50. <https://doi.org/10.1111/j.1468-2885.2004.tb00302.x>

- Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer-Mediated Communication*, 3(2), JCMC321. <https://doi.org/10.1111/j.1083-6101.1997.tb00072.x>
- Matthews, M., Teo, K. K., Tay, M., & Wang, A. (2021). (rep.). *Our Singaporean Values: Key Findings from the World Values Survey*. Singapore, Singapore. <https://doi.org/10.25818/zb6t-tz11>
- Mayer, R. (2005). *The Cambridge Handbook of Multimedia Learning*. Cambridge University Press.
- Mujica, C., & Bachmann, I. (2018). The impact of melodramatic news coverage on information recall and comprehension. *Journalism Studies*, 19(3), 334-352. <https://doi.org/10.1080/1461670X.2016.1190661>
- Panti, M. (2010). The value of emotion: An examination of television journalists' notions on emotionality. *European Journal of Communication*, 25(2), 168-181. <https://doi.org/10.1177/0267323110363653>
- Peters, C. (2011). Emotion aside or emotional side? Crafting an 'experience of involvement' in the news. *Journalism*, 12(3), 297-316. <https://doi.org/10.1177/1464884910388224>
- Riva, G., Mantovani, F., Capideville, C. S., Preziosa, A., Morganti, F., Villani, D., Gaggioli, A., Botella, C., & Alcañiz, M. (2007). Affective interactions using virtual reality: the link between presence and emotions. *Cyberpsychology & Behavior*, 10(1), 45-56. <https://doi.org/10.1089/cpb.2006.9993>
- Sánchez Laws, A. L. (2020). Can immersive journalism enhance empathy? *Digital Journalism*, 8(2), 213-228. <https://doi.org/10.1080/21670811.2017.1389286>
- Sanchez-Vives, M. V., & Slater, M. (2005). From presence to consciousness through virtual reality. *Nature Reviews Neuroscience*, 6(4), 332-339. <https://doi.org/10.1038/nrn1651>

- Seijo, S. P. (2017). Immersive journalism: From audience to first-person experience of news. In *Media and Metamedia Management* (pp. 113-119). Springer.
- Shen, L. (2010). On a Scale of State Empathy During Message Processing. *Western Journal of Communication*, 74(5), 504-524. <https://doi.org/10.1080/10570314.2010.512278>
- Shin, D. (2018). Empathy and embodied experience in virtual environment: To what extent can virtual reality stimulate empathy and embodied experience? *Computers in Human Behavior*, 78, 64-73. <https://doi.org/10.1016/j.chb.2017.09.012>
- Shin, D., & Biocca, F. (2018). Exploring immersive experience in journalism. *New Media & Society*, 20(8), 2800-2823. <https://doi.org/10.1177/1461444817733133>
- Silverstein, J. (2015, November 8). The Displaced: Introduction. *New York Times Magazine*. <https://www.nytimes.com/2015/11/08/magazine/the-displaced-introduction.html>
- Slater, M. (2009). Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 364(1535), 3549-3557. <https://doi.org/10.1098/rstb.2009.0138>
- Steinfeld, N. (2020). To be there when it happened: immersive journalism, empathy, and opinion on sexual harassment. *Journalism Practice*, 14(2), 240-258. <https://doi.org/10.1080/17512786.2019.1704842>
- Stocks, E. L., Lishner, D. A., & Decker, S. K. (2009). Altruism or psychological escape: Why does empathy promote prosocial behavior? *European Journal of Social Psychology*, 39(5), 649-665. <https://doi.org/10.1002/ejsp.561>
- Sundar, S. S., Kang, J., & Oprean, D. (2017). Being there in the midst of the story: How immersive journalism affects our perceptions and cognitions. *Cyberpsychology, Behavior, and Social Networking*, 20(11), 672-682. <https://doi.org/10.1089/cyber.2017.0271>

Susindar, S., Sadeghi, M., Huntington, L., Singer, A., & Ferris, T. K. (2019). The feeling is real: Emotion elicitation in virtual reality. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*.

Wald, D. M., Johnston, E. W., Wellman, N., & Harlow, J. (2021). How does personalization in news stories influence intentions to help with drought? Assessing the influence of state empathy and its antecedents. *Frontiers in Communication*, 5(588978).

<https://doi.org/10.3389/fcomm.2020.588978>

Table 1*Measurement Items*

Construct	Measurement Items	Cronbach's Alpha
Emotional valence	<p>For each pair of words, select the option that best represents how you felt about the news story you just watched. (1 = you felt very strongly the adjective on the left; 7 = you felt very strongly the adjective on the right.)</p> <p>Bad 1 2 3 4 5 6 7 Good Unlikeable 1 2 3 4 5 6 7 Likeable Unhappy 1 2 3 4 5 6 7 Happy Gloomy 1 2 3 4 5 6 7 Lively Melancholy 1 2 3 4 5 6 7 Positive Down 1 2 3 4 5 6 7 Upbeat Unhealthy 1 2 3 4 5 6 7 Healthy</p>	.88
Presence (Being there)	<p>How much do you agree with the statements below about the news story you watched? (1 = Completely agree, 7 = Not at all)</p> <p>I felt as though I was physically present in the story environment. I felt like I was immersed in places that I couldn't physically visit I thought I experienced the story event in person without actually being there</p>	.96
Presence (Interaction)	<p>How much do you agree with the statements below about the news story you watched? (1 = Completely agree, 7 = Not at all)</p> <p>I had a sense of being together with the characters in the story There were times during which I felt like I was directly interacting with the characters in the story I felt the characters in the story were aware of my presence</p>	.87
Empathy	<p>For each word, select the option that best represents how you felt about the news story you just watched. (1 = Not at all, 7 = Extremely)</p> <p>Moved Compassionate Warm Softhearted Tender</p>	.81

Recall

Please select the answer which you think is correct.

Which part of Congo, mentioned in the video, is where fighting goes on?

- (a) Northern
- (b) Eastern
- (c) Southern
- (d) Western

What are the villagers' opinions regarding the UN troops?

- (a) The UN troops' presence are reassuring because they are here to protect the villagers
- (b) The UN troops' presence has helped; attacks on the village seemed to have significantly lessened since they came
- (c) The UN troops' presence is not reassuring because the attacks have not stopped since they came.
- (d) The UN troops are suspicious because they are Southern soldiers

What disease is rampant in the village which the news story showed?

- (a) Ebola
- (b) Cholera
- (c) Typhoid
- (d) Tuberculosis

How many people in Congo have been displaced from their homes because of fighting?

- (a) 2 million
 - (b) 3 million
 - (c) 4 million
 - (d) 5 million
-

Table 2*MANOVA results of EP and IJ modality (N = 193)*

	EP-Present Mean (SD)	EP-Absent Mean (SD)	<i>F</i>	Partial η^2
Emotional Valence	2.50 (1.02)	2.61 (0.93)	0.81	<.01
Presence (Being there)	5.09 (1.64)	4.56 (1.83)	4.65*	.02
Presence (Interaction)	4.65 (1.62)	4.14 (1.61)	4.55*	.03
Empathy	5.11 (1.13)	4.93 (1.29)	0.82	<.01
Recall	2.58 (0.84)	2.31 (0.82)	7.00*	.05
	VR Mean (SD)	Desktop Mean (SD)	<i>F</i>	Partial η^2
Emotional Valence	2.39 (1.02)	2.70 (0.92)	5.00*	.03
Presence (Being there)	4.93 (1.69)	4.72 (1.82)	0.91	<.01
Presence (Interaction)	4.44 (1.56)	4.35 (1.72)	0.25	<.01
Empathy	5.21 (1.21)	4.84 (1.20)	4.42*	.02
Recall	2.47 (0.87)	2.42 (0.82)	0.11	<.01

Note. $df = (1, 189)$. * $p < .05$.