Media Psychology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/hmep20

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To cite this article: Hyunyi Cho, Lijiang Shen & Lulu Peng (2021) Examining and extending the influence of presumed influence hypothesis in social media, Media Psychology, 24:3, 413-435, DOI: 10.1080/15213269.2020.1729812

To link to this article: https://doi.org/10.1080/15213269.2020.1729812

MEDIA PSYCHOLOGY
2021, VOL. 24, NO. 3, 413–435
https://doi.org/10.1080/15213269.2020.1729812

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Examining and extending the influence of presumed influence hypothesis in social media

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ABSTRACT

The influence of presumed influence hypothesis (IPI) is a communication theory accounting for the process of persuasive media effects. The present study integrates theoretical perspectives in persuasion and new and traditional media effects research to investigate the assumptions and explanatory mechanisms of IPI in an experiment. View numbers in social media directly predicted presumed exposure by others and indirectly predicted presumed influence on others, consistent with IPI and inconsistent with the bandwagon heuristic. Presumed exposure predicted presumed influence, consistent with IPI. Other predictors of presumed exposure and presumed influence were also found. Self's evaluation of the message (realism) and engagement in the message (identification) predicted presumed exposure by others and presumed influence on others, supporting the expectation that a motivational mechanism of IPI is self-centric social perception. Social media message view numbers did not predict persuasive outcomes directly, but the evaluation of and engagement in the message did. Finally, the data were inconsistent with the assumption of pervasive mass media reach. This study provides theoretical implications for examining persuasive effects of social media messages, while enhancing and expanding IPI. Limitations of the study and directions for future research are discussed.

The influence of presumed influence hypothesis (IPI; Gunther, Bolt, Borzekowski, Liebhart, & Dillard, 2006; Gunther & Storey, 2003) occupies a unique space in the media effects literature as it provides a perspective on lay theorizing of media effects and how it impacts their attitudes and actions. IPI models a persuasive media effects process with three components: presumed exposure, presumed influence, and influence of presumed influence (Gunther et al., 2006). First, people's own exposure to media content functions as the foundation of making inferences about others' exposure to the same content (presumed exposure). Second, the presumed exposure by others promotes the presumption that the media content will influence others (presumed influence). Third, the presumed influence on others prompts the alignment of the attitude of self to the presumed attitude of others (influence of presumed influence).

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About fifteen years after the initial articulation of IPI, the present study is an effort to examine the assumptions and explanatory mechanisms proposed in the model. In this effort, our theoretical foci are the *presumed exposure* and *presumed influence* as the distinct components of IPI's account of media-based persuasion where self is conscious about others' media usage. In the present formulation of IPI, consequently, exposure to media content predicts presumed exposure by others to the same content, and in turn, this presumed exposure predicts presumed influence of the content on others (Gunther et al., 2006; Gunther & Storey, 2003). Drawing on the research on the bandwagon heuristic and theories of self-centric social perception, we propose and evaluate multiple pathways predicting presumed exposure and presumed influence.

These new postulations are tested in a social media environment, which challenges a core underpinning of IPI. Different from the mass media environment in which exposure by others is an assumption made by the audience, in the social media environment exposure by others is concrete information made accessible to the audience in various forms (e.g., view numbers). Despite the fact mass media, the backdrop of IPI is being complemented and replaced by social media, sparse research has investigated IPI in a social media context. Research is needed to investigate whether the mass media-based predictions of IPI hold for social media.

Mass media-based assumptions about presumed exposure and presumed influence

Presumed exposure and presumed influence are the two core components of IPI. Developed and tested in mass media contexts, these constructs may be based on assumptions of large-scale exposure and influence. IPI posits exposure to (mass) media fosters the belief that others are also exposed to the (mass) media content, which then facilitates the belief that others are influenced by the (mass) media content. We begin by examining these mass media-based assumptions about presumed exposure and presumed influence.

One of the conceptual bases of IPI is the persuasive press inference hypothesis (Gunther, 1998). This hypothesis posits that people infer public opinion per their interpretation of the content and effects of mass media. A premise of this hypothesis is the pervasive reach presumption, in which people think the (mass) media content they are consuming is being consumed by others as well. This pervasive reach presumption may be predicated on the notions of "mass media" and "broadcasting," and these notions imply "media by definition have a broad reach" (Gunther, 1998, p. 488; Parisot, 1988). This pervasive reach presumption suggests that, in mass media contexts, people may default to the presumption of large-scale exposure by others.

Importantly, presumption about others' exposure to the media content may be associated with presumption about others' influence by the content.

Both the initial version of IPI (Gunther & Storey, 2003) and the third person effect hypothesis (TPE; Davison, 1983) expect exposure to persuasive media messages impact presumed influence of those messages, thereby motivating actions in response to the presumed influence. Developed and tested within mass media contexts, IPI and TPE may assume large exposure and large influence of the media.

Yet as discussed, social media contexts contain concrete information about others' exposure (e.g., view numbers), thereby making default assumptions about large exposure and large influence less likely. In turn, presumed exposure and presumed influence are likely positively associated with the view number information. If exposure to and influence of mass media are assumed to be large rather than small, then only the social media messages with large view numbers should generate the magnitude of presumed exposure and presumed influence equivalent to that of mass media. Therefore, we predict:

H1a: Presumed exposure by others will differ between mass and social media conditions when social media view numbers are low rather than high.

H1b: Presumed influence on others will differ between mass and social media conditions when social media view numbers are low rather than high.

Extant delineation of presumed exposure

Through its original and revised forms, IPI has articulated the assumption about others' exposure inherent in perceived media effects. In the initial formulation of IPI, Gunther and Storey (2003) posited a direct path between *exposure by self* and *presumed influence on others*. It was expected that one's exposure to media messages will produce presumption about other's exposure to the same messages, which then will adjust one's behavior to the direction of the messages' presumed influence on others. Evidence consistent with the prediction was obtained in their Nepalese national radio campaign study aimed at improving clinic health workers' interpersonal communication skills. Members of the general public who were exposed to the message presumed the messages' influence on clinic health workers and thereby changed their attitude toward the health workers and increased the use of the clinics. The Nepalese public's presumed influence of the radio messages on health workers would have been based on their presumption about the workers' exposure to the radio messages.

In a revision of IPI, Gunther et al. (2006) added *presumed exposure* as an intermediary between *self's exposure* to the media content and *presumed influence* of the media content on others. In their cross-sectional survey of adolescents in the U.S., participants reported their own exposure to pro-smoking advertisements

and anti-smoking public service announcements (PSAs) in mass media. Adolescents were also asked to estimate peers' exposure to the same messages and the influence of the messages on those peers. Results indicated that self-reported exposure to the smoking messages was associated with presumed exposure by peers. In turn, the presumed exposure was linked to the messages' presumed influence on peers. In the end, the presumed influence on peers was associated with the participants' susceptibility to smoking (i.e., situational willingness to uptake smoking). These results affirmed the revised IPI.

Shifting attention to the social media context, others' exposure to a message does not have to be assumed. With view numbers being visible and varying across messages and over time, social media provide concrete information about others' exposure. Therefore, in social media, the estimation of others' exposure may be less dependent on self's presumption than others' digital footprints such as view numbers. This raises a question: What role may view number information play in the IPI process on social media?

Two perspectives on the role of presumed exposure: IPI and the bandwagon heuristic

Sundar (2008) posits that social media view numbers, such as those on YouTube videos, afford users access to others' viewing behavior. Specifically, view numbers on social media may function as a cue for the bandwagon heuristic (Sundar, Oh, Kang, & Sreenivasan, 2012), a rule of thumb with which people adopt the majority of others' action for its presumed benefit (Coleman, 2003). In one of the earliest studies on the bandwagon effect, Simon & Newell (1958) investigated voting behavior as a function of the expectation of the election outcome shaped by published polling data. When people are likely to vote for a candidate who is expected to win than lose, a bandwagon effect is in operation (Simon & Newell, 1958).

Sundar et al. (2008, 2012) assert that affordances on social media such as view numbers can influence users' perception about the content. Drawing on the heuristic-systematic model (Chaiken, 1987), Sundar et al. (2012) explain that this influence occurs because social media affords users' heuristics (i.e., simple rules) with which people can make judgments and decisions about the content. As an affordance that allows the gauging of others' disposition, view number information on social media may signify the popularity of the content. Consequently, view number information may facilitate message acceptance (Sundar, 2008; Sundar et al., 2012; cf. Salganik, Dodds, & Watts, 2006).

Whereas the bandwagon effect predicts a direct relationship between popularity cues and persuasive outcomes, IPI predicts an indirect relationship via presumed exposure. From the IPI perspective, view numbers of social media messages may directly impact presumed exposure to the messages by others, which may in turn affect presumed influence of the message on others. Hence,

view numbers may indirectly impact presumed influence via presumed exposure. Based on this IPI perspective, we predict the following.

H2a: Social media view numbers will directly predict presumed exposure.

H2b: Social media view numbers will indirectly predict presumed influence via presumed exposure.

In the perspective of the bandwagon heuristic, view number information may play a different role. Cues such as view numbers are direct predictors of persuasion in technology-mediated settings because they represent agency cues generated and valued by users of social media (Sundar, 2008; Sundar et al., 2012). Thus, it is plausible that the view number information functions as an agency cue that facilitates the influence of the social media message on others. Larger view numbers may be construed as indicators of higher acceptance of the social media messages, impacting more than presumed exposure. This perspective based on the bandwagon heuristic leads us to predict the following.

H2c: Social media view numbers will directly predict presumed influence.

Explaining presumed influence: beyond presumed exposure

Other-consciousness

IPI explains persuasive media effects in terms of other-consciousness as it predicts that self's exposure to media content leads to presumption about others' exposure to the same content, which leads to presumption about others' influence by the media content. The presumed influence of the media content on others' attitude motivates the adjustment of one's own attitude (Gunther et al., 2006). As such, presumed influence is predicted only by presumed exposure in the current version of IPI (see Figure 1). This perspective may be limited. As media exposure may be a necessary but not a sufficient predictor of media effects, presumed exposure may not be a sufficient or sole predictor of presumed influence.

Despite the centrality of presumed influence in the IPI process, little research has investigated its predictors. This may be due to methodological constraints. Specifically, the vast majority of prior IPI studies used cross-sectional surveys and only a small number of studies employed experimental methods (e.g., Lim & Golan, 2011; Shen & Huggins, 2013). Survey methods, which rely on recalled self-exposure, may not have allowed the studies to isolate the effects of message perceptions affecting presumed influence or presumed exposure. Using an experimental design, we investigate the effects

Figure 1. Influence of presumed influence model's predictors of presumed exposure and presumed influence.

of message perceptions in the IPI process, thereby examining potential predictors of presumed influence beyond other-consciousness: for example, self-centric social perception.

Self-centric social perception

In an adjacent literature, research found that self's evaluation of and engagement with the media message affected the judgment of the effectiveness of the message (Cho & Boster, 2008), a construct akin to *presumed influence*. Specifically, the more participants related to the message (i.e., identification) and considered it real (i.e., realism), the more effective they deemed it in persuading the intended audience of the message. A psychological mechanism at play here may be the looking glass perception (Fields & Schuman, 1976), in which people use their own opinions to estimate the opinions of others. The phenomenon of looking glass perception occurs because social perceptions tend to be self-centric (Nisbett & Ross, 1980). People tend to believe that situational factors are similar for self and other, and attention to one's own personal experience can amplify the perceived social consensus on the personal experience (Marks & Miller, 1987). Findings from a study on question order effects lend support for this idea that the IPI process may be self-centric. Shen and Huggins (2013) found that the robust causal chain of self-exposure → presumed exposure by others → presumed influence on others was a function of corresponding question order. When the question order was reversed, the causal chain was inconsistent with the IPI process. These results suggest that self's exposure may be the anchor for projecting presumed exposure by others and presumed influence on others.

A theoretical perspective based on self-centric social perception suggests that people use their own opinion of a message to estimate others' opinion of it. From this, we can posit other predictors of presumed influence. Specifically, we expect that evaluation of the message (realism) and engagement in the message (identification) will predict presumed influence of the message on others. Collectively, there may be two sets of predictors of presumed influence: self's evaluation of and engagement in the message (based on the self-centric social perception perspective) and presumed

exposure to the message by others (based on the other-consciousness perspective of IPI). Each path draws from different theoretical traditions and has different implications for media-based persuasion.

Further extrapolating from the self-centric social perception perspective, it is also plausible that self's evaluation of and engagement in the message predicts the estimation of others' exposure to the message. That is, a strong evaluation of and engagement in the message may promote the perception that others will similarly be attracted to the message. Self's evaluation and engagement may function as an indicator of the message's social reach potential.

Hence, in addition to self's exposure, we expect self's evaluation and engagement to predict presumed exposure by others. Figure 2 shows predictors of presumed exposure and presumed influence of social media messages as hypothesized by H2 and H3.

H3a: Evaluation of (realism) and engagement in social media messages (identification) will directly predict presumed exposure.

H3b: Evaluation of (realism) and engagement in social media messages (identification) will indirectly predict presumed influence via presumed exposure.

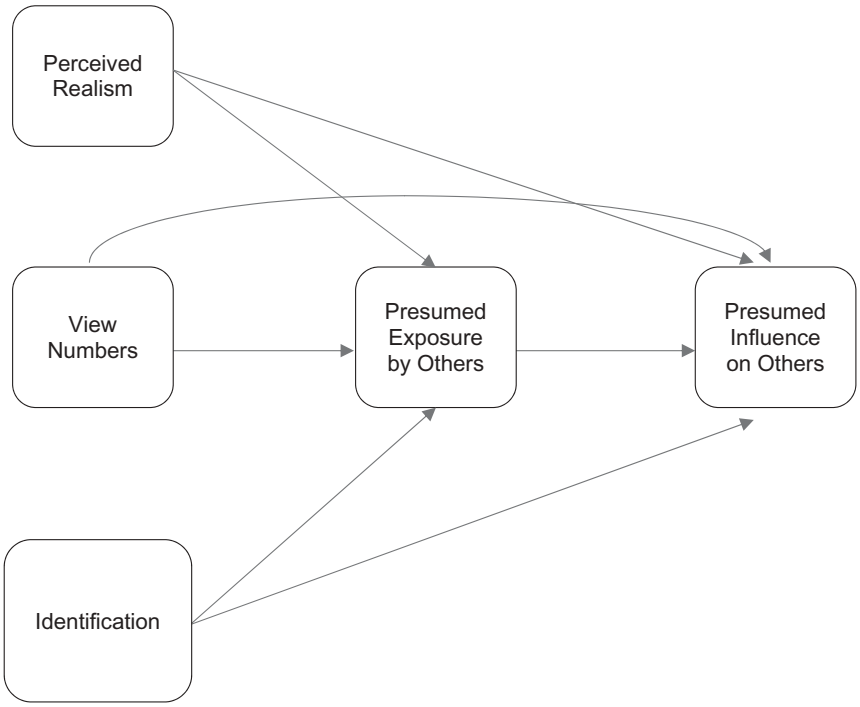

Figure 2. Hypothesized model predicting presumed exposure and presumed influence of social media messages.

H3c: Evaluation of (realism) and engagement in social media messages (identification) will directly predict presumed influence.

Persuasive effects of social media messages

We now turn to the effects of these other-conscious (e.g., view numbers) and self-centric factors (e.g., realism, identification) on persuasive outcomes in social media. Studying persuasive effects of social media messages may require reconsidering the conceptualization of message factors. For example, others' exposure may be a *psychological process* variable in mass media effects theory and research (e.g., IPI) because mass media messages do not present user metrics. However, it may be a *message feature* variable in social media effects research because social media messages do present user metrics (e.g., views, likes, comments). On this basis, we differentiate between external and internal social media message factors.

External and internal message factors in social media-based persuasion

Traditionally, message features (e.g., framing) have been controlled by the *creator* of the message. On social media, messages come with cues (e.g. view numbers) that are generated by *users* of the message. Regardless of the origin, as they accompany the message, bandwagon cues such view numbers could be considered as a message feature in the social media age. Moreover, view numbers could be construed as an agency cue valued by other users as indicators of acceptance or approval of the message (Sundar, 2008; Sundar et al., 2012).

Previous research has reported that bandwagon cues determine the choice of online content such as videos (Fu, 2012) and news (Knobloch-Westerwick, Sharma, Hansen, & Alter, 2005). Choice-making, a proximal outcome, may not indicate the more distal persuasive outcome, attitude change. Research should examine the effects of bandwagon cues on more distal outcomes of persuasion. In this study, we investigate whether view numbers can be a direct predictor of persuasion in technology-mediated settings. On the basis of the bandwagon heuristic discussed above, it is expected that increased view numbers will lead to a more positive attitude toward the issue advocated in the message.

All messages, across mass and social media, have qualities the audience can evaluate and engage in. These include the audience's evaluation of the message (e.g., realism) and engagement in the message (e.g., identification). Importantly, these qualities differ from social media cues. These are internalized message factors felt by self, whereas social media view numbers are externally situated message factors generated by others. They are also less tangible or visible than social media cues, such as view numbers. Extant persuasion research has

focused on the internal factors and found that perceived realism and identification predict persuasion (e.g., Cho, Shen, & Wilson, 2014).

In sum, we expect social media message effects will be a function of both external and internal factors. On the basis of bandwagon heuristic, we expect that externally visible cues will contribute to the efficacy of social media message. On the basis of traditional persuasion research, we expect internal evaluation of and experience with social media messages will also contribute to the efficacy of social media messages.

H4a: Social media view numbers will directly predict persuasive outcomes.

H4b: Evaluation of (realism) and engagement in social media messages (identification) will directly predict persuasive outcomes.

Applied context of the study

These hypotheses were tested in an experiment in which participants viewed e-cigarette commercials and PSAs on social media and mass media. This context is timely as Gunther et al.'s (2006) first test of IPI in the U.S. was in the setting of cigarette-related messages in mass media. E-cigarettes are a recent product line of the industry that raises new social concerns (Drope et al., 2017). Social media are a primary channel through which U.S. young adults are exposed to e-cigarette messages (Pokhrel et al., 2018). Furthermore, a majority of Americans use social media, with YouTube being the most popular platform (Pew Research Center, 2018).

Method

Design and participants

A 5 (view number) x 2 (message type) x 2 (message) mixed design web-based experiment was conducted. The five view number conditions included four YouTube conditions with view number information and one television condition with no view number information. The four YouTube conditions showed variations of the following view number levels: 10, 100, 100,000, and 1,000,000. The two message types were commercials for or public service announcements (PSAs) against e-cigarette use. Each participant viewed either two commercials or two PSAs presented in a random order. View number and message type were between-individuals factors and message was a within-individuals factor. We employed multiple types and number of messages to proactively control for message heterogeneity (for discussion, see Slater, Peter, & Valkenburg, 2015). Participants (N = 819) were recruited from Qualtrics panels, an online research platform that provides demographically diverse samples. Participants' age

ranged from 18 to 35 years (M = 27.44, SD = 4.78), among whom e-cigarette use is most prevalent (Pokhrel et al., 2018). About half of the participants were female (n = 408, 49.9%). The majority reported their race/ethnicity as White (64.1%), followed by African American (15.5%), Hispanic (11.9%), and Asian (4.9%). The data associated with this study can be found at: https://u.osu.edu/cho.919/research-resources/.

Procedure

Participants first answered questions about their tobacco use, which were embedded in a battery of lifestyle questions including those about social media use, physical activity, and fruit and vegetable consumption, to prevent sensitization. They were then randomly assigned to one of the experimental conditions and exposed to two messages.

The instruction for the YouTube conditions was: "Imagine that while surfing the web, you came to see a YouTube page such as the one below. We ask you to take a look at the YouTube page, watch the video on it, and let us know what you think." The TV condition instruction was: "Imagine that while surfing the channels on your television, you came to see a commercial such as the one below. We ask you to watch the television commercial via the link below and let us know what you think." By clicking on a link below the instruction, participants were directed either to the YouTube condition with a mock YouTube site with a stimulus video and its experimentally manipulated view number, or to the TV condition with a full-screen display of the stimulus video. The mock YouTube site was professionally produced to mimic the actual site. We removed the like and share features which were extraneous to this study.

Upon completion, participants were provided with information about the health risks of e-cigarette consumption and given the link to the website of the Centers for Disease Control and Prevention for further information. The average completion duration was 14.31 minutes (SD = 7.50). For quality control, participants who spent less than 1/3 of the median duration in the soft launch and those who failed at the attention checkers were automatically dropped by Qualtrics. A participant who spent longer than an hour completing the study was also dropped.

Messages

The messages were professionally produced videos taken from YouTube, a video-sharing social media platform. The average length of the videos was 55 seconds (range = 43–60 seconds). The two commercials were produced by two e-cigarette brands, while the two PSAs were produced by two nonprofit organizations. The commercials portrayed character(s) smoking an e-cigarette in an attractive way whereas the PSAs focused on information about dangers associated with

e-cigarette smoking. Thus, the two messages within the commercial or PSA conditions were in the same format. Compared with an increasing number of e-cigarette commercials, very few e-cigarette PSAs have been available, prohibiting us from using the same format messages across the commercial and PSA conditions. At each level of YouTube view numbers (10, 100, 100,000, and 1,000,000), two random numbers not exceeding a 40% increase from the base level were given (e.g., 11 and 14 for the level of 10; 1,060,232 and 1,341,976 for the level of 1,000,000 views). As indicated above, at each level of view numbers messages were given in a random order.

Measures

Measures were given on a 7-point scale ranging from 1 "strongly disagree" to 7 "strongly agree" unless specified otherwise. Message-specific measures (presumed exposure, presumed influence, realism, identification) were administered after exposure to each message. Outcome measures (i.e., curiosity about e-cigarettes, and attitude toward and susceptibility to e-cigarette use) were assessed after exposure to both messages. Multilevel confirmatory factor analyses (Mels, 2004) showed that the scales were unidimensional.

Composite scores were calculated by averaging individual item scores. Grand means and multilevel reliability were computed for repeated measures per the procedure in Bonito, Ruppel, and Keyton (2012) and Nezlek (2016). Because Shen and Huggins (2013) found an order effect of self- and other-related questions on the causal order of the presumed influence variables, the measures were given on a random order.

Presumed exposure was measured with two items taken from Gunther et al. (2006): "how often do you think other young people may have seen this message in the past 30 days?" and "how often do you think your friends may have seen this message in the past 30 days?" The response scale ranged from 1 "never" to 5 "very often" (M = 2.60, SD = 1.07, α = .91).

Presumed influence

Two items adapted from Paek and Gunther (2007) were used. The items for the presumed influence of the commercials were: "how much e-cigarette ads such the one that you just saw influence other young adults' desire to try e-cigarettes?" and "how much influence ads such as the one that you just saw may have on young people's interest in e-cigarettes?" These items were slightly modified for PSAs: "how much anti-e-cigarette ads such as the one that you just saw influence other young adults to stay away from e-cigarettes?" and "how much influence the message has on young people's desire to stay away from e-cigarettes?" The response scale ranged from 1 "none" to 5 "a great deal." (M = 3.22, SD = 1.07, α = .91).

Self's evaluation of (perceived realism) and engagement in the message (identification)

Perceived realism was measured with three items taken from Cho et al. (2014): "The message was truthful," "The message was believable," and "The message made sense" (M = 5.07, SD = 1.53, α = .85). *Identification* was measured with two items adapted from Hoffner (1996) to measure the wishful aspect of identification: "I wish I could look as cool as the actor/actress in the message" and "I wish I could look as attractive as the actor/actress in the message" (M = 3.22, SD = 1.94, α = .91). Identification was measured only with the commercials which featured a character. The PSAs did not feature a character.

Persuasive outcomes

Three variables were assessed as outcomes of exposure to e-cigarette messages, including curiosity about e-cigarettes, attitude toward e-cigarette use, and susceptibility to e-cigarette use. *Curiosity about e-cigarettes* was measured with two items adapted from Rath et al. (2017): "The ads that I saw made me think about e-cigarettes." and "I feel a little curious about e-cigarettes" (M = 4.56, SD = 1.62, α = .67). *Attitude toward e-cigarette use* was assessed with six semantic differential items (e.g., "uncool/cool," "unattractive/attractive") on a 7-point scale (M = 3.06, SD = 1.90, α = .97). *Susceptibility to e-cigarette use* measured situational willingness to engage in the risk behavior with two items adapted from (Pierce, Choi, Gilpin, Farkas, & Merritt, 1996). These included, "Suppose you were with a group of close friends and some of them were going to try e-cigarettes. How willing would you be to join them to try an e-cigarette?" and "Imagine that in the next 12 months you had the opportunity to try an e-cigarette. Please tell us how willing you would be to try an e-cigarette in that opportunity." Participants rated them on a 7-point scale ranging from 1 "very unwilling" to 7 "very willing" (M = 3.20, SD = 2.13, α = .97).

Covariates

Previous cigarette and e-cigarette use were assessed by asking whether participants had used these products in the past 30 days. Prior exposure to e-cigarette ads was measured by giving participants a list of 12 advertising outlets including tobacco company web sites and mass and social media platforms. These variables, along with age, sex, and education, were controlled in all data analyses.

Results

Data analyses strategy

Recall that each participant was exposed to two messages in a particular condition. This means that the message-specific variables were repeated and

there was interdependence in the data structure. The estimate for standard errors will be biased and significance tests inaccurate if this interdependence is not taken care of. In this study, multilevel models were estimated with individuals at the higher level and each message as repeated measures clustered within individuals, and with both messages and individuals specified as random-effects factors (for discussion, see Judd, Westfall, & Kenny, 2012; Raudenbush & Bryk, 2002; Rabe-Hesketh & Skrondal, 2005; for a more accessible introduction to multilevel modeling/mixed effects analyses in SPSS, see Peugh & Enders, 2005). Effect size estimates (i.e., η^2) from multilevel modeling can be calculated as the ratio of the variance accounted for by a predictor divided by the total variance explained by the unconditional model (see Raudenbush & Bryk, 2002 for the variance components in multilevel models; see Hox, 2010, Chapter 2, for a similar procedure).[1,2]

Statistical power

Statistical power for multilevel analyses in the current study was estimated using the Optimal Design Plus Software (Version 3.0) (Spybrook et al., 2011). With repeated measures design for person randomized study, assuming $\alpha = .05$, variability at Level 1 (message level) $\sigma^2 = 1.0$, variability of Level 1 (message level) coefficient $\tau = 0.10$, two measurement occasions (i.e., one measurement occasion per stimuli message) with a sample size of 819 yielded statistical power of .65 to detect an effect size of Cohen's $d = .40$, which was considered as a small to moderate effect size.

Hypotheses testing

H1a-b expected that estimations of (a) presumed exposure by and (b) presumed influence on others would differ across mass vs. social media when social media messages have low view numbers. Multilevel models with both individual and message specified as random-effects factors were estimated to predict presumed exposure and presumed influence, respectively. Message type (commercial vs. PSA), view numbers (but with mass media condition as an additional category, i.e., mass media vs. social media with different level of view numbers), realism, and identification were specified as fixed effects factors. Age, sex, education, past 30-day cigarette use and e-cigarette use, and previous exposure to e-cigarette ads were included as covariates.

H1a held that the estimation of presumed exposure by others would differ across mass vs. social media when social media messages have low view numbers. The mass vs. social media factor was a significant predictor of presumed exposure of others: $F(4, 1616) = 9.82$, $p < .001$, $\eta^2 = .009$. The presumed exposure was $M = 2.50$ (s.e. = .05) in the mass media condition. In

the social media conditions, presumed exposure was M = 2.52 (s.e. = .05) for views = 10, M = 2.55 (s.e. = .05) for views = 100, M = 2.57 (s.e. = .05) for views = 100,000, and M = 2.90 (s.e. = .05) for views = 1,000,000. Pairwise comparisons showed the mass and social media conditions were significantly different only when views = 1,000,000. These results were opposite to H1a.

H1b held that the estimation of presumed influence on others would differ across mass vs. social media when social media messages have low view numbers. The mass vs. social media factor was a significant predictor of presumed influence on others: F (4, 1616) = 3.52, p = .007, η^2 = .002. In the mass media condition, presumed influence was M = 3.12 (s.e. = .06). In the social media conditions, presumed influence was M = 3.20 (s.e. = .06) for views = 10, M = 3.22 (s.e. = .06) for views = 100, M = 3.21 (s.e. = .06) for views = 100,000, and M = 3.40 (s.e. = .06) for views = 1,000,000. Pairwise comparisons showed the mass and social media conditions were significantly different only when views = 1,000,000. These results were opposite to H1b.

H2a and H3a concerned the direct predictors of presumed exposure. H2a expected that social media view numbers would predict presumed exposure, while H3a posited that realism and identification would predict presumed exposure. A multilevel model was estimated to predict presumed exposure. In this model, view numbers, realism, identification, and message type were specified as fixed effects factors, both the individual and message were specified as random effect factors, and age, sex, education, past 30-day cigarette and e-cigarette use, and prior exposure to e-cigarette ads were controlled covariates.

View number information was a significant predictor of presumed exposure: β = .08, p < .001, η^2 = 0.014. The marginal means for the view number conditions were: M = 2.51 (s.e. = 0.07) for views = 10, M = 2.58 (s.e. = 0.07) for views = 100, M = 2.61 (s.e. = 0.07) for views = 100,000, and M = 2.89 (s.e. = 0.07) for views = 1,000,000. Pairwise comparison showed that the significant difference was due to that between views = 1,000,000 condition versus the other conditions combined (p < .001 for all three comparisons). There were no significant differences among the other three conditions. H2a was supported. Realism (β = 0.06 [95% CI: 0.02, 0.10], p = .002, η^2 = 0.008) and identification were significant predictors of presumed exposure (β = 0.10 [95% CI: 0.06, 0.13], p < .001, η^2 = 0.023). H3a was supported.

H2b and H3b concerned indirect predictors (via presumed exposure), and H2c and H3c concerned direct predictors, of presumed influence. This set of hypotheses were tested with two subsequent multilevel models. The first model specified view numbers, realism, identification, and message type as fixed effect factors, the individual and message as random effect factors, and the aforementioned covariates. The second model included presumed exposure as an additional fixed effect predictor of presumed

influence. The first model was to determine the total effects from the respective predictors. To infer the presence of direct and indirect effects, the second model was needed where presumed exposure was entered as an additional predictor.

Given that the factors considered in this set of hypotheses were significant predictors of presumed exposure (H2a and H3a) and the effects from presumed exposure to presumed influence, there were four potential scenarios. First, a non-significant predictor from the first model remained non-significant: This would mean absence of direct effect, but presence of indirect effect (via presumed exposure). Second, a non-significant predictor from the first model became significant: This would be a case of suppression, which means both significant direct and indirect effects (via presumed exposure) that were opposite in directions. Third, a significant predictor from the first model was no longer significant in the second model: This would mean there was only indirect effect (via presumed exposure), but no direct effect from this variable. Fourth, the predictor from the first model remained significant in the second model: This would mean there was both indirect (via presumed exposure) and direct effects from this variable.

Results from the first model showed that view numbers was not a significant predictor of presumed influence: $\beta = .03$, $p = .11$, $\eta^2 = 0.001$. Specifically, there was no direct effect from view numbers – H2c was not supported. Realism ($\beta = 0.11$ [95% CI: 0.06, 0.16], $p < .001$, $\eta^2 = 0.015$) and identification ($\beta = 0.08$ [95% CI: 0.04, 0.12], $p < .001$, $\eta^2 = 0.008$) were significant predictors of presumed influence. These two effects potentially consisted of both direct and indirect effects and needed to be further decomposed in the second model.

Results from the second model showed presumed exposure was a significant predictor of presumed influence: $\beta = 0.38$ [95% CI: 0.33, 0.43], $p < .001$, $\eta^2 = 0.118$. View numbers remained a non-significant predictor in the second model: F (3, 770) = 0.47, $p = .76$, $\eta^2 = 0.001$. Together with the results from the first model, the results from the second model showed that view numbers did not predict presumed influence directly, but indirectly – a) view numbers did not predict presumed influence, b) view number predicted presumed exposure; and c) presumed exposure predicted presumed influence. H2b received support.

Realism ($\beta = 0.09$, 95% CI [0.04, 0.14], $p < .001$,$\eta^2 = 0.007$) remained significant and the coefficient was not statistically different from the one obtained in the first model. This result indicated that there was no indirect effect from realism on presumed influence via presumed exposure. This finding about realism was consistent with H3c and inconsistent with H3b. However, identification was no longer a significant predictor of presumed influence: $\beta = 0.03$ [95% CI: −0.01, 0.07], $p = .16$,$\eta^2 = 0.000$. This showed the

association between identification and presumed influence was mediated by presumed exposure, and there was no direct association. This finding about identification was inconsistent with H3c but consistent with H3b.

To further examine and estimate the indirect effects posited under H2b and H3b, a multilevel (i.e., messages nested within individuals) SEM model was estimated in LISREL 8.80. The multilevel SEM approach estimates a two-group model with individuals being the grouping factor (i.e., message-specific responses clustered within individuals). The first group is the between-individuals data matrix, and the second group is the within-individuals data matrix from the same input variables (see Mels, 2004 for a more accessible introduction to multilevel SEM analyses in LISREL).

In the proposed model, view numbers, realism, and identification were specified as exogenous variables, presumed exposure and presumed influence as endogenous variables. The three exogenous variables were specified to predict presumed exposure only, which was specified to predict presumed influence. The same co-variates in the MLM models in hypotheses testing were partialled out (Model 1). In the alternative model (Model 2), the three exogenous variables were also specified to predict presumed influence.

With a direct path added from realism to presumed influence, Model 1 yielded an acceptable fit: d.f. = 18, $\chi 2$ = 176.12, $p < .001$, close fit $p < .001$, RMSEA = .08, CFI = .91, GFI = .92. Model 2 yielded substantially better model fit: d.f. = 16, $\chi 2$ = .52, p = 1.00, close fit p = 1.00, RMSEA = .00. CFI = 1.00, GFI = 1.00. Figure 3 presents the standardized coefficients in the obtained mediation model.

Indirect effects were computed following Preacher and Hayes (2008). Realism had a significant direct effect on presumed influence (.16, $p < .001$), but the

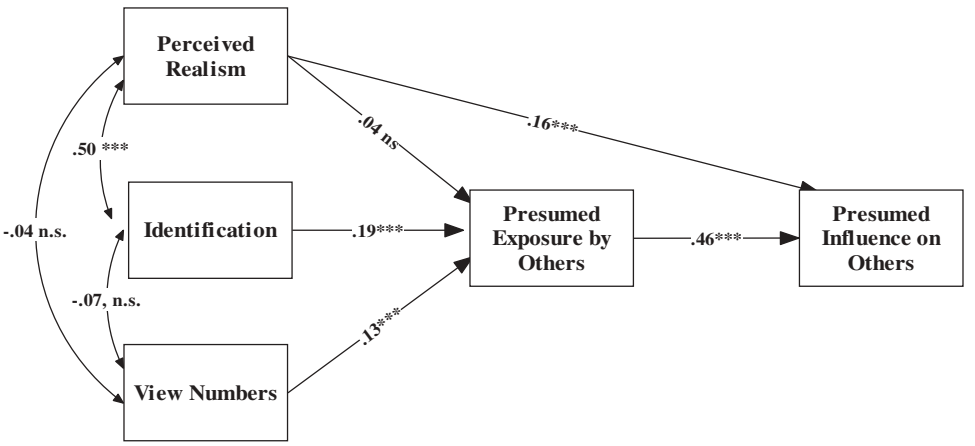

Figure 3. Obtained model predicting presumed exposure and presumed influence of social media messages. *** $p < .001$. Age, sex, education, past 30-day cigarette use and e-cigarette use, and previous exposure to e-cigarette ads were included as covariates.

indirect effect via presumed exposure was not significant: .02, p = .23. The relationships between identification and presumed influence (.09, p < .001) and between view numbers and presumed influence (.06, p < .001) were completely mediated by presumed exposure. Across the models, view numbers only indirectly predicted presumed influence.

H4a-b predicted direct effects of social media view numbers, realism, and identification on persuasive outcomes. Multilevel models were estimated to predict each of the three persuasive outcomes: curiosity of e-cigarettes, and attitude toward and susceptibility to e-cigarette use. View numbers, realism, identification, presumed exposure, and message types were specified as fixed effect factors. Individual and message were random effect factors. Age, education, cigarette and e-cigarette use, and previous exposure to e-cigarette ads were covariates.

When predicting curiosity, social media view numbers was not a significant predictor: F (3, 768) = 1.60, p = .17, η^2 = 0.004. But realism (β = 0.27 [95% CI: 0.20, 0.34], p < .001,η^2 = 0.031) and identification (β = 0.27 [95% CI: 0.21, 0.33], p < .001, η^2 = 0.05) were both significant predictors. When predicting attitude, social media view numbers was not a significant predictor: F (3, 769) = 1.03, p = .39, η^2 = 0.001. Yet realism (β = 0.26 [95% CI: 0.18, 0.33], p < .001, η^2 = 0.029) and identification (β = 0.27 [95% CI: 0.21, 0.33], p < .001, η^2 = 0.039) were both significant predictors. When predicting susceptibility, social media view numbers was not a significant predictor: F (3, 754) = 1.11, p = .35, η^2 = 0.003. Again, realism (β = 0.18 [95% CI: 0.06, 0.30], p = .015, η^2 = 0.010) and identification (β = 0.29 [95% CI: 0.17, 0.41], p = .006, η^2 = 0.032) were both significant. Since presumed exposure was also a fixed-effect predictor in these models, these results showed view numbers did not predict persuasion directly, while realism and identification did. These results did not support H4a but did support H4b.

Discussion

IPI is a distinct media effects theory because it describes the process of indirect effects of media and predicts that the media will have persuasive impacts on individuals' attitudes and actions. The core components of IPI are presumed exposure and presumed influence. This study aimed to extend IPI by investigating mass media-based assumptions about presumed exposure and influence, differential perspectives about the role of presumed exposure in social media, differential theoretical explanations of presumed influence, and the relative contributions of external and internal message features to persuasive outcomes in social media.

In studying the role of view number information in social media, we examined the differential predictions of IPI and the bandwagon heuristic.

Whereas the IPI model posits presumed exposure by others only as intermediary between self's exposure and presumed influence on others, the bandwagon heuristic in technology-mediated persuasion predicts direct effects of social media cues such as view numbers on persuasive outcomes. The results were more consistent with the specification of IPI than the bandwagon heuristic. Social media view numbers directly impacted presumed exposure, which then predicted presumed influence, consistent with IPI. The view number information showed no direct impact on presumed influence, inconsistent with the bandwagon heuristic. These findings differ from existing conceptualizations about the role of bandwagon heuristic in technology-mediated persuasion.

Whereas view numbers, an other-related factor, showed limited effects, the self-related factors evidenced significant effects on the IPI process. Self-related factors (realism, identification) predicted both presumed exposure and presumed influence, while view number information predicted only presumed exposure. The wider-ranging effects of self-related factors are noteworthy because whereas view numbers (other-related factor) are a visible, external cue, realism and identification are not visible and only felt internally. Consistent with literature on self-centric social perception and the looking glass perception, results suggest pathways linking media exposure and attitude may be self-centric, as well as other-conscious. The IPI process may be driven not only by other-focused factors such as view numbers – as previously theorized – but also by self-focused factors such as realism and identification – as this study found.

Collectively, these results extend IPI. The predictors of presumed influence now span self's evaluation of and engagement with the message as evidenced in this study, as well as presumed exposure as posited by Gunther et al. (2006). These paths are premised on differential theoretical grounds and offer different implications for research. If the IPI process is predominantly self-centric, future research should focus on other internally felt factors that promote the projection of self's perspective onto others. If the process is predominantly other-conscious, future research should focus on social media cues (e.g., view numbers, comments, likes, shares) and their effects on the IPI process. The present findings offer practical implications as well. The pathways uncovered in this study suggest the importance of the content of the message in addition to the view number metric of the message and that user's evaluation of and engagement in the message may be primary and other users' view numbers may be secondary to attitude change in response to social media messages.

The strength of self-centric social perception explanation relative to other-consciousness was also present in predicting persuasive outcomes. View number information showed no significant association with any of the three persuasive outcomes employed in this study, but realism and identification significantly predicted all three persuasive outcomes including curiosity about e-cigarettes, positive attitude toward e-cigarette use, and susceptibility to using

e-cigarettes in the future. These findings do not comport with the bandwagon heuristic which posits a significant effect of agency cues such as view numbers on the audience's acceptance or approval of the message. As an externally visible cue conveying others' propensity, view numbers may constitute a component of social media messages. But the findings from this study suggest that the contribution of view numbers may not be as strong as the more internally felt and self-driven factors such as realism or identification. Together with the results from the test of indirect effects, the test of the direct effects on persuasive outcomes suggests the superiority of the user's internal experience with the message over external cues in social media message (i.e., view number information).

Of note, this study examined the underpinning assumptions of IPI, by comparing the effects of a mass media condition and social media conditions with varying view numbers on presumed exposure and presumed influence. The pervasive reach presumption implies that the lay assumption about the scope of mass media exposure and influence is large rather than small. Evidence consistent with the pervasive reach presumption concerning mass media was not found, however. Presumed exposure to mass media was equivalent to the social media view numbers that were less than 1,000,000. This finding leads to a speculation that lay understanding of mass media reach may have changed between 1998, when the presumed reach presumption was conceived of, and the present day when social media use is widespread. Social media may be more pervasive than mass media because they transcend geographic boundaries and are less confined by traditional media market structures. Some implications can be drawn from these results. One, these results are consistent with other findings of this study suggesting that others' exposure to the message may not be as important as self's experience with the message. Two, these results suggest the boundary between mass media and social media is blurring as social media gain greater traction in individuals' media use behavior.

Strengths, limitations, and suggestions for future research

This study has a few methodological strengths. It used an experimental design to map out the roles of the self-relevant and other-relevant factors in the IPI process. It used multiple messages varying in type to control for message heterogeneity. It used concrete stimuli (professionally produced real-world messages), which reduce noise in the measurement of message perceptions and increase the accuracy of the measurement and the internal validity of the results. To our knowledge, this is the first experimental study to examine IPI in a social media environment and to compare presumed exposure and influence in social and mass media.

This study has some limitations. This first investigation of IPI in a social media context focused only on the effects of view number information. It varied view

numbers at four levels and the highest number was 1,000,000. The results of this study may need to be interpreted with the current design in mind. Future research could use more fine-grained intervals in view numbers and a wider range of view numbers including numbers larger than 1,000,000. More detailed investigations of social media view number effects on persuasion are needed.

Future research on IPI in social media could also expand the kinds of cues. View numbers are one of the social media cues and others include likes and comments (number, valence). Although Sundar et al. (2008, 2012) categorized view numbers, likes, and comments as agency cues, they may have differential agentic functions. Comments may imply greater user agency and therefore have greater impact on the IPI process. Number of comments itself may not convey the disposition of others, and messages about polarizing issues may be more appropriate for examining the effects of likes and valence of comments.

Prior research on bandwagon effects has frequently focused on the more proximal outcomes (e.g., message choice). This study focused on more distal outcomes (e.g., attitude toward behavior, willingness to engage in behavior). The difference between the results of this study and prior research may be due to the difference in outcome variables. Because outcomes of social media message exposure range from messages selection to behavioral willingness, future research should investigate a comprehensive range of outcomes. In addition, future research could examine whether perceived exposure and message evaluation (e.g., realism, identification) interact to impact persuasion.

Final reflection

This study integrated theoretical perspectives from diverse research traditions, including persuasion, new media, and mass media, to examine and extend IPI in a social media environment. The results offer an improved understanding of the nature of the IPI process as they show the importance of considering both self-centric social perception and other-consciousness. The results also offer a framework for studying persuasive effects of social media messages in which not only internal user experience with the message (e.g., realism) but also external user metrics (e.g., view number) contribute toward persuasion.[1] As social media are an environment where rich information about what others do is available and intersects with the desire to preserve and promote self's values and interests, this enhanced and expanded understanding of IPI can be a useful framework for studying the processes and effects of social media messages.[2]

Notes

1. Because this study varied intrinsic message features or attributes of media messages (i.e., view numbers) rather than psychological responses to stimuli, a manipulation check was unnecessary (O'Keefe, 2003; Tao & Bucy, 2007).

2. Message type was not of theoretical focus in this paper. Results showed that presumed exposure was significantly higher for e-cigarette commercials (M = 3.49, s.e. = .04) than e-cigarette PSAs (M = 2.98, s.e. = .04; $p < .001$). Presumed influence was also significantly higher for commercials (M = 3.42, s.e. = .04) than PSAs (M = 3.04, s.e. = .04; $p < .001$). Data analyses for hypothesis-testing related to presumed exposure and presumed influence were run within each message type, which yielded the same pattern. Therefore, results from the pooled were reported here, with message type as a covariate.

Disclosure statement

The authors have no conflict of interest to disclose.

Funding

This work was supported in part by the National Institutes of Health [R01CA176196].

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