"Empathy machine": how virtual reality affects human rights attitudes

Mila Bujić, Mikko Salminen, Joseph Macey and Juho Hamari

Gamification Group, Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland

Abstract

Purpose – This study aims to investigate how media content consumed through immersive technology may evoke changes in human rights attitudes. It has been proposed that our inability to empathize with others could be overcome by stepping into another's shoes. "Immersive journalism" has been postulated as being able to place us into the shoes of those whose feelings and experiences are distant to us. While virtual reality (VR) and 360-degree news videos have become widely available, it remains unclear how the consumption of content through immersive journalism affects users' attitudes.

Design/methodology/approach – Utilizing a between-subject laboratory-controlled experiment ($N = 87$) this study examined participant scores on the Human Rights Questionnaire before and after consuming 360-degree video immersive journalism content via VR ($n = 31$), 2D ($n = 29$), and Article ($n = 27$) formats. Collected data were analysed using statistical inference.

Findings – Results indicate that immersive journalism can elicit a positive attitudinal change in users, unlike an Article, with mobile VR having a more prominent effect than a 2D screen. Furthermore, this change is more strongly affected by users' higher Involvement in the content.

Originality/value – These findings are relevant for grasping the distinct effects novel and recently popularized technologies and media have on attitudinal change, as well as inform the current debate on the value of VR as "empathy machines".

Keywords Virtual reality, 360-degree video, Immersive journalism, Human rights, Attitude change, Being-there

Paper type Research paper

Introduction

It has been proposed that inducing empathy towards those who are temporally or geographically distant is best achieved by stepping into their shoes (Coke *et al.*, 1978; Harris and Foreman-Peck, 2004; Tosh, 2015). In particular, it is difficult to empathize with people whose actions and experiences have little relation to our own (Gutsell and Inzlicht, 2012; Kunstman and Plant, 2008). Therefore, we may be less likely to care about the human rights of people whose hurdles are culturally, temporally and/or geospatially distant, despite the fact that equal human rights for all would be one of the building blocks for a stable and functioning society.

Immersive computer technologies are increasingly being explored as a potential means to increase the empathy of humankind (Kors *et al.*, 2016). Virtual reality (VR) technologies in particular have been popularly proposed as the "ultimate empathy machines" (Constine,

Internet Research
Vol. 30 No. 5, 2020
pp. 1407-1425
Emerald Publishing Limited
1066-2243
DOI 10.1108/INTR-07-2019-0306

2015; Milk, 2015) – primarily because of the technological characteristics that strengthen the users' feeling of "being there" (Cummings and Bailenson, 2016). At the same time, the availability and low cost of mobile VR headsets have popularized consuming 360-degree videos in VR sourced from the internet, such as immersive journalism (Jones, 2017).

Similarly, in the VR documentary *Clouds Over Sidra* viewers are immersed into the Za'atari refugee camp in Jordan, containing tens of thousands of Syrians displaced by civil war. The experience builds upon the concept of perspective-taking – the ability to adopt another person's point of view (Coke *et al.*, 1978), which has been suggested as encouraging prosocial behaviour when used in VR (e.g. van Loon *et al.*, 2018). In 2017, a special Oscar was awarded for *Carne y Arena*, an immersive VR experience that engages users in a dramatic illegal border crossing between Mexico and the United States. Although the work is currently only available at specific exhibition sites, and therefore, inaccessible to a wider audience, the award suggests that we should expect more similar experiences in the future.

The relevance of stepping into another's shoes is not restricted to artistic audiences or public education, it is particularly important for politicians responsible for ratifying foreign policies. Undoubtedly, the human rights attitudes of both the politicians and citizens will have an effect on globalization and policies regarding foreign outreach. Moreover, the relevance of human rights is not limited to foreign policy but is, instead, a prominent part of any human interaction.

However, computer sciences research has focused predominantly on the relationship of information technology use and rights of an individual, such as information access (e.g. Lazar and Stein, 2017), rights to privacy and other similar ethical issues (Lazar *et al.*, 2017; Tavani, 2003), rather than on how attitudes to human rights could be influenced by new technologies. Indeed, immersive experiences, akin to those outlined above, could help reframe this issue from the more abstract level of institutions to the personal one in order to make it more accessible and tangible. It is yet unclear how different immersive media technologies can affect a population's attitudes and behaviour using the same source content. Considering the rising popularity and relevance of these technologies in the public discourse, as well as the recent refugee crisis and ambiguous reactions to it (Hangartner *et al.*, 2019), this study investigates *how immersive technologies, utilised via immersive journalism, can affect consumers' human rights attitudes, and whether the effects differ when compared to written articles.*

Theoretical background and hypotheses development
Human rights attitudes
The concept of human rights has been endorsed by legislative bodies and institutions across the world. The most widely known and, arguably, influential is the United Nations' Universal Declaration of Human Rights (UDHR). According to the UN, human rights can be broadly divided into civil-political rights and social, economic, and cultural rights. While the UDHR has become the cornerstone of contemporary human rights, both in respect to legislation and a general conceptual framework, the 20th Century also saw rights extended in the areas of universal suffrage, civil rights and workers' rights.

In terms of psychological measurement and the conceptualization of human rights, literature is commonly focused on the attitudes or beliefs that people hold towards others, and to what rights people are entitled. Understanding the conceptualization of human rights attitudes in particular has tended to fall into one of two camps: the first states that there is a single underlying attitudinal approach, with the second proposing that attitudes are clustered into distinct constructs or dimensions. Proponents of the first approach state that any disparity in attitudes to different "sets" of human rights, for example in supporting civil rights but denying cultural rights, is due to a lack of understanding or political "know-how". On the other hand, research has demonstrated links between distinct dimensions and

psychological or ideological characteristics (Crowson, 2004). This debate, specific to the concept of human rights, can be seen to reflect that of the more general processes underlying moral reasoning outlined above.

Whether attitudes to human rights can be attributed to a single unidimensional perspective, or whether they can be conceived of as distinct dimensions, the psychological operationalisation of human rights could broadly be divided into the following areas: (a) social security; (b) equality; (c) civilian constraint (or the lack thereof); and (d) privacy (Crowson, 2004; Diaz-Veizades et al., 1995). The first two can be seen to address the social, economic and cultural aspects of human rights, while the latter two can be seen to address the civil-political dimension of human rights (Diaz-Veizades et al., 1995). Consequently, the measurement of human rights has largely focused on similar distinctions. The way in which these attitudes are formed and maintained has been studied in respect to political ideology (Cohrs et al., 2007), peer-influence (Dunbar et al., 2007) and personality (Swami et al., 2012). However, personality traits and beliefs have themselves been shown to be malleable (Cohen, 2003; Mischel and Shoda, 1995), whether in regard to natural experience (Roberts et al., 2006) or designed interventions (Dweck, 2008; Gerber et al., 2010).

Empathy has been shown to be a predictor for endorsing the ideals of both human rights (McFarland and Mathews, 2005) and social equality (Pratto et al., 1994). With this in mind, we can assume that utilizing new media to create "the ultimate empathy machine" (Constine, 2015; Milk, 2015) would be an effective means for promoting human rights and contributing to social equality and overall human well-being.

Immersive journalism

The field of immersive journalism relies specifically on the advantage of allowing users to immerse themselves within a virtual scene. It is a medium which relies on immersive media and technologies such 360-degree video and virtual reality (Jones, 2017) in order for users become involved in the content and, consequently, empathize with a specific group as a direct result of "being there" (Heeter, 1992; Slater and Wilbur, 1997), of being directly involved in the depicted events (Aitamurto, 2019; De la Peña et al., 2010; Sánchez Laws, 2017). Nonetheless, an analysis of different representative cases from immersive journalism indicated that some examples are more successful than others in inducing empathy in users (Sánchez Laws, 2017). However, the analysis did not investigate the effects of different platforms, but rather the design of the experience itself.

There is some preliminary evidence suggesting that a VR-mediated, first-person view of tragic situations promotes empathy and compassion. For instance, Schutte and Stilinović (2017) showed that experiencing Clouds Over Sidra via a head-mounted display (HMD) increased perspective-taking and empathic concern in comparison to watching it in a 2D format. This branch of VR-content production and research is, however, in its early stages; it is mostly exploratory and experimental, while possible attitudinal changes in users are largely hypothetical and evidence of prosocial behaviour is anecdotal.

Media and attitudes

Different types of media have been widely used to elicit emotional responses and to induce changes to individuals' attitudes and biases throughout the history of media. From the 20th century, notable examples include wartime propaganda materials (Trommsdorff and Kornadt, 1995) and, more recently, video games (Gabriel, 2017; Gentile et al., 2009; Isbister, 2016). Although war propaganda was primarily intended to evoke negative images of the enemy, it was also partially aimed at promoting prosocial behaviour on the home front (Trommsdorff and Kornadt, 1995). Several decades later it has been suggested that video games have the capability to encourage both prosocial thought and behaviour (Gentile et al.,

2009; Greitemeyer and Osswald, 2010), as well as empathy whilst also decreasing antisocial affect (Granic *et al.*, 2014; Greitemeyer *et al.*, 2010; Koivisto and Hamari, 2019). Based on these established findings that different media in general have been shown to alter attitudes, the first hypothesis is as follows:

H1.1. Viewing journalistic media content leads to a positive shift in human rights attitudes.

Compared to other media, such as films and books, video games provide a step forward for eliciting empathic responses in users by affording interactivity and user agency. This is achieved via avatars, which act as inhabitable protagonists (Isbister, 2016), thereby allowing users to identify and empathize with characters (Li *et al.*, 2013). Notably, a body of video games exist which are seen to teach human rights; narration and player agency have been understood as the elements that drive and define experiences in such games (Gabriel, 2017). A notable example is *This War of Mine* (11 bit studios), a survival game set in a besieged city, where players must make choices which have both strategic and moral consequences which, in turn, influence both the potential survival and mental state of their characters (De Smale *et al.*, 2017). Furthermore, news-games draw from the history of persuasive games and stand at the intersection of journalism and videogames (Bogost, 2007; Bogost *et al.*, 2010). Newsgames, such as *Cutthroat Capitalism* by Wired, therefore, represent one of the earlier attempts to utilize new media with the aim of involving or engaging the audience with news content (Bogost *et al.*, 2010). These examples depict how more intricate, immersive, and complex (multi)media forms and technologies could have a higher influence on users' attitudes than simpler media, such as written text. Therefore:

H1.2. Immersive journalism has a stronger effect on human rights attitudes compared to written journalism.

Additionally, technological immersiveness is often seen as the main predictor of presence and the subsequent involvement in the virtual environment (Slater, 2003). A meta-review confirmed the position of the relatedness of technological immersion and presence but also emphasized the effects of some technological properties over others (Cummings and Bailenson, 2016). For example, the field of view and stereoscopy have a medium effect, whereas image quality has a small effect on presence. However, some studies show there might be either a ceiling effect or individual user differences that as an effect evoke the same levels of presence mostly regardless of the technology (e.g. Shin, 2018; Shin, 2019a). In the context of immersive journalism, considering the findings of the meta-review (Cummings and Bailenson, 2016) and building upon H1.2, the third hypothesis is as follows:

H1.3. Technological immersiveness of immersive journalism is positively associated with a shift in human rights attitudes.

The immersive direction in media production is of particular importance when considering mass social issues connected to the "collapse of compassion" (Slovic, 2010); a term used to denote the psychological perspective in which an individual's suffering is more impactful and actionable than that of many. This principle is evident in the emergence of "empathy machines", a commonly used term that describes the attempt to humanize the objects of news stories, for example, by relaying experiences to users via immersive technologies. This specific term, and the aim of inducing empathy via VR, has often been criticized in regard to the inability of humans to truly know and feel others' experiences. According to this critique, subjects are absorbed, through consumption, and transformed into an object in an attempt to consolidate oneself and the other, ultimately understanding the other through this process (Bollmer, 2017; Fisher, 2017; Hassan, 2019). However, this seems to be a misconception, which may stem from a literal interpretation of popular discourse, as the absolute understanding of

another's experiences is not the goal. "Empathy machines" are utilized in an attempt to bring the user closer to others via immersion and perspective-taking, to transform them into a subject with whom they can relate. Consequently, users' attitudes towards both the presented individual and the respective group are affected (e.g. Herrera *et al.*, 2018). Considering the posited heightened personal engagement in immersive media and its suggested relevance to attitudinal changes, two additional hypotheses emerged:

H2.1. Level of involvement in a media experience mediates the relationship between the immersiveness of the technology and the shift in human rights attitudes.

H2.2. Involvement in the experience has a stronger positive effect on human rights attitudes in immersive journalism than in written journalism.

Despite these growing trends in popular discourse, digital humanities and immersive journalism, there is still relatively little scientific research examining the theorized ability of VR to positively affect human rights attitudes in particular. The majority of existing research into the positive social influences of VR concentrates on therapeutic use, face-to-face interactions, and attitudinal change (Bailenson, 2018). Concerning empathy and prosocial behaviour, the evidence is promising but not conclusive; current findings suggest virtual embodiment increases some aspects of empathy (Oh *et al.*, 2016; Shin, 2018) and that affective VR-documentaries are able to evoke empathy more effectively than text or 2D video format (Sundar *et al.*, 2017; Shin and Biocca, 2017; Schutte and Stilinović, 2017). We can observe, therefore, that despite the theorized potential for immersive technologies to affect human rights attitudes there is a dearth of empirical studies that quantitatively test these assumptions in controlled settings.

The empirical study

A between-subjects pretest-posttest laboratory experimental study was designed and conducted in order to test the hypotheses. A between-subjects design was applied to participants' assignment to conditions to avoid multiple exposures to the stimuli, which are the hypothesized sources of the measured outcome. The pretest-posttest factor refers to administering the measurement instrument on attitudes before and after the exposure to the stimulus in order to obtain a baseline and be able to track changes in scores.

The sample size of approximately 30 per experimental group was pre-planned in accordance with a controlled laboratory environment, planned analyses, and the context and aim of the study. A higher number of participants would provide for higher granularity in the collected data sample and reduce the possibility of not finding existing small effects (i.e. false negative, Type II error). However, due to the context of this study being immersive journalism and its possible influence on the attitudes of the public, the objective was not to look for any minimal effects that might be detectable through statistical inference tests. Instead, the aim was to test for effects that potentially might have practical implications. For detecting even small effects as Cohen's *d* of 0.4 (Cohen, 2013) using a one-tailed paired *t*-test with the statistical power of 80% and alpha set to 0.05, the recommended minimum total sample size in the compared groups is 41 participants, as calculated in G*Power v. 2.1.9.4. As such, the total number of participants comfortably exceeds the minimum threshold.

Participants

A total of 87 individuals participated in a laboratory-controlled experiment; 31 (VR), 29 (2D), and 27 (Article). The ratio of female to male participants was approximately 2:1. Participant distribution in experimental conditions is described in Table 1. The mean age was 26.38 years (SD = 4.52 years; 20–39 years). The participants consisted of a diverse international sample

and were contacted through universities' bulletin boards and email lists. The experiment was planned and conducted following the guidelines of the National Board on Research Integrity.

The sample is specific to the university context and the country in which participants were recruited, although it was not necessary for them to be students in order to take part in the study. The majority of participants were accounted for by the following nationalities: Finnish (26.4%), Chinese (10.3%), Spanish (9.2%), Russian (9.2%) and Vietnamese (5.7%). Approximately three-quarters of participants had university-level education (Bachelor, 52.9%; Master, 21.8%), while 25.3% had some lower-level education.

Furthermore, participants' political orientation was predominantly liberal or neutral ("In politics people sometimes talk of liberal and conservative. Where would you place yourself on a scale from Liberal to Conservative?", anchors 1 and 7 signified liberal and conservative respectively). Only 10.3% of participants indicated a more conservative orientation.

Procedure
Those interested in participating in the study were first directed to SurveyGizmo, an online survey service, where they completed the pre-questionnaire. Participants were presented with all relevant information about the study, i.e. its aim, procedure and compensation, and were required to consent to participation. In all instances involving psychometric questionnaires, all items on a single page in the survey service were presented in a randomized order. The human rights attitudes were measured across two pages. At the end of the questionnaire, they were asked to leave their email address so that they would be contacted in order to book the time for the experiment. This email address was later used to provide the post-treatment reports on the background data. Participants were offered two movie tickets as compensation. The study was conducted in April and May 2018.

The study was conducted at the premises of two universities in the same city and participants were free to choose at which location they wished to participate. Both spaces were similarly-sized empty office rooms. A between-subjects design was utilized with participants being assigned to groups using simple randomization, i.e. one of the three conditions for each experiment time slot was randomly chosen before the arrival of the participant and without any precognition about them. Table 2 describes the conditions in detail.

Gender	HMD-360 N (%)	Monitor-360 N (%)	Monitor-article N (%)	Total
Male	20 (64.5)	18 (62.1)	17 (63.0)	55
Female	10 (32.3)	11 (37.9)	9 (33.3)	30
Other	1 (3.2)	/	1 (3.7)	2
Total	31 (100)	29 (100)	27 (100)	87

Table 1. Participant distribution to experimental conditions

Condition	Technological immersiveness	In-text abbreviation	Output device	Mode of control	Content type
HMD-360	High	VR	Google Daydream VR with Samsung S8 phone	Head movement	360-degree video
Monitor-360	Medium	2D	Computer monitor (24")	Click and drag with a computer mouse	360-degree video
Monitor-article	Low	Article	Computer monitor (24")	Scrolling with a computer mouse	Internet article

Table 2. Properties of the three experimental conditions

The entire experiment lasted between 20 and 30 min, depending on the treatment, as the text article did not necessarily require the allocated 7 min to read. During that time, the invigilator stayed in the room but out of sight. In all conditions, participants used noise-cancelling headphones and were seated in a revolving office chair. Participants experienced the media content once. In the VR condition, the head-mounted display was worn for the full duration of the video; for the 360-degree video condition the full video was viewed on a monitor; for the third condition, the article was read once from the beginning to end on a computer monitor. After the treatment, participants were asked to fill out the post-questionnaire in SurveyGizmo using the computer screen.

Material

An existing 360-degree video, *The Sea Prayer* published by Guardian VR, was used as the stimulus. In its original form, it is viewable on both the computer screen and a head-mounted VR display device. The video itself was drawn in 3D in Tilt Brush for VR and the narration was written by Khaled Hosseini. The length of the video is 7 min and 4 s. The material is a mix of journalistic and artistic content portraying the refugee crisis of Syria in the form of a story narrated by the imagined father of a refugee boy. The official description of *The Sea Prayer* is as follows:

> Inspired by the story of Alan Kurdi, the three-year-old Syrian refugee who drowned in the Mediterranean Sea, Khaled Hosseini, the novelist and Goodwill Ambassador for UNHCR, the UN Refugee Agency, has written an exclusive story brought to life in virtual reality. The night before a potentially fatal journey, a father reflects with his son on their life in Syria before the war – and on their unknown future. (*Guardian VR*)

The first scene presents a happy family home and life; the second introduces the transformation of the city into a war zone; finally, the third depicts the father (narrator) and his infant son waiting for boats to emigrate from Syria.

For the Article condition, the authors created a transcript of the narration, accompanied by stills captured from each of the scenes in the video. The content was unaltered for the 2D and VR conditions.

Measurements

Existing questionnaires were used to measure human rights attitudes (HRA) and involvement with media content. All items were measured using seven-point Likert scales, with response options ranging from 1 (strongly disagree) to 7 (strongly agree) for HRA, and 1 (not at all) to 7 (very much) for Involvement. The items in both scales were presented in a random order within the corresponding scale.

First, we employed an abridged version of the Human Rights Questionnaire (Diaz-Veizades *et al.* 1995) which consists of four constructs – social security, civilian constraint, equality and privacy. The participants were instructed to: "Please rate the following statements on a scale from Strongly Disagree to Strongly Agree". The questionnaire was administered both before and after exposure to the stimulus.

Social security (SOC; Cronbach's $\alpha = 0.76$) used 6 items to measure attitude towards the right of access or entitlement to adequate standards of living (e.g. "People are entitled to have the food, housing, and medical care necessary to maintain their health and well-being").

Civilian constraint (CIV; Cronbach's $\alpha = 0.78$) used nine items to measure attitude towards ensuring individual civic and political rights, or the limitation of thereof (e.g. "Arrest for political reasons is always wrong").

Equality (EQT; Cronbach's $\alpha = 0.74$) used nine items to measure attitude towards equal access to basic rights for all individual regardless of race, gender, or beliefs (e.g. "Men and

women of full age have a right to marry and establish a family, without regard to their race, nationality, or religion.").

Privacy (PRI; Cronbach's $\alpha = 0.22$) used four items to measure attitude towards individual privacy rights (e.g. "Everyone should be free to speak his or her opinions."). The PRI dimension was discarded due to the unacceptably low Cronbach's alpha value and PRI data was not used in any part of the subsequent analyses. Discarding of the Privacy construct is in line with a previous study, which validated the scale consisting of the remaining three factors (Crowson, 2004).

Mean scores for SOC, CIV and EQT dimensions were computed for both pre- and post–experiment questionnaires, as was the difference between pre- and post-questionnaires for each dimension. These scores present the change in the attitudes after consuming the media content during the experiment. Additionally, a mean score for the overall human rights attitudes was computed for both pre- and post-experiment questionnaires, as was the difference.

Second, Involvement (INV; Cronbach's $\alpha = 0.83$) as a dimension of presence was measured via 5 items adapted from a widely used Presence questionnaire from Witmer and Singer (1998). The instruction was as follows: "Please answer the following questions on a scale from Not at All to Very Much". The scale aims to reflect the level of involvement with the media content (e.g. "Were you involved in the experience to the extent that you lost track of time?"). For the contrast analysis, one dichotomous mean score was computed for this measure, denoting high and low involvement.

Results
The analyses were conducted in several phases. All results were obtained using IBM SPSS version 25.

First, the mean scores for overall human rights attitudes before and after the treatments were compared using paired t-tests for each of the treatments.

Second, changes in individual dimensions were tested to gain further insight into the data. So as not to run unnecessary analyses across three dimensions and three conditions, a repeated-measures ANOVA was used to find in which dimensions there was a detectable change in attitudes. Next, paired t-tests were used for those dimensions where significant results in the ANOVA were obtained to identify in which of the conditions the changes occurred.

Third, ANOVA and a contrast test were used to examine if there is a difference in the effects on HRA between conditions.

Finally, the reported involvement in the three conditions and its effects on the attitudinal change was analysed using ANOVA and a generalized linear model (GLM) with an interaction contrast test.

Changes in overall HRA
Paired t-tests were conducted in order to test for a change in the overall human rights attitudes in 2D, VR, and Article conditions. Considering that only 2D and VR conditions elicited a statistically significant change in participants' HRA, H1.1 was not supported (Table 3); however, these results support H1.2. These two hypotheses were further found to be supported with tests that examine changes in the individual dimensions of HRA, as described in the following section.

Changes in dimensions of HRA
After examining overall attitudes to human rights, individual dimensions were investigated separately. A statistically significant effect was found when employing the repeated

measures ANOVA for two of the three dimensions: SOC factor: $F(1, 84) = 13.33, p < 0.001$; and EQT factor: $F(1, 84) = 4.09, p = 0.046$. These two dimensions of human rights attitudes were both rated higher overall in the post- than in the pre-questionnaires. No statistically significant difference was observed between pre- and post-scores for the CIV factor: $F(1, 84) = 1.09; p = 0.300$.

Consuming the content in VR elicited a positive attitudinal shift in two out of the three dimensions of HRA (SOC and EQT); consuming the content in the 2D condition led to a statistically significant positive shift in attitudes in one dimension of HRA (SOC) and a statistically borderline change in another (EQT); finally, consuming the content in the Article condition elicited no changes in attitudes in any dimension (Table 4).

Differences between immersive journalism and the article
The results for the overall HRA scale indicate whether there was an attitudinal change in each of the conditions. However, although VR and 2D seem to have an effect on the measured attitudes the results do not indicate whether the changes were significantly different between the conditions. Therefore, a One-Way ANOVA was conducted to compare the changes in participants' human rights attitudes according to the condition in which they consumed the media content. The results show a statistically significant difference in the change in HRA dependent on condition: $F(2, 84) = 3,39, p = 0.038$. Effect size index ($\eta_p^2$) suggested that the condition in which the media content was consumed accounted for 7.5% of the variance in HRA.

As Levene's test indicated equal variances ($F(2,84) = 1.01, p = 0.368$) and group sizes are roughly equal, the Tukey HSD post hoc test was used in order to further investigate the effects of viewing conditions on HRA. The post-hoc analysis suggested borderline significant

Condition	Pre Mean (SD)	Post Mean (SD)	Paired *t*-test			
			t	*p*	*d*	95% CI
HMD-360	5.78 (0.46)	5.98 (0.52)	−3.22	*0.003*	0.58	−0.327, −0.073
Monitor-360	5.61 (0.62)	5.83 (0.51)	−2.42	*0.022*	0.45	−0.403, −0.034
Monitor-article	5.94 (0.50)	5.92 (0.58)	0.49	0.627		−0.113, 0.184

Note(s): SD = Standard deviation, 95% CI = 95% Confidence interval. Cohen's *d* values should be interpreted as small effect size when *d* value is between 0.2 and 0.5, and medium when *d* value is between 0.5 and 0.8 (Cohen, 2013). Statistically significant results are in italic font ($p < 0.05$)

Table 3.
Results of the paired *t*-tests on the change in overall HRA

Condition	Pre Mean (SD)	Post Mean (SD)	Paired *t*-test			
			t	*p*	*d*	95% CI
	Social security (SOC)					
HMD-360	6.15 (0.87)	6.35 (0.78)	−2.64	*0.013*	0.47	−0.358, −0.046
Monitor-360	6.16 (0.82)	6.46 (0.60)	−2.98	*0.006*	0.55	−0.495, −0.091
Monitor-article	6.30 (0.66)	6.44 (0.56)	−1.14	0.263		−0.414, 0.118
	Equality (EQT)					
HMD-360	6.66 (0.57)	6.81 (0.38)	−2.39	*0.024*	0.43	−0.275, −0.021
Monitor-360	6.45 (0.66)	6.63 (0.51)	−1.90	0.068	0.35	−0.387, 0.015
Monitor-article	6.80 (0.27)	6.76 (0.46)	0.52	0.611		−0.133, 0.222

Note(s): SD = Standard deviation, 95% CI = 95% Confidence interval. Cohen's *d* values should be interpreted as small effect size when *d* value is between 0.2 and 0.5, and medium when *d* value is between 0.5 and 0.8 (Cohen, 2013). Statistically significant results are in italic font ($p < 0.05$)

Table 4.
Results of the paired *t*-tests on the change in dimensions of HRA

differences in mean scores of HRA when comparing the Article condition to 2D as well as to VR. When comparing the positive change in HRA between the Article condition and 2D, the mean difference was 0.25, SE = 0.11, $p = 0.056$. Regarding comparisons between Article and VR, the mean difference was 0.24, SE = 0.11, $p = 0.76$.

A statistically significant contrast test (Contrast 1), indicated a more prominent change for the 2D and VR conditions when compared to the Article condition (Table 5). However, there was no statistically significant difference between 360-degree video and VR (Contrast 2) in human rights attitudes change.

The results suggest that the difference in changes in HRA scores for 2D and VR are non-significant. However, previously obtained results indicate that VR elicited a change in two out of the three dimensions of HRA (see Table 4), while 2D only affected one of the dimensions, and a borderline statistically significant for a second. Hence, H1.3 is partially supported. Immersive journalism (2D and VR conditions) indeed have a stronger effect than the Article, but there seems to be no difference between the medium and high degrees of immersiveness.

Involvement as a mediator of HRA change
First, involvement scores between the three conditions were examined. An ANOVA analysis suggested a difference exists in the reported involvement between conditions: $F(2, 84) = 6.56$, $p = 0.002$, $\eta_p^2 = 0.135$. Tukey HSD further indicated between which pairs of conditions there is a difference in mean Involvement scores. The only statistically significant differences in means were found when comparing the Article condition to 2D (mean difference 0.82, SE = 0.30, $p = 0.023$, 95% CI [0.096, 1.547]) and Article to VR (mean difference 1.04, SE = 0.30, $p = 0.002$, 95% CI [0.326, 1.753]). There was no significant difference in reported involvement by participants in 2D and VR conditions. These results indicate that the participants in 2D and VR rated involvement higher than those in the Article condition, partially supporting H2.2 (Figure 1).

When examining each of the individual conditions, involvement did not have a statistically significant effect on HRA change in the Article ($p = 0.965$), 2D ($p = 0.608$), or in the VR ($p = 0.361$) conditions. A non-significant interaction test across all three conditions implies that involvement does not mediate the effect of the condition on the change in attitudes, therefore, H2.1 was not supported.

In order to further investigate possible effects of involvement on the change of the total HRA score, a GLM with an interaction contrast test was specified. In the contrast test, the 2D and VR conditions were compared to the Article condition (Figure 2). A statistically significant result indicated that high involvement had a more prominent effect on HRA change in the 2D and VR conditions than in the Article condition; $F(1, 81) = 5.10$, $p = 0.027$, $\eta_p^2 = 0.059$. A significant interaction contrast test supports H2.2.

Summary
Finally, Table 6 provides a systematic presentation of hypotheses, pertinent tests, and outcomes in order to improve the clarity and comprehensibility of the results.

| Source	SS	SSE	df	MS	MSE	F	p	η_p^2
Contrast 1	1.12	13.87	1, 84	1.12	0.17	6.76	*0.011*	0.074
Contrast 2	0.005	13.87	1, 84	0.005	0.17	0.03	0.863	

Table 5.
Results of the contrast analyses on the change in overall HRA

Note(s): η_p^2 = partial eta squared, SS = Total sum of squares, SSE = Error sum of squares, df = Degrees of freedom, MS = Mean square, MSE = Mean squared error. Statistically significant results are in italic font ($p < 0.05$)

Note(s): Error bars present 95% CIs
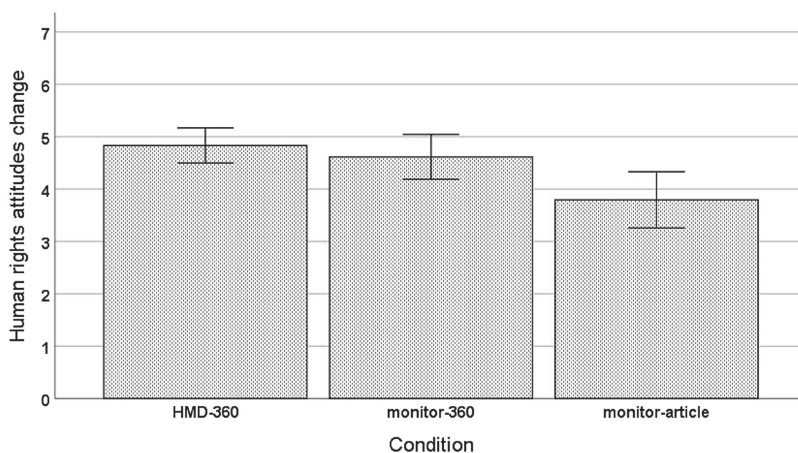
Figure 1.
Mean scores for
Involvement in the
three conditions

Note(s): Error bars present 95% CIs
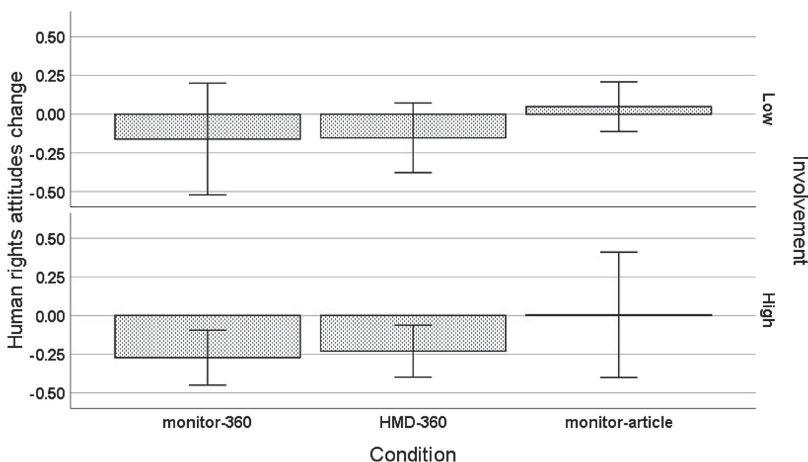
Figure 2.
HRA change in the
three conditions for
high and low
Involvement scores

Statistical test		Hypotheses	Outcome
Paired *t*-test	H1.1	Viewing journalistic media content leads to a positive shift in human rights attitudes	Not supported
Repeated measures ANOVA Paired *t*-test	H1.2	Immersive journalism has a stronger effect on human right attitude compared to written journalism	Supported
ANOVA Contrast test	H1.3	Technological immersiveness of immersive journalism is positively associated with a shift in human rights attitudes	Partially supported
ANOVA Interaction test	H2.1	Level of involvement in a media experience mediates the relationship between the immersiveness of the technology and the shift in human rights attitudes	Not supported
GLM with interaction contrast	H2.2	Involvement in the experience has a stronger positive effect on human rights attitudes in immersive journalism than in written journalism	Supported

Table 6.
A summary of results

Discussion
This work investigated if, and to what extent, the platform on which media content is consumed affects attitudes toward human rights. Despite the increasing availability and popularity of mobile VR and 360-degree videos, distributed through *YouTube* and online news media outlets, it remains unclear how it affects users' attitudes pertaining to the content topic. Results of this study suggest that viewing an immersive journalism 360-degree video via mobile VR, or on a computer screen, can have a positive effect on users' human rights attitudes. Immersive conditions (2D and VR) elicited a positive change in users' HRA, although the change is slightly more prominent in the VR condition. On the other hand, the Article condition, which is closer to traditional journalism, had no effect on individuals' HRA. Furthermore, involvement was shown to have no overall mediation effect, although a statistically significant interaction contrast suggested high involvement led to a more prominent positive change in the HRA in the immersive conditions.

Overall, the results from the sample collected in this study indicate that even the most simplistic immersive journalism content, such as an animated 360-degree video, can bring about a positive shift in users' human rights attitudes, and that VR is statistically somewhat more efficient at this than 2D. In contrast, comparable content in the format of an article elicited no attitudinal change in participants.

General discussion
Firstly, we hypothesized that the content itself will positively influence participants' attitudes regardless of the platform (H1.1). The results indicate that there is a media-specific difference in the way the content is experienced and, consequently, how it affects an individual's HRA. Both VR and the 2D conditions evoked a positive change on participants' overall HRA. However, participants that consumed the content in the article format showed no change in their HRA compared to the pre-experiment assessment. Overall, the most significant finding is that the two immersive conditions were more likely to have an effect on one's attitudes compared to the Article condition (H1.2).

The three individual dimensions of HRA were affected differently depending on the treatment. Following the non-significant results of the overall HRA scores, the Article condition showed no effect on the participants' attitudes for any dimension. Although analysis of both immersive conditions showed a significant overall HRA change, further analysis showed that VR elicited a change in two out of the three dimensions: Social security and Equality. At the same time, 2D only affected attitudes regarding Social security issues, and only borderline affected Equality (H1.3). However, the origin of this difference is unclear; whilst VR was expected to have a stronger effect on attitudes compared to 2D, differences in the affected dimensions were not predicted.

The rationale underpinning H1.3 assumed that involvement brought on by the platform would mediate the effects of the content on the HRA (H2.1). However, the results for the collected data show that there is no interaction effect when looking into all three conditions. On the other hand, immersive conditions did elicit a stronger experience of involvement with the content as a dimension of presence. Likewise, a differentiation between the effects of high versus low levels of involvement showed that higher involvement did indeed have a positive effect on the change in overall HRA (H2.3), meaning that partially presence and the feeling of "being-there" (De la Peña *et al.*, 2010; Schutte and Stilinović, 2017) affect the intensity of change in users' human rights attitudes.

Theoretical implications
The primary theoretical implication that can be derived from this study stems from the investigation of the relation between the technological immersiveness and attitudinal change.

The results provide evidence and support for the trend of using richer experiences for a more profound effect on one's cognition and affect (e.g. Bogost *et al.*, 2010; Schutte and Stilinović, 2017). Thus, they support the main premise and aim of immersive journalism of using new media and new media technologies for engaging consumers in otherwise inaccessible events or experiences (Aitamurto, 2019; De la Peña *et al.*, 2010). Therefore, they also indirectly support the notion of "empathy machines" (Constine, 2015; Milk, 2015), and their role in subjectifying distant, or otherwise non-comprehensible human experiences (e.g. Herrera *et al.*, 2018).

However, it is unclear whether the unexpected results regarding the effects on involvement stem from a specific element of the content, or if viewing a 360-degree video in 2D and in mobile VR do not provide for distinct enough experiences. Furthermore, it remains inconclusive whether the difference in the technological immersiveness of mobile VR compared to a 2D screen might affect user's attitudes not only more strongly, but also in a different manner. If distinct dimensions of certain attitudes are affected in distinct ways, this could be due to, for example, the perceived distance from the content and involvement evoked by different interaction mechanics.

Furthermore, there are theoretical implications for our understanding of human rights attitudes and their genesis. If attitudes toward human rights were derived from a single underlying psychological construct (Kohlberg, 1978; McClosky, 1964; McClosky and Zaller, 1984) it would be reasonable to assume that any changes resulting from the experiment are broadly consistent. However, the results clearly demonstrate that this is not the case: the VR condition showed positive changes for Social security and Equality, but not for Civilian constraint; while the 2D condition showed a positive change for SOC, but not conclusively for either CIV or EQT. In fact, the only consistency of results was observed in the Article condition, where there were no changes in either SOC, EQT, CIV, or in the overall HRA. With this in mind, the results support the theoretical position that attitudes toward human rights can be different for distinct clusters, or dimensions (Diaz-Veizades *et al.*, 1995; McFarland and Mathews, 2005). It has been argued that differences are the result of a lack of political "know-how" regarding the implementation or applicability of human rights concepts (McClosky, 1964; McClosky and Zaller, 1984). If this were true, it would be expected that samples consisting of highly-educated participants would support a unidimensional construct, but this is not the case, either in this work or in other studies (Crowson, 2004; Diaz-Veizades *et al.*, 1995).

Practical implications
The notion of the "collapse of compassion" describes the decrease in compassion when the number of people in need of help increases (Cameron and Payne, 2011; Slovic, 2010). This is of particular relevance when considering possible practical implications of our results as a large group of people in need may be perceived as overwhelming by an individual, potentially evoking emotion regulation. This effect is also visible in evidence suggesting that although the number of individuals in need of help increases, the willingness to donate to charity may not increase (Slovic, 2010). Furthermore, studies show that help is more often allocated to identifiable, versus statistical, victims (Kogut and Ritov, 2005; Small and Loewenstein, 2003). Charity organizations recognize this issue and often use visual material of individuals in need in an attempt to humanize mass, or even global, issues. Therefore, various charity and non-government organizations dealing with related global issues might benefit from utilizing VR as a novel way to overcome the collapse of compassion and to present identifiable victims in need.

Similarly, VR could be exploited in various fields of education. There are already numerous academic and industry examples of applications in simulation training and science education (Lamb *et al.*, 2018; Moro *et al.*, 2017; Süncksen *et al.*, 2018). However, it might also

prove useful in respect to social sciences and humanities. For example, it has been suggested that the effectiveness of studying history would be supported by so-called historical empathy (Davis *et al.*, 2001; Endacott and Brooks, 2013; Yilmaz, 2007) which aims to bring temporally or geographically distant societies or individuals closer to the student, enabling a deeper understanding of the depicted context.

Limitations and future studies

The results pertaining to participants' change in HRA was based exclusively on data collected via self-reported measurements immediately after the experiment and, therefore, lacks behavioural and qualitative data that would provide further validity. It has been suggested that measures of implicit attitudes could be more useful in detecting the effects of media than self-report measures (Blanton and Jaccard, 2015; Payne and Dal Cin, 2015). Thus, it is possible that a study utilizing implicit attitudes measures could produce more nuanced insights. Furthermore, this study only considered participants' change in attitudes immediately after consuming the content. A longitudinal study would further develop our understanding on how attitudes change, and how sustainable that change is over time, as some studies have shown that empathy induced change in attitudes was even further strengthened after a period of a couple of weeks (Batson *et al.*, 1997; Herrera *et al.*, 2018). It has been suggested that perspective-taking in VR in particular enhances empathy over a period of several weeks, as well as encouraging prosocial behaviour (Herrera *et al.*, 2018). As such, it would be beneficial to investigate possible behavioural effects of immersive journalism, such as involvement with charities, non-government organizations, or public calls for social awareness and change.

We have used an otherwise blank webpage for the Article condition, which might be problematic when it comes to external validity as web pages usually contain plentiful amounts of other stimuli. Moreover, the Article condition did not contain any audio, but rather only text and images, while the immersive conditions were comprised of both video and audio. Furthermore, it is probable that participants watching the video in immersive conditions were exposed to the stimulus for a longer time period than those reading the article. Although the two types of conditions and media are intrinsically different, which may pose issues regarding internal validity, this design was necessary in order to compare a more traditional means of delivering news-related media with the novel, immersive ones.

The underlying reasons for changes in some, but not other, dimensions of human rights attitudes also require further examination. One possible cause for changes in only two of the three dimensions could be the theme of the content itself or the manner in which it is narrated or visually presented. Likewise, it is plausible that users perceive that aspects of the content are differently emphasized according to the platform on which it is consumed. Investigating these nuances is crucial for effective and targeted representations of a certain issue. Although this study suggests that, overall, VR is more effective in evoking attitudinal change, in some cases 2D might be comparably efficient but more cost-effective and commercially viable.

A promising avenue for future work is an empirical investigation of this theoretical issue via a large-scale study in which different populations would be compared to one another. As the diversity in our sample is limited to the study locality and context, the results cannot be reliably prescribed to different populations that may be utilizing immersive technologies. Replication studies with diverse samples would help ascertain external validity and allow for a more nuanced understanding of how content similar to the one used in this study influences the attitudes of users with different backgrounds. For example, it has been repeatedly suggested that presence, and consequent empathizing, is influenced by users' individual differences rather than only the technological disparities in immersiveness or the content itself (Iachini *et al.*, 2019; Jurnet *et al.*, 2005; Shin, 2018; Shin, 2019b). Additionally, the low

degree of attitudinal change could be partially explained by the predominantly liberal political orientation of the participants. It has been suggested that an existing liberal viewpoint allows for a smaller positive change, whilst conservative views allow for a greater shift in attitudes (Emler *et al.*, 1983; Passini, 2014). Furthermore, those of a politically conservative standpoint have been found to be avoidant of information which conflicts with their worldview, whereas liberals have been found to be more receptive to information which supports their political stance (Garrett and Stroud, 2014). As such, it can be argued that when an individual of conservative opinions is presented with information which they cannot avoid, for example via an immersive experience, they are more likely to be receptive to that information than someone of a more liberal perspective. A more conservative sample in a replicated or similar experiment could provide further insights into the effects of the media.

It has been suggested that embodiment enhances empathy (for a review, see Bertrand *et al.*, 2018), therefore, of particular importance would be to study how the effects of a VR experience differ depending on whether the user is embodied within the experience or not. In this way, differentiation could be made between the effects of particular affordances of the designed experience itself and those of the immersive qualities of the employed hardware.

Finally, it should be taken into consideration that VR is still a young medium to which most users are unaccustomed, it has been suggested that the novelty effect influences the way content is experienced (e.g. Wells *et al.*, 2010). A such, it would be worthwhile to compare the effects immersive journalism content has on users' cognition and behaviours, depending on their familiarity with VR. Well-versed users could be less affected by similar content and, hence, less immersed, which could influence its effects on their cognition. On the other hand, long-term consumption of immersive journalism could eventually lead to burnout and desensitization, due to the potential psychological toll of its effects (Moroz and Krol, 2018; Slovic, 2010).

References

Aitamurto, T. (2019), "Normative paradoxes in 360 journalism: contested accuracy and objectivity", *New Media and Society*, Vol. 21 No. 1, pp. 3-19.

Bailenson, J.N. (2018), *Experience on Demand: What Virtual Reality Is, How it Works, and what it Can Do*, W. W. Norton & Company, New York.

Batson, C.D., Polycarpou, M.P., Harmon-Jones, E., Imhoff, H.J., Mitchener, E.C., Bednar, L.L., Klein, R., T. and Highberger, L. (1997), "Empathy and attitudes: can feeling for a member of a stigmatized group improve feelings toward the group?", *Journal of Personality and Social Psychology*, Vol. 72 No. 1, pp. 105-118.

Bertrand, P., Guegan, J., Robieux, L., McCall, C.A. and Zenasni, F. (2018), "Learning empathy through virtual reality: multiple strategies for training empathy-related abilities using body ownership Illusions in embodied virtual reality", *Frontiers in Robotics and AI*, Vol. 5, p. 26.

Blanton, H. and Jaccard, J. (2015), "Not so fast: ten challenges to importing implicit attitude measures to media psychology", *Media Psychology*, Vol. 18 No. 3, pp. 338-369.

Bogost, I, Ferrari, S. and Schweizer, B. (2010), *Newsgames. Journalism at Play*, MIT Press, Cambridge, MA.

Bogost, I. (2007), *Persuasive Games*, MIT Press, Cambridge, MA.

Bollmer, G. (2017), "Empathy machines", *Media International Australia*, Vol. 165 No. 1, pp. 63-76.

Cameron, C.D. and Payne, B.K. (2011), "Escaping affect: how motivated emotion regulation creates insensitivity to mass suffering", *Journal of Personality and Social Psychology*, Vol. 100 No. 1, pp. 1-15.

Cohen, G.L. (2003), "Party over policy: the dominating impact of group influence on political beliefs", *Journal of Personality and Social Psychology*, Vol. 85 No. 5, pp. 808-822.

Cohen, J. (2013), *Statistical Power Analysis for the Behavioral Sciences*, Routledge, New York.

Cohrs, J.C., Maes, J., Moschner, B. and Kielmann, S. (2007), "Determinants of human rights attitudes and behavior: a comparison and integration of psychological perspectives", *Political Psychology*, Vol. 28 No. 4, pp. 441-469.

Coke, J.S., Batson, C.D. and McDavis, K. (1978), "Empathic mediation of helping: a two-stage model", *Journal of Personality and Social Psychology*, Vol. 36 No. 7, pp. 752-766.

Constine, J. (2015), "Virtual reality, the empathy machine", available at: http://techcrunch.com/2015/02/01/what-it-feels-like/ (accessed 12 May 2020).

Crowson, H.M. (2004), "Human rights attitudes: dimensionality and psychological correlates", *Ethics and Behavior*, Vol. 14 No. 3, pp. 235-253.

Cummings, J.J. and Bailenson, J.N. (2016), "How immersive is enough? A meta-analysis of the effect of immersive technology on user presence", *Media Psychology*, Vol. 19 No. 2, pp. 272-309.

Davis, O.L., Yeager, E.A. and Foster, S.J. (Eds) (2001), *Historical Empathy and Perspective Taking in the Social Studies*, Rowman & Littlefield.

De la Peña, N., Weil, P., Llobera, J., Giannopoulos, E., Pomes, A., Spanlang, B., Friedman, D., Sanchez-Vives, V.M. and Slater, M. (2010), "Immersive journalism: immersive virtual reality for the first-person experience of news", *Presence: Teleoperators and Virtual Environments*, Vol. 19 No. 4, pp. 291-301.

De Smale, S., Kors, M.J. and Sandovar, A.M. (2017), "The case of this war of mine: a production studies perspective on moral game design", *Games and Culture*, Vol. 14 No. 4, pp. 387-409.

Diaz-Veizades, J., Widaman, K.F., Little, T.D. and Gibbs, K.W. (1995), "The measurement and structure of human rights attitudes", *The Journal of Social Psychology*, Vol. 135 No. 3, pp. 313-328.

Dunbar, E., Sullaway, M., Blanco, A., Horcajo, J. and De La Corte, L. (2007), "Human rights attitudes and peer influence: the role of explicit bias, gender, and salience", *International Journal of Intercultural Relations*, Vol. 31 No. 1, pp. 51-66.

Dweck, C.S. (2008), "Can personality be changed? The role of beliefs in personality and change", *Current Directions in Psychological Science*, Vol. 17 No. 6, pp. 391-394.

Emler, N., Renwick, S. and Malone, B. (1983), "The relationship between moral reasoning and political orientation", *Journal of Personality and Social Psychology*, Vol. 45 No. 5, pp. 1073-1080.

Endacott, J. and Brooks, S. (2013), "An updated theoretical and practical model for promoting historical empathy", *Social Studies Research and Practice*, Vol. 8 No. 1, pp. 41-58.

Fisher, J.A. (2017), "Empathic actualities: toward a taxonomy of empathy in virtual reality", in Nunes, N., Oakley, I. and Nisi, V. (Eds), *International Conference on Interactive Digital Storytelling*, Springer, Cham, pp. 233-244.

Gabriel, S. (2017), "Teaching human rights with video games?", in Pivec, M. and Gründler, J. (Eds), *European Conference on Games Based Learning*, University of Applied Sciences, Graz, pp. 191-196.

Garrett, R.K. and Stroud, N.J. (2014), "Partisan paths to exposure diversity: differences in pro-and counterattitudinal news consumption", *Journal of Communication*, Vol. 64 No. 4, pp. 680-701.

Gentile, D.A., Anderson, C.A., Yukawa, S., Ihori, N., Saleem, M., Kam Ming, L., Shibuya, A., Liau, A.K., Khoo, A., Bushman, B.J., Huesmann, R. and Sakamoto, A. (2009), "The effects of prosocial video games on prosocial behaviors: international evidence from correlational, longitudinal, and experimental studies", *Personality and Social Psychology Bulletin*, Vol. 35 No. 6, pp. 752-763.

Gerber, A.S., Huber, G.A. and Washington, E. (2010), "Party affiliation, partisanship, and political beliefs: a field experiment", *American Political Science Review*, Vol. 104 No. 4, pp. 720-744.

Granic, I., Lobel, A. and Engels, R.C. (2014), "The benefits of playing video games", *American Psychologist*, Vol. 69 No. 1, pp. 66-78.

Greitemeyer, T. and Osswald, S. (2010), "Effects of prosocial video games on prosocial behavior", *Journal of Personality and Social Psychology*, Vol. 98 No. 2, pp. 211-221.

Greitemeyer, T., Osswald, S. and Brauer, M. (2010), "Playing prosocial video games increases empathy and decreases schadenfreude", *Emotion*, Vol. 10 No. 6, pp. 796-802.

Gutsell, J.N. and Inzlicht, M. (2012), "Intergroup differences in the sharing of emotive states: neural evidence of an empathy gap", *Social Cognitive and Affective Neuroscience*, Vol. 7 No. 5, pp. 596-603.

Hangartner, D., Dinas, E., Marbach, M., Matakos, K. and Xefteris, D. (2019), "Does exposure to the refugee crisis make natives more hostile?", *American Political Science Review*, Vol. 113 No. 2, pp. 442-455.

Harris, R. and Foreman-Peck, L. (2004), "'Stepping into other peoples' shoes': teaching and assessing empathy in the secondary history curriculum", *International Journal of Historical Learning,Teaching and Research*, Vol. 4 No. 2, pp. 98-111.

Hassan, R. (2019), "Digitality, virtual reality and the 'empathy machine'", *Digital Journalism*, Vol. 8 No. 2, pp. 195-212.

Heeter, C. (1992), "Being there: the subjective experience of presence", *Presence: Teleoperators and Virtual Environments*, Vol. 1 No. 2, pp. 262-271.

Herrera, F., Bailenson, J., Weisz, E., Ogle, E. and Zaki, J. (2018), "Building long-term empathy: a large-scale comparison of traditional and virtual reality perspective-taking", *PLoS ONE*, Vol. 13 No. 10, e0204494, doi: 10.1371/journal.pone.0204494.

Iachini, T., Maffei, L., Masullo, M., Senese, V.P., Rapuano, M., Pascale, A., Sorrentino, F. and Ruggiero, G. (2019), "The experience of virtual reality: are individual differences in mental imagery associated with sense of presence?", *Cognitive Processing*, Vol. 20 No. 3, pp. 291-298.

Isbister, K. (2016), *How Games Move Us: Emotion by Design*, MIT Press, Cambridge, MA.

Jones, S. (2017), "Disrupting the narrative: immersive journalism in virtual reality", *Journal of Media Practice*, Vol. 18 Nos 2-3, pp. 171-185.

Jurnet, I.A., Beciu, C.C. and Maldonado, J.G. (2005), in Slater, M. (Ed.), "Individual differences in the sense of presence", *Proceedings of Presence 2005: The 8th International Workshop on Presence*, University College London, London, pp. 133-142.

Kogut, T. and Ritov, I. (2005), "The 'identified victim' effect: an identified group, or just a single individual?", *Journal of Behavioral Decision Making*, Vol. 18 No. 3, pp. 157-167.

Kohlberg, L. (1978), "Revisions in the theory and practice of moral development", *New Directions for Child and Adolescent Development*, Vol. 1978 No. 2, pp. 83-87.

Koivisto, J. and Hamari, J. (2019), "The rise of motivational information systems: a review of gamification literature", *International Journal of Information Management*, Vol. 45, pp. 191-210.

Kors, M.J., Ferri, G., Van Der Spek, E.D., Ketel, C. and Schouten, B.A. (2016), "A breathtaking journey. On the design of an empathy-arousing mixed-reality game", *Proceedings of the 2016Annual Symposium on Computer-Human Interaction in Play*, pp. 91-104.

Kunstman, J.W. and Plant, E.A. (2008), "Racing to help: racial bias in high emergency helping situations", *Journal of Personality and Social Psychology*, Vol. 95 No. 6, pp. 1499-1510.

Lamb, R., Antonenko, P., Etopio, E. and Seccia, A. (2018), "Comparison of virtual reality and hands on activities in science education via functional near infrared spectroscopy", *Computers and Education*, Vol. 124, pp. 14-26.

Lazar, J. and Stein, M.A. (Eds) (2017), *Disability, Human Rights, and Information Technology*, University of Pennsylvania Press, Philadelphia, PA.

Lazar, J., Feng, J.H. and Hochheiser, H. (2017), *Research Methods in Human-Computer Interaction*, Morgan Kaufmann, Cambridge, MA.

Li, D.D., Liau, A.K. and Khoo, A. (2013), "Player–Avatar Identification in video gaming: concept and measurement", *Computers in Human Behavior*, Vol. 29 No. 1, pp. 257-263.

McClosky, H. and Zaller, J. (1984), *The American Ethos: Public Attitudes toward Capitalism and Democracy*, Harvard University Press, Cambridge, MA.

McClosky, H. (1964), "Consensus and ideology in American politics", *American Political Science Review*, Vol. 58 No. 2, pp. 361-382.

McFarland, S. and Mathews, M. (2005), "Who cares about human rights?", *Political Psychology*, Vol. 26 No. 3, pp. 365-385.

Milk, C. (2015), "How virtual reality can create the ultimate empathy machine", available at: https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine (accessed 12 May 2020).

Mischel, W. and Shoda, Y. (1995), "A cognitive-affective system theory of personality: reconceptualizing situations, dispositions, dynamics, and invariance in personality structure", *Psychological Review*, Vol. 102 No. 2, pp. 246-268.

Moro, C., Štromberga, Z. and Stirling, A. (2017), "Virtualisation devices for student learning: comparison between desktop-based (Oculus Rift) and mobile-based (Gear VR) virtual reality in medical and health science education", *Australasian Journal of Educational Technology*, Vol. 33 No. 6, pp. 1-10.

Moroz, M. and Krol, K. (2018), "VR and empathy: the bad, the good, and the paradoxical", in *2018 IEEE Workshop on Augmented and Virtual Realities for Good*, pp. 1-4.

Oh, S.Y., Bailenson, J., Weisz, E. and Zaki, J. (2016), "Virtually old: embodied perspective taking and the reduction of ageism under threat", *Computers in Human Behavior*, Vol. 60, pp. 398-410.

Passini, S. (2014), "The effect of personal orientations toward intergroup relations on moral reasoning", *Journal of Moral Education*, Vol. 43 No. 1, pp. 89-103.

Payne, B.K. and Dal Cin, S. (2015), "Implicit attitudes in media psychology", *Media Psychology*, Vol. 18 No. 3, pp. 292-311.

Pratto, F., Sidanius, J., Stallworth, L.M. and Malle, B.F. (1994), "Social dominance orientation: a personality variable predicting social and political attitudes", *Journal of Personality and Social Psychology*, Vol. 67 No. 4, pp. 741-763.

Roberts, B.W., Walton, K.E. and Viechtbauer, W. (2006), "Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies", *Psychological Bulletin*, Vol. 132 No. 1, pp. 1-25.

Sánchez Laws, A.L. (2017), "Can Immersive journalism enhance empathy?", *Digital Journalism*, Vol. 8 No. 2, pp. 213-228.

Schutte, N.S. and Stilinović, E.J. (2017), "Facilitating empathy through virtual reality", *Motivation and Emotion*, Vol. 41 No. 6, pp. 708-712.

Shin, D. and Biocca, F. (2017), "Exploring immersive experience in journalism", *New Media and Society*, Vol. 20 No. 8, pp. 2800-2823.

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*, Vol. 78, pp. 64-73.

Shin, D. (2019a), "How do users experience the interaction with an immersive screen?", *Computers in Human Behavior*, Vol. 98, pp. 302-310.

Shin, D. (2019b), "How does immersion work in augmented reality games? A user-centric view of immersion and engagement", *Information, Communication and Society*, Vol. 22 No. 9, pp. 1212-1229.

Slater, M. (2003), "A note on presence terminology", *Presence Connect*, Vol. 3 No. 3, pp. 1-5.

Slater, M. and Wilbur, S. (1997), "A framework for immersive virtual environments (FIVE): speculations on the role of presence in virtual environments", *Presence: Teleoperators and Virtual Environments*, Vol. 6 No. 6, pp. 603-616.

Slovic, P. (2010), "If I look at the mass I will never act: psychic numbing and genocide", in Roeser, S. (Ed.), in *Emotions and Risky Technology, The International Library of Ethics, Law and Technology*, Springer, Dordrecht, Vol. 6, pp. 37-60.

Small, D.A. and Loewenstein, G. (2003), "Helping a victim or helping the victim: altruism and identifiability", *Journal of Risk and Uncertainty*, Vol. 26 No. 1, pp. 5-16.

Süncksen, M., Bendig, H., Teistler, M., Wagner, M., Bott, O.J. and Dresing, K. (2018), "Gamification and virtual reality for teaching mobile x-ray imaging", *2018 IEEE 6th International Conference on Serious Games and Applications for Health*, IEEE, Vienna, pp. 1-7.

Sundar, S.S., Kang, J. and Oprean, D. (2017), "Being there in the midst of the story: how immersive journalism affects our perceptions and cognitions", *Cyberpsychology, Behavior, and Social Networking*, Vol. 20 No. 11, pp. 672-682.

Swami, V., Nader, I.W., Pietschnig, J., Stieger, S., Tran, U.S. and Voracek, M. (2012), "Personality and individual difference correlates of attitudes toward human rights and civil liberties", *Personality and Individual Differences*, Vol. 53 No. 4, pp. 443-447.

Tavani, H.T. (2003), *Ethics and Technology: Ethical Issues in an Age of Information and Communication Technology*, John Wiley & Sons, New York.

Tosh, J. (2015), *The Pursuit of History: Aims, Methods and New Directions in the Study of History*, Routledge, Abingdon.

Trommsdorff, G. and Kornadt, H.J. (1995), "Prosocial and antisocial motivation of adolescents in East and West Germany", *New Directions for Child and Adolescent Development*, Vol. 1995 No. 70, pp. 39-56.

van Loon, A., Bailenson, J., Zaki, J., Bostick, J. and Willer, R. (2018), "Virtual reality perspective-taking increases cognitive empathy for specific others", *PLoS ONE*, Vol. 13 No. 8, e0202442, doi: 10. 1371/journal.pone.0202442.

Wells, J.D., Campbell, D.E., Valacich, J.S. and Featherman, M. (2010), "The effect of perceived novelty on the adoption of information technology innovations: a risk/reward perspective", *Decision Sciences*, Vol. 41 No. 4, pp. 813-843.

Witmer, B.G. and Singer, M.J. (1998), "Measuring presence in virtual environments: a presence questionnaire", *Presence*, Vol. 7 No. 3, pp. 225-240.

Yilmaz, K. (2007), "Historical empathy and its implications for classroom practices in schools", *The History Teacher*, Vol. 40 No. 3, pp. 331-337.

Corresponding author

Mila Bujić can be contacted at: mila.bujic@tuni.fi