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Humor and camera view on mobile short-form video apps influence user experience and technology-adoption intent, an example of *TikTok* (*DouYin*)

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ABSTRACT

Mobile short-form videos on social media apps are increasingly popular. Human-Computer Interaction (HCI) theories may be extended to short-form video apps to understand and improve app user experience, as well as to persuade new technology-adoption. The present study examined the psychological responses and persuasive outcomes associated with short-form videos on a mobile social media app. In a 2 (low- V.S. high-level humor) X 2 (first- V.S. third-person view) between-subject experimental design, participants (N = 81) were randomly assigned one of the four sets of videos about smart homes; post-viewing, they filled out an online questionnaire. Results of ANCOVA demonstrated significant effects of videos' humor and camera view on the viewer perceptions of Immersion, Social Presence and Entertainment but not on Spatial Presence and Perceptual Realism: Humor had mixed effects on the interaction between users and the mobile app; the first-person camera view elevated viewers' Immersion, Social Presence, Entertainment. As a PROCESS mediation test showed, Social Presence mediated (by 56.78%) the indirect link between the level of humor getting from a video and the viewers' post-viewing intent to adopt the technology depicted in the video. The study demonstrated values of extending HCI theories to mobile short-form video apps. Implications were discussed in terms of using appropriate humor and camera view for improving user experience and persuading serious agenda.

1. Introduction

Whether on the metro or at home, numerous people are burying their heads in the "sand" of mobile screens. Mobile devices enable users to immerse themselves into a mediated world, one that psychologically removes them from where they are physically situated. Instances of such temporary mental getaways include interactions with distant friends as if those interactions were face-to-face. This is achieved through social media, single- or multi-player mobile video gaming, and the consumption of mobile videos.

Prior research suggests that mobile videos, given humor and appropriate camera views (e.g., first-person), may promote new technology adoption (Maredia et al., 2018). On top of traditional social media, public healthcare sectors are starting to leverage short-form video-sharing apps for comminuting health-related information to local communities, hoping for public health behavioral changes (Zhu, Xu, Zhang, Chen, & Evans, 2020). Mobile video-sharing app users, even on serious topics, prefer not only content shorter than 60 s but also content in cartoons or documentary style (Zhu et al., 2020). As to understand the underlying mechanism of whether and how short-form videos influence and persuade app users around a certain agenda, this study aims to take a Human-Computer Interaction (HCI) Approach and examine the associations between video characteristics and user responses. By testing several theory-driven models, this study also attempts to extend theories of immersion and presence to mobile social media platforms. Particularly, it studies short-form videos as a popular phenomenon, using *TikTok* as an example. By April 2019, *TikTok* has gained 200% market-share in a two-year growth period (Lee & Nass, 2005): The app had 1.17 million ratings on iPhone app store, 9.67 million ratings on Google Play (2019 April), and over 9.67 million downloads. With a fast-growing popularity and acceptance, social video-sharing apps may foster an ecology at the intersection of Snapchat and Instagram and shape unique user experience.

1.1. Short-form videos on social media apps

At mobile terminals, short-form videos are gaining increasing popularity through social media. As of 2010, most videos on YouTube had been under 10 min in length (Davidson et al., 2010). In 2017, however, social media users would already associate YouTube with an

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impression of longer (10-, 20-min) videos in contrast to Facebook, Instagram, and Snapchat, which they considered to typically provide shorter-form videos (Wright, 2017). On Instagram, for instance, users can watch short-form videos through "Feed", "Stories", and "Explore". The posts feed congregates content from the accounts that a particular user follows; "Stories" allow users to share video-status no longer than 15 s (as of February 2020); the "Explore" page recommends posts from interesting accounts based on users' previous in-app activities. According to Instagram (2020), more than 500 million accounts use the feature of "Stories" daily. The trend of consuming increasingly shorter videos may, to some extent, result from the fast pace of modern life. In a prior study (Wright, 2017), social media users explained that their preference for social media with short-form videos was due to convenience; in the meantime, users enjoyed content curation, through which the algorithm garners all posts but only presents a selection of curated content to the user. Indeed, a content curation strategy would very likely to tailor social media content for users, creating more app traffics in shorter intervals of time.

Apart from the trend for shorter video length, mobile videos on social media are also becoming increasingly overarching in content. For example, a lot of bloggers would endorse beauty products through short-form video apps; they often have the potential to persuade followers into purchases (Wright, 2017). Despite a length limit of 15 s, short-form videos can be substantial in content. With all user-generated content, users follow and interact with each other by viewing, liking, commenting, and sharing videos. Social media influencers and their followers, especially, may form a para-social bond, which promotes the sales of ideas, services, and products. On China-based social video-sharing app, *TikTok* (or *"Dou Yin"*), for example, mobile videos cover numerous aspects of life, e.g. beauty, cooking, cinema, education, health, and technology. Unlike Instagram (which is primarily a lifestyle photo-sharing app), *TikTok* positions itself to focused on quirky videos, most of which were not too professionally or aesthetically produced. While its international versions primarily targets at youth via singing, dancing, and funny viral videos, its Chinese version targets at older adults of a wide age range; majority of the videos are about daily life. Because of the different app versions, its Chinese version is used in this study for extracting natural, user-generated videos that can provide more substantial content on a comparatively more serious topic – possibly still in a humorous way.

Previous research has shown the promise of social media in marketing new technologies (Erkan & Evans, 2016; Iyengar, Van den Bulte, & Valente, 2011; Pentina, Koh, & Le, 2012) and the power of humor in persuasion (English, Sweetser, & Ancu, 2011). Humor is often a powerful psychological cue in persuasive technology design (Cialdini, 2007; Fogg, 2002; Khooshabeh, McCall, Gandhe, Gratch, & Blascovich, 2011; Morkes, Kernal, & Nass, 1999). Humorous and persuasive messages may significantly elevate the sense of *presence* (i.e., the sensation of being in a mediated environment) and sequentially facilitate message recall (Skalski, Tamborini, Glazer, & Smith, 2009). *TikTok*, likewise, may be used as a powerful tool to disseminate entertaining content that persuades people to adopt particular new technologies.

1.2. Smart homes

Among the numerous new ideas and technologies depicted on mobile video platforms, the smart home is no doubt under heated discussion. Since the early days, numerous animations and science fiction have depicted homes of the future. Among the variety of futuristic imaginations is the smart home, embedded with robots and automation systems. On *TikTok*, hundreds of user-generated videos are already showcasing real, existing smart homes. They include demonstration videos about automatic systems – fingerprint lock, window shades/curtains that can open and close according to indoor lighting needs, voice-controlled lighting/TV/music players, and thermostatically responsive systems. This diffusion trend of social media content on smart home technologies and the Internet of Things (i.e., IoT) is likely to expand and extend with the increasing prevalence of 5G, or the 5th generation of wireless communications, which started to emerge in 2019. Based on the above reasons, this study considers smart home technology as a readily available example, which is well suited for surveying users' adoption intent after viewing mobile videos that depict smart homes.

1.3. Immersion, presence, Perceptual Realism, and entertainment

In cyberspace and popular electronic media, Immersion, Involvement, and Presence are some common psychological outcomes of media effects. Other common media effects include enjoyment or entertainment and persuasion (Bracken & Skalski, 2010, pp. 5–8). These concepts appear in a plethora of communication research. For example, social presence has been observed in Computer-mediated Communication (CMC) through telephone or emails (Short, Williams, & Christie, 1976; Rice, 1993), with intelligent virtual agents such as those in online video games (Bailey, Wise, & Bolls, 2009) or in e-commerce sites (Lee & Nass), and through television (Freeman, Avons, Pearson, & IJsselsteijn, 1999). Few studies, if any, examined Immersion, Involvement, and Presence in the context of short-form videos on social media at mobile terminals. This study, hence, aims to fill in this gap in research. It will draw on research on television since television viewing is perhaps the most similar media experience comparable to viewing short-form videos on mobile devices.

While "presence" and "immersion" are often used interchangeably and seen together (McMahan, 2003), they underline different aspects of experience in a virtual or mediated environment. Ever since Jonathan Steuer coined the term "telepresence" in 1992 in an article published in *the Journal of Communication*, "(tele)presence" has been researched by numerous scholars from different fields including psychology, computer science, as well as communication. "(Tele)presence" is defined as "the extent to which one feels present in the mediated environment." (Steuer, 1992, p. 76). In comparison, "*immersion* is a psychological state characterized by perceiving oneself to be enveloped by, included in, and interacting with an environment that provides a continuous stream of stimuli and experiences," or "the degree to which an individual feels absorbed by or engrossed in a particular experience." (Witmer & Singer, 1998, p. 227). According to McMahan (2003), the most accepted definition of immersion was from Janet Murray and Murray (2017): "the physical experience of being submerged in water." It is the original, literal meaning of immersion, from which its metaphorical meaning derived to describe a subjective, psychological experience of being surrounded by another environment.

Apart from "presence" and "immersion," one's engagement with virtual media content may often also relate to the notion of "involvement." "*Involvement* is a psychological state experienced as a consequence of focusing one's energy and attention on a coherent set of stimuli or meaningfully related activities and events." An individual attaches significance or meaning to the stimuli, activities, or events, the level of which affects their level of involvement. (Witmer & Singer, 1998, p. 227). However, the attentional attribute of this state should fall into the domain of *Social Presence* according to Nichols, Haldane, and Wilson (2000) – involvement was thereafter part of the measurement of presence in some studies (e.g., Lee, Park, & Song, 2005; Turner, Turner, & McGregor, 2007).

Apart from the definitions mentioned above, some researchers also consider presence as the following psychological state after "immersion" and "involvement." It is "the subjective experience of being in one place or environment, even when one is physically situated in another" (Witmer & Singer, 1998, p. 225). When an individual is mediated by technology, her/his presence in the cyberspace is two-folded (Bailey et al., 2009): Physical presence and social presence. *Physical presence* is the feeling as if transcending the medium. *Social Presence* is the feeling of social interaction. According to Biocca (1997), social presence is a relational term in a mediated communication environment. It is one's

feeling of coexisting and interacting with other intelligent social actors despite the physical division. The degree of social presence is associated with one's feeling of access to the other social actors in the shared space, and their form, behavior, and sensory experience, which carries intelligence, intentions, and sensory impressions. (Biocca, 1997).

As discussed, these concepts above may overlap in their implications. In this study, the concepts will be reorganized in the actual measurement to generate a much clearer division of dimensional meanings in media content viewing experience.

1.4. Camera perspective/view

Previous research suggests that camera angles may influence how people engage and interact with media content, hence creating more persuasive power to incur positive outcomes. According to McMahan (2003), camera perspectives or views may influence viewer response to the same scene. Between a first-person perspective and an isometric (i.e., "constant measurements") perspective where all objects receive equal emphasis, the first-person perspective may be more immersive, engaging, and thus afford a higher level of presence. In an evaluation study of several interactive simulation systems, the camera view was found to influence user performance in virtual driving simulators (Bateman et al., 2011). The four views tested were overhead, first-person, third-person-high, and third-person-low. Results indicated that performance with overhead views was significantly worse than with first-person or third-person views. No performance differences were found between first-person and third-person views in any study reported by Bateman et al. (2011). While previous research implied an effect of camera perspectives or views on user outcomes, findings differed regarding the specific direction of effect from the various views. The conflicting findings may result from the varied nature of the technology devices used because each technology device can afford different functionality and usability. Hence, this study posits that mobile smartphone applications (e.g., mobile video streaming social media apps like *TikTok*), may also generate unique psychological experiences of Immersion, Presence, Perceived Realism, and Entertainment, some of which may be amplified through specific camera angles. Overall, this study builds upon previous research and hypothesizes as follows.

H1. A higher level of Humor Use provides more sense of Immersion (a), Spatial Presence (b), Social Presence (c), Perceptual Realism (d), and Entertainment (e) than the third-person angle in short-form mobile videos on social media.

H2. The first-person angle provides more sense of Immersion (a), Spatial Presence (b), Social Presence (c), Perceptual Realism (d), and Entertainment (e) than the third-person angle in short-form mobile videos on social media.

H3. Immersion (a), Spatial Presence (b), Social Presence (c), Perceptual Realism (d), and Entertainment (e) influence Intent to adopt smart home technologies.

H4. The indirect effect of Humor Use on Intent to adopt smart home technologies is mediated by Immersion (a), Spatial Presence (b), Social Presence (c), Perceptual Realism (d), and Entertainment (e).

H5. The indirect effect of Camera view on Intent to adopt smart home technologies is mediated by Immersion (a), Spatial Presence (b), Social Presence (c), Perceptual Realism (d), and Entertainment (e).

Namely, as Fig. 1 shows, this study proposes a mediation model on Intent to adopt smart home technologies post-viewing related mobile short-form videos. The effects of Camera view and Humor use on Intent to adopt are examined through possible psychological mediators of Immersion, Spatial presence, Social presence, Perceptual realism, and Entertainment.

2. Methods

2.1. Approved study protocol and participants

The study protocol was approved by the Institutional Review Board of a university in the United States in May 2019 for presenting minimal to no harms to the study participants. Afterwards, the study recruited 81 voluntary participants through online chat groups and email lists. This study received no funding from any organizations and declares no conflict of interest with all social media companies mentioned in this article. Participants received no monetary compensation but a small amount of class credits. Except for three participants who did not report

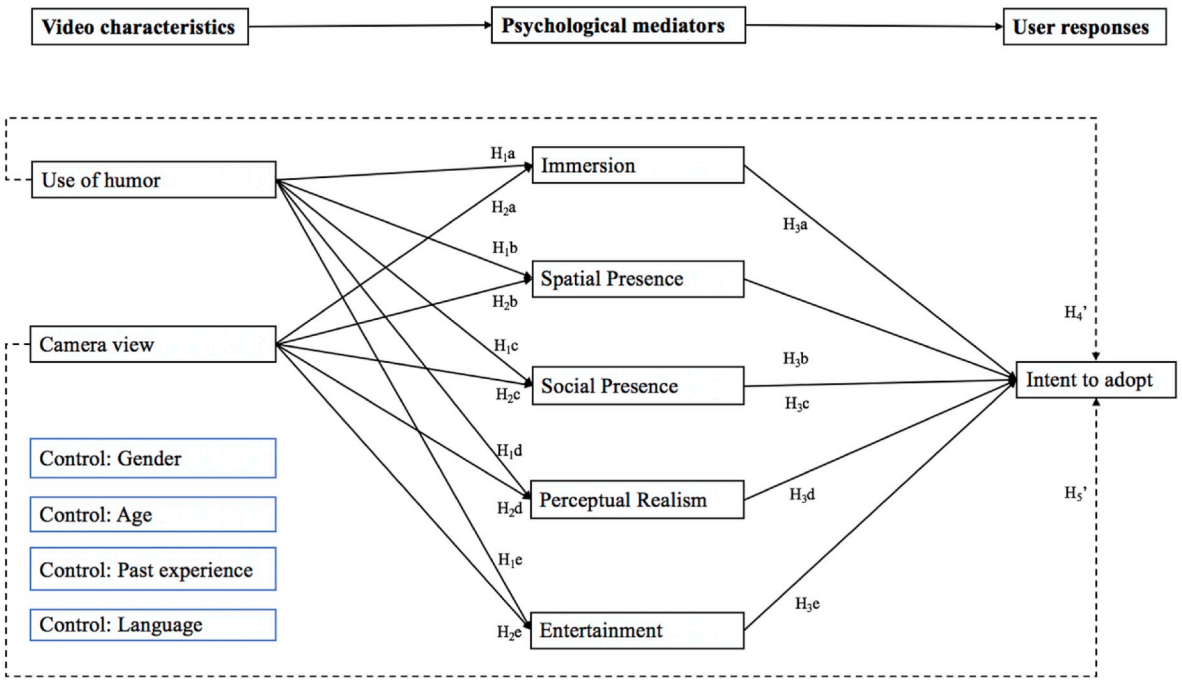

Fig. 1. Proposed research model.

their gender, 25 were male, and 53 were female. The mean age was 22.71 years ($SD = 2.95$). Regarding the past experience of using smart home technologies, 39 had owned some type of smart home device, such as home automation systems or virtual voice agents (e.g., Amazon's Alexa), while 42 had not. Participants' primary language of use was English ($n = 53$), followed by Chinese ($n = 24$), Spanish ($n = 1$), Korean ($n = 1$), and Hebrew ($n = 1$).

2.2. Procedure

2.2.1. Materials

Two coders used the Chinese search terms of "smart home" and its synonyms in different combinations to identify over 300 user-generated videos clips about smart homes from *TikTok*. To be eligible for selection, all videos had to provide demonstration of smart home technology and be comprehensible to both Chinese and non-Chinese native speakers without knowing Chinese - participants' primarily language of use was later analyzed as a covariate on several analyses and turned out to be not a statistically significant covariate. After a brief training, coders worked independently to identify an unlimited number of candidate videos for the four pre-defined groups until repetitive patterns of videos occurred. This was to aim for the best possible balance and manipulation of experimental conditions, although perfect manipulation may not be achieved through natural samples. Two coders discussed and agreed on the final 20 videos. Manipulation check is necessary and may increase the robustness of data analyses. The final selection of 20 videos were mostly about 15-s-long, with each group having one longer short-form video about 20–40 s.

2.2.2. Study design

The two main factors of interest are *Humor use* and *Camera view*. A 2 (low-level V.S. high-level of humor) X 2 (first- V.S. third-person camera view) between-subject experiment (see Table 1) were conducted through Qualtrics. Participants were randomly assigned to one of the four conditions, each of which showed in a random order five short-form videos about smart home technologies. As Table 1 shows, Group A had 18 participants who watch five videos that were of a lower level of humor use and a first-person camera view. Group B had 21 participants who watch five videos that were of a higher level of humor use and a first-person camera view. Group C had 23 participants who watch five videos that were of a lower level of humor use and a third-person camera view. Group D had 19 participants who watch five videos of a higher level of humor use and a third-person camera view.

During the study, participants first received an online questionnaire, giving information about their demographics and past experience about smart home technologies before viewing the clips; post-viewing, they gave responses to the videos in terms of Immersion, Presence, Perceptual Realism, and Entertainment, as well as their Intent to Adopt smart home technologies. Responses to the questionnaire were analyzed.

2.3. Measures

2.3.1. Intent

After viewing the videos, participants rated from 1 ("extremely unlikely") to 7 ("extremely likely") their intent of adopting some type of smart home technologies: "*Based on your viewing experience of the previous TikTok videos about Smart Home, how likely are you going to adopt some type of smart home technologies?*" Three questions accessed participants under different timeframes: 1) in the next six months, 2) in the next 12 months, and 3) in an undesignated future. Responses to the three items were averaged to produce an intent score.

Table 1
Experimental design testing effects of humor and camera view on psychological responses and adoption intent.

		Humor	
		Low	High
Camera view	First-person	18 (A)	21 (B)
	Third-person	23 (C)	19 (D)

Note. The numbers of 18, 21, 23, 19 are cell sample sizes.

2.3.2. Immersion

Six items from Bracken (2005) measured the extent to which participants "felt a sense of involvement or connection when they watch" (Bracken, 2005) the video clips. Three of the items were on a 7-point Likert-type scale, and three were Semantic Differential scales. This study adapted items from Lee and Nass (2005) and Lee and Nass (2005). Sample items included "*How involving was the media experience?*" and "*I lost track of time.*" See Table 2 for the other items. The scale was internally reliable, Cronbach's alpha = 0.845.

2.3.3. Spatial presence

Three items of a 7-point Likert-type scale from Lee and Nass (2005) measured to which extent participants felt physically situated in a space when they were not. Sample items included "*How much did it seem as if you could reach out and touch the objects or people you saw/heard?*" See Table 2 for the other items. The scale was internally reliable, Cronbach's alpha = 0.837.

2.3.4. Social presence

Four items measured on a 7-point Likert-type scale the extent to which participants felt social interaction, engagement, and co-presence with the other social actor(s) in a mediated world. The first item came from Lee and Nass (2005) – "*It seemed like the video character(s) and I were interacting.*" The second item was from Lee and Nass (2005) – "*It seemed like one or more other people or entities from the video were communicating with me.*" The third item was from Lee, Peng, Jin, and Yan (2006) – "*How much did you feel as if you were accompanied with the video character(s)?*" The fourth item was from Nichols, Haldane, and Wilson (2000) – "*How much attention did you pay to it?*" The scale was internally reliable, Cronbach's alpha = 0.714.

Table 2
Measurement of immersion, spatial presence, social presence, perceptual realism, and entertainment.

	Items
Immersion	*1. How involving was the media experience?* *2. How completely were your senses engaged?* *3. To what extent did you experience a sensation of reality?* *4. I lost track of time.* *5. I felt that the displayed environment was part of the real world.* *6. I felt surrounded by the displayed environment.*
Spatial presence	*1. How much did it seem as if the objects and the people you saw/heard had come to the place you were?* *2. How much did it seem as if you could reach out and touch the objects or people you saw/heard?* *3. How often when an object seemed to be headed toward you did you want to move out of its way?*
Social presence	*1. It seemed like the video character(s) and I were interacting.* *2. It seemed like character(s) or entities from the video were communicating with me.* *3. I feel as if I were accompanied with the video character(s).* *4. How much attention did you pay to viewing the videos?*
Perceptual realism	*1. I feel that the things/people in the environment that I saw/heard SOUND like they would if I experienced them directly.* *2. I feel that the things/people in the environment that I saw/heard LOOK like they would if I experienced them directly.* *3. I feel that the things/people in the environment that I saw/heard FEEL like they would if I experienced them directly.* *4. I feel like the events I saw/heard were happening to me.*
Entertainment	*1. Rate the level of entertainment that you (they) get from watching the videos.*

2.3.5. Perceptual realism

Four items from Bracken (2005) measured the extent to which participants perceived the world presented via the videos to be realistic. Participants rated from 1 ("strongly disagree") to 7 ("strongly agree") in terms of the extent they agree with the statements. Items involved three specific senses – "*I feel that the things/people in the environment that I saw/heard SOUND/LOOK/FEEL like they would if I experienced them directly*" and one general sense – "*I feel like the events I saw/heard were happening to me.*" The scale was internally reliable, Cronbach's alpha = 0.845.

2.3.6. Entertainment

Entertainment or enjoyment, as a common media effect, was measured as an additional psychological outcome of viewing mobile short videos on social media. One item asked the participants to "*Rate the level of entertainment that you (they) get from watching the videos*."

2.3.7. Background factors

Apart from the psychological measures mentioned above, the study also surveyed demographics and past experience of using smart home technologies. Participants reported their gender, birth year, whether having owned some type of smart home devices like home automation systems or virtual voice agents (e.g., Amazon), and primary language of use.

2.4. Manipulation check

In order to test the level of manipulation effectiveness regarding humor use in the videos, the study asked participants to rate the level of humor of the videos they watched on a 7-point Likert-type scale, with 1 for "extremely not humorous" and 7 for "extremely humorous." According to Table 1 shown in Section 2.2., Group B should be rated higher on humor than Group A, while Group D should be rated higher on humor than Group C, if the manipulation was successful.

3. Results

3.1. Preliminary analyses

3.1.1. Missing value imputation

In IBM SPSS Statistics 26, a missing value analysis calculated the percentages of missing values for all variables. The analysis showed that two variables (age, sex) had 3.7% ($n = 3$) missing data, while measures on Immersion and Adoption Intent had respectively two variables missing 1.2% ($n = 1$) values and one variable missing 2.5% ($n = 2$) data. The absolute counts of missing values are not large, but the percentages indicate that data imputation may be needed to avoid possible biases resulting from missing data, although scholars have not yet reached consensus on the percentage cutoffs (Schlomer, Bauman, & Card, 2010). To determine whether data imputation would be appropriate for this dataset, we first wanted to see whether values are missing at random or not. According to the results of the Little's Missing Completely at Random (MCAR) Test, X^2 (121, $N = 81$) = 106.889, $p = .816$, the test failed to reject the null hypothesis. Therefore, the values are missing at random, and data imputation would be appropriate in this case (Little, 1988; Schlomer et al., 2010). Missing data on Gender were imputed by "female", which was the median and mode for the gender distribution ("mean or mode imputation (MEI) method", Allison, 2001). An Expectation-Maximization algorithm imputed missing data at the item-level (Enders, 2003) for Immersion and Adoption Intent respectively per sub-scale; this was to leverage construct scales' internal reliability for more reliable simulation.

3.1.2. Randomization check and confounds analyses

To ensure that the four experiential groups only differed on the manipulation and are randomized in terms of demographic factors (age and sex), two tests were performed. A Pearson Chi-Square test showed that the four groups did not vary significantly on sex, X^2 (3, $N = 81$) = 1.054, $p = .788$. A one-way ANOVA showed that the four groups also did not vary significantly on age, F (3, 77) = 0.825, $p = .484$; a test of homogeneity of variances showed that homogeneity of variances was not violated for age, $p = .17$. Hence, the potential confounding effects of demographic factors on the study outcomes were ruled out. Age and sex will not be controlled as co-variates in the following analyses.

3.1.3. Manipulation check

As introduced in the methods section, participants rated the level of humor of the videos they watched on a 7-point Likert-type scale, with 1 for "extremely not humorous" and 7 for "extremely humorous." According to a univariate ANOVA followed by a post hoc test of Tukey's HSD, participants, as the manipulation intended, rated Group B videos ($n = 21$, $M = 3.33$, $SD = 1.528$) more humorous than Group A videos ($n = 18$, $M = 2.89$, $SD = 1.323$), although the between-group mean difference was not statistically significant, $p = .816$, Cohen's $d = 0.308$, 95% CI [-0.88, 1.77]. They also rated Group D videos ($n = 19$, $M = 3.42$, $SD = 1.805$) more humorous than Group C videos ($n = 23$, $M = 3.09$, $SD = 1.593$), but the between-group difference was again not statistically significant, $p = .903$, Cohen's $d =$, 95% CI [-0.95, 0.162]. Experimental manipulation in this study presented limited effectiveness. Responses to the manipulation check question may thus serve as an indicator for the individual-level effectiveness of experimental manipulation and worth being controlled as a covariate for subsequent analyses.

3.2. Hypotheses testing

3.2.1. Humor use (H1a) and Camera view (H2a) on immersion

A first two-way Analysis of Covariance (ANCOVA) was conducted to test the possible effects of Humor use and Camera view of a short-form video on participants' feeling of Immersion, controlling for three possible covariates, which were to be confirmed: 1) past experience related to smart home technology use, 2) participant's primary language of use, and 3) manipulation effectiveness of humor in the video. Two variables turned to be not covariates for Immersion: 1) past experience, F (1, 74) = 0.930, $p = .338$, 95% CI: [-0.689, 0.240], and 2) participant's primary language of use, F (1, 74) = 0.459, $p = .500$, 95% CI: [-0.191, 0.387]. However, videos' manipulation effectiveness of the humor use had a significant effect on participants' feeling of Immersion, F (1, 74) = 29.794, $p < .001$, partial $\eta^2 = 0.287$ (large effect), and hence it was a covariate. Specifically, participants who rated the humor manipulation to be more effective reported a higher level of Immersion, which supported the importance of manipulation check in experiment evaluation as well as the importance of successful experimental manipulation.

ANCOVA also indicated a significant main effect of Humor use (high/low) on Immersion, F (1, 74) = 5.510, p = .022, partial $\eta^2 = 0.082$ (moderate effect), and a significant main effect of Camera view (first-person/third-person) on Immersion, F (1, 74) = 5.479, $p = .022$, partial $\eta^2 = 0.077$ (moderate effect). There was no significant interaction effect between Camera view and Humor use on Immersion, F (1, 74) = 1.321, $p = .254$, 95% CI: [-1.411, 0.379]. Specifically, lower humor group ($M = 4.289$, $SD = 1.084$) reported more Immersion than higher humor group ($M = 3.979$, $SD = 1.260$), t (79) = 2.568, 95% CI: [0.179, 1.416]. Meanwhile, the first-person view ($M = 4.346$, $SD = 0.983$) provided more sense of Immersion than the third-person view ($M = 3.940$, $SD = 1.314$), t (79) = 2.568, 95% CI: [0.157, 1.436]. Therefore, the opposite direction of H1a was supported, and H2a was supported.

3.2.2. Humor use (H1b) and Camera view (H2b) on Spatial Presence

A second two-way Analysis of Covariance (ANCOVA) was conducted to test the possible effects of Humor use and Camera view of a short-form video on participants' feeling of Spatial Presence, controlling for the same three possible covariates mentioned above: 1) past experience, 2) participant's primary language of use, and 3) manipulation effectiveness

of humor in the video. Participants' primary language of use turned out to be non-significant once again, F (1, 74) = 2.052, p = .156, 95% CI: [-0.628, 0.103]. However, "past experience related to smart home technology use" (F (1, 74) = 4.529, p = .037, partial η^2 = 0.058, moderate effect, 95% CI: [-1.215, −0.040])) and "manipulation effectiveness of humor" (F (1, 74) = 17.638, p < .001, partial η^2 = 0.192, large effect size, 95% CI: [0.205, 0.574]) were significant covariates for Spatial Presence. Specifically, participants who had less previous experience with smart home technology tended to experience more sense of Spatial Presence through viewing the short-form videos in this study. One possible explanation may be novelty.

Regarding main effects testing, neither Humor use nor Camera view had a significant main effect on Spatial Presence; Humor use: F (1, 74) = 1.135, p = .290, CI: [-0.339, 1.227]; Camera view: F (1, 74) = 825, p = .367, CI: [-0.411, 1.208]. No significant interaction between the two factors were found, F (1, 74) = 0.222, p = .639, CI: [-1.400, 0.865]. H1b and H2b were not supported.

3.2.3. Humor use (H1c) and Camera view (H2c) on social presence

A third two-way Analysis of Covariance (ANCOVA) was conducted to test the possible effects of Humor use and Camera view of a short-form video on participants' feeling of Social Presence, controlling for 1) past experience, 2) participant's primary language of use, and 3) manipulation effectiveness of humor in the video.

Participants' primary language of use turned out to be non-significant, F (1, 74) = 0.713, p = .401, 95% CI: [-0.165, 0.406]. However, "manipulation effectiveness of humor" was a significant covariate for Social Presence, F (1, 74) = 21.559, p < .001, partial η^2 = 0.226 (large effect size), 95% CI: [0.192, 0.480], as well as "previous experience", F (1, 74) = 4.559, p = .036, partial η^2 = 0.058 (moderate effect size), 95% CI: [-0.951, −0.033].

Regarding main effects testing, Humor use had a significant main effect on Social Presence, F (1, 74) = 6.202, p = .015, partial η^2 = 0.049 (small effect size), 95% CI: [-0.015, 1.208]. Camera view also had a significant main effect on Social Presence, F (1, 74) = 5.979, p = .017, partial η^2 = 0.044 (small effect size), 95% CI: [-0.046, 1.218]. A first-person camera view and a lower level of humor would lead to more sense of Social Presence; non-accepted rumor use in short-form videos may be distracting rather than engaging. Also, no significant interaction effect was found between the two main factors, F (1, 74) = 0.019, p = .891, 95% CI: [-0.945, 0.824]. Thus, the opposite direction of H1c was supported; and H2c are supported. However, please note that since the 95% Confidence Intervals crossed zero for the main effects of Humor use and Camera on Social Presence, though slightly, interpretation of these two findings should be evaluated with some conservation or less confidence. A further examination is needed.

3.2.4. Humor use (H1d) and Camera view (H2d) on Perceptual Realism

A fourth two-way Analysis of Covariance (ANCOVA) was conducted to test the possible effects of Humor use and Camera view of a short-form video on participants' sense of Perceptual Realism, controlling for 1) past experience, 2) participant's primary language of use, and 3) manipulation effectiveness of humor in the video.

ANCOVA found "past experience" was not a significant covariate for Perceptual Realism: F (1, 74) = 0.751, p = .389, 95% CI: [-0.790, 0.311]; nor was "primary language of use": F (1, 74) = 0.575, p = .451, 95% CI: [-0.212, 0.473]; but "manipulation effectiveness of humor" was significant covariate: ": F (1, 74) = 19.932, p < .001, partial η^2 = 0.212 (large effect size), 95% CI: [0.215, 0.561].

Results also indicated no significant main effect of Humor use on Perceptual Realism, as the 95% Confidence Interval clearly crossed zero: [-0.107, 1.360], although F (1, 74) = 4.786, p = .032. Likewise, there was no significant main effect of Camera view on Perceptual Realism, as the 95% Confidence Interval clearly crossed zero: [-0.129, 1.388], although F (1, 74) = 4.823, p = .031. There was insufficient evidence to support H1d or H2d.

3.2.5. Humor use (H1e) and Camera view (H2e) on the perceived level of entertainment

As mentioned earlier, post-viewing, participants were asked to rate the level of entertainment that they get from watching the set of videos in the study. A fifth two-way Analysis of Covariance (ANCOVA) tested the possible effects of Humor use and Camera view of short-form videos on participants' perceived level of Entertainment, controlling for 1) past experience, 2) participant's primary language of use, and 3) manipulation effectiveness of humor in the video.

ANCOVA found "past experience" was not a significant covariate for perceived Entertainment level: F (1, 74) = 1.810, p = .183, 95% CI: [-1.050, 0.204]; nor was "primary language of use": F (1, 74) = 2.647, p = .108, 95% CI: [-1.237, 0.125]; but "manipulation effectiveness of humor" was significant covariate: ": F (1, 74) = 39.914, p < .001, partial η^2 = 0.350 (large effect size), 95% CI: [0.438, 0.841].

Regarding main effects testing, Humor use had a significant main effect on Entertainment, F (1, 74) = 5.724, p = .019, partial η^2 = 0.094 (large effect size), 95% CI: [0.334, 2.037]. Camera view also had a significant main effect on Entertainment, F (1, 74) = 5.212, p = .025, partial η^2 = 0.087 (large effect size), 95% CI: [0.289, 2.029]. There was no significant interaction effects between the two main factors, F (1, 74) = 2.099, p = .152, 95% CI: [-2.096, 0.331]. Specifically, participants in the lower-humor condition (M = 4.15, SD = 1.509) reported a higher level of perceived Entertainment than the higher-humor condition (M = 3.78, SD = 1.833), supporting the opposite direction of H1e. Participants who watched the videos in a first-person view (M = 4.21, SD = 1.704) reported getting more Entertainment than those in the third-person view (M = 3.74, SD = 1.639). The opposite direction of H1e was supported; H2e was supported.

So far, hypotheses testing demonstrated that a lower level of Humor Use would provide more sense of Immersion (supporting the opposite of H1a), Social Presence (supporting the opposite of H1c), and Entertainment (supporting the opposite of H1e) than the third-person angle in short-form mobile videos on social media, but Humor Use did not influence Spatial Presence (rejecting H1b) or Perceptual Realism (rejecting H1d). Meanwhile, participants in this study tended to feel that a first-person angle would provide more sense of Immersion (supporting H2a), Social Presence (supporting H2c), and Entertainment (supporting H2e) than a third-person angle in short-form videos, but Camera view did not influence Spatial Presence (rejecting H2b) or Perceptual Realism (rejecting H2d) - at least on mobile social media.

3.2.6. Intent to adopt

For H3, a multiple regression analysis was conducted to test if the five psychological variables, controlling for 1) past experience, 2) participant's primary language of use and 3) manipulation effectiveness of humor in the video, significantly predicted participants' Intent to adopt smart home technologies post-viewing. Results indicated that the eight predictors explained 39.2% of the variance, R^2 = 0.392, F (8,72) = 5.836, p < .001. However, among all potential predictors, only two were significant: past experience (p = .002, β = −0.311, 95% CI: [-1.682, −0.400]) and Social Presence (p = .039, β = 0.296, 95% CI: [0.023, 0.864]). The other six variables were not significant predictors: manipulation effectiveness of humor (p = .995, 95% CI: [-0.252, 0.253]), primarily language of use (p = .071, 95% CI: [-0.064, 1.513]), Immersion (p = .632, 95% CI: [-0.335, 0.548]), Spatial Presence (p = .572, 95% CI: [-0.403, 0.224]), Perceptual Realism (p = .844, 95% CI: [-0.354, 0.290]), Entertainment (p = .069, 95% CI: [-0.020, 0.523]). An updated Regression model with Adoption Intent as the dependent variable was tested on the two significant predictors, past experience and Social Presence. R^2 did not change much, R^2 = 0.308, F (2,78) = 17.364, p < .001; past experience and Social Presence during short-video viewing explained 30.8% of the variance on smart home technology Adoption Intent. There was no concerning collinearity between the two predictors, VIF = 1.011. Specifically, past smart home technology users reported less intent to adopt. Social presence was also a predictor of

Intent to adopt ($\beta = 0.257$, p = .071). The more Social Presence participants felt watching the mobile videos, the more likely they would adopt smart home technologies post-viewing. Thus, the study was unable to support H3a, H3b, H3d, and H3e, but supported H3c.

3.2.7. Mediation testing, social presence as the mediator

H4 and H5 are in the premise that H3 is supported. As only H3c was supported according to the analyses above, H4 and H5 were hence reduced to H4c and H5c, focusing on exploring the mediation effect of Social Presence on the link between Humor use (or Camera view) and Intent to adopt. The first PROCESS mediation test had the dependent variable of Adoption Intent, independent variable of Humor Use ("*Rate the level of humor of these videos. 1 is for 'extremely not humorous' and 7 is for 'extremely humorous'.*"), and the mediator of Social Presence, controlling for past experience related to smart home technologies. Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% confidence interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles.

In Step 1 of the mediation model, the regression of Humor Use on the mediator (Social Presence) was significant, $b = 0.2965$, $t\,(79) = 4.007$, $p < .001$, 95% CI [0.149, 0.444]. In Step 2, the mediator (Social Presence), controlling for Humor Use, was significant on smart home technology-Adoption Intent, $b = 0.5960$, $t\,(79) = 3.830$, $p < .001$, 95% CI [0.286, 0.906]. In Step 3, the regression of Humor Use on smart home technology-Adoption Intent, ignoring the mediator, was significant, $b = 0.3107$, $t\,(79) = 2.8189$, $p = .006$, 95% CI [0.091, 0.530]. In Step 4, results indicated a statistically significant indirect effect of Humor Use on Adoption Intent through Social Presence, $b = 0.1767$, 95% CI [0.074, 0.308]. It was implied that the indirect path from Humor Use to Adoption Intent through Social Presence took up 56.78% of the total effect of Humor Use on Adoption Intent. H4c was supported. Fig. 2 illustrates this mediation model with path coefficients.

Similarly, as for the independent variable of Camera View, the second PROCESS mediation test had the dependent variable of Adoption Intent and the mediator of Social Presence, controlling for past experience. Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the 95% Confidence Interval was computed by determining the indirect effects at the 2.5th and 97.5th percentiles. The Bootstrap CI when Social Presence was tested as a mediator was [-.669, .032], containing zero. Results showed that the mediation model was not statistically significant. H5c was not supported.

To sum up, this study supported the following hypotheses: 1) H1a (in the opposite direction) and H2a about Immersion, 2) H1c (in the opposite direction), H2c, H3c, and H4c about Social Presence, 3) H1e (in the opposite direction) and H2e about perceived Entertainment but failed to support other hypotheses, including those related to Spatial Presence and Perceptual Realism. See Figs. 3 and 4 for the final models.

4. Discussion

The present study addresses the effects of short-form videos characteristics on viewers' psychological responses and technology-related behavioral intent. Two specific types of videos characteristics are explored: Humor Use and Camera View. Humor is divided to high or low levels. Camera view is compared between the first-person and third-person angles. Humor presents conflicting effects on viewer's psychological responses. On the one hand, contrary to the presumptions, participants from the lower-humor group would report more sense of Immersion, Social Presence, and Entrainment. On the other hand, when the humor level of videos is measured on a 7-point Likert scale, humor appears to have a positive impact on Social Presence, through which humor has an indirect positive effect on the participants' post-viewing intent to adopt smart home technologies. The conflicting findings about humor may be explained by three possibilities. Firstly, statistics from the 2 × 2 experiment were only compared at the group-mean level to yield negative associations. Since responses to the scale of Humor provides individual differences, the positive association at an individual level may be closer to the actual case; but this speculation surely needs to be verified. Secondly, the manipulation of humor use in the videos may be insufficiently effective, causing spurious relationship between variables somewhere. As mentioned in Section 2.2, the video materials were user-generated content sampled from the actual app rather than specially produced for the present study. This decision, compromising some rigor of experimental control, was initially intended to help the lab experience resemble the real-life app use experience more closely. Further research can test the humor effect by using more strictly controlled experimental materials. Thirdly, based on the experimental materials, among all four groups of videos, videos of less humor are able to focus on demonstrating smart home technologies with more details and more types of devices. This may be because these videos did not need a complete plot to build toward a humorous scenario. Other possibilities include that bad humor can be distracting, and that the perception of humor can be subjective. Future research may further explore the effect of humor use in mobile short-video settings to disentangle this problem.

Meanwhile, findings of this study regarding Camera View confirm claims of Maredia et al. (2018) and McMahan (2003). Like they have previously suggested, a first-person view indeed creates a more Immersive experience, meanwhile increasing Social Presence and Entertainment. In a Human-Computer Interaction approach, psychological responses were measured on scales adapted from previous literature: 1) Immersion (Bracken, 2005; Lee & Nass, 2005; Lessiter, Freeman, Keogh, & Davidoff, 2001), 2) Social Presence (Lee et al., 2006; Lee & Nass, 2005), 3) Spatial Presence (Lee & Nass, 2005; Nichols, Haldane, & Wilson, 2000), 4) Perceptual Realism (Bracken, 2005), and 5) Entertainment (self-created one-item). The process of scale adaptation involved the identification and evaluation of existing scales, followed by language adjustment tailored for this study. The set of scales from this study may be helpful for future research on the same content genre or similar platforms.

Moreover, Spatial Presence and Perceptual Realism were both not impacted by Humor Use or Camera View, which makes sense in a mobile view experience. In comparison to mobile short-form videos, a virtual environment is able to provide more sense of Spatial/physical Presence by the creation of virtual reality (Seibert & Shafer, 2018); Television also usually keep audience attentional for a longer period of time – much

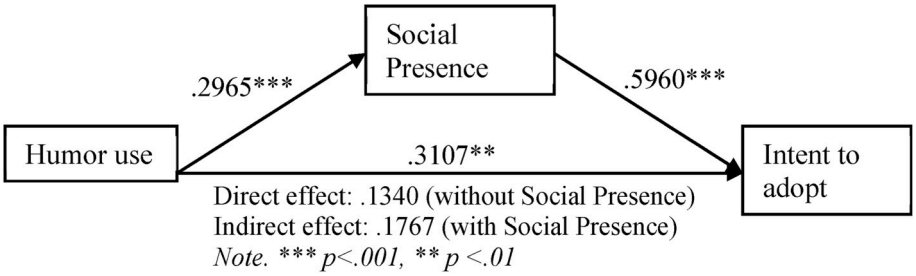

Fig. 2. Mediator model testing – humor use.

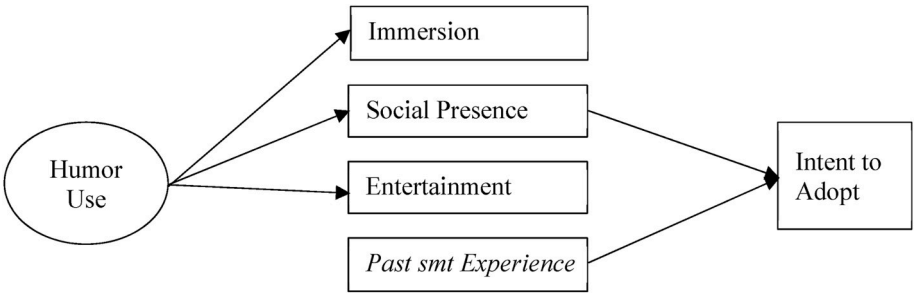

Fig. 3. Final model about Humor Use in mobile short-form videos.

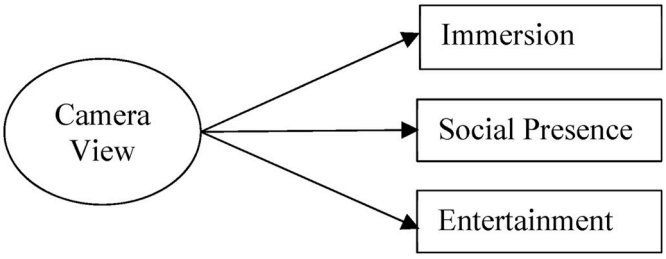

Fig. 4. Final model about Camera View in mobile short-form videos.

longer than the duration of this study. Short-form mobile videos, in comparison, engage viewers more in a virtual social setting rather than providing them physical transportation to another world. However, Saker and Frith (2019) argued, "Mobile Virtual Reality" may be achievable given two conditions: physical distraction and spatial enhancement. Mobile videos in the present study may have failed one or both of the two conditions, but a longer session of mobile video-viewing and engagement may contribute to more sense of Spatial Presence and Perceptual Realism. Future research is needed.

Additionally, mediation models through psychological responses are tested but only the model from Humor, through Social Presence, to technology-Adoption Intent is significant. By adding appropriate Humor, the sense of Social Presence increases, consequentially leading to a stronger technology-Adoption Intent. Social Presence may be the most relevant construct to a mobile video-sharing app given its nature of social media. As the present study reveals, two modes of social interactions exist during the consumption of mobile short-form videos: 1) asynchronous computer-mediated communication between the app user and the original creator of the video; 2) synchronous human-computer interaction between the app user and the short-form video platform, which consists of the hardware and software as well as the creative content generated by real-humans.

While mobile short-form video apps show potential to advocate for positive changes, they can also pose adverse impacts on app users. Population of certain characteristics are prone to short-form video app addition, e.g. those who experience more social interaction anxiety and social isolation, and those who get more Entertainment through using the app (Zhang, Wu, & Liu, 2019). Both online and offline wellbeing require that we use mobile short-form video apps non-excessively.

5. Conclusions

This study delineates a recent trending social media platform: social video-sharing apps, or mobile short-form video apps. Though still an understudied new media, mobile videos seem comparable to previous media such as television and cinema, differentiating with them on mobility. Through a 2 × 2 between-subject experimental design and subsequent data analyses, two conceptual models were constructed. Humor shows mixed effects on the interaction between users and the app. Through demonstration, short-form mobile videos have the potentials to persuade viewers to adopt smart home technologies by creating a sense of Immersion, Social Presence, and Entertainment. These senses would also be stronger if the video adopts a first-person camera angle. Social Presence mediates the indirect link between the level of humor getting from a video and the viewers' post-viewing intent to adopt the technology depicted in the video, controlling for past experience of the related technology. Human-Computer Interaction (HCI) theories may be extended to short-form video-sharing apps for understanding and improving app user experience as well as persuading new technology-adoption.

CRediT authorship contribution statement

Yunwen Wang: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization.

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