User Engagement with Interactive Media: A Communication Perspective

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1 Introduction

Recently, Google launched "Engagement Ads" with the goal of optimizing "user engagement." According to Google, this new model of advertising metric will replace the old pay-per-click model—by which advertisers are charged every time users click an ad regardless of whether they have actually watched or read it. Instead, engagement ads expand a display ad once the user has hovered over it for 2 s. This 2-s hover is considered evidence that the ad has grabbed the users' attention and they are ready to be further engaged with the content.

The idea of a *cost-per-engagement* model is not new. Advertising researchers and industry professionals have long wondered how to effectively measure user engagement with digital media content, going beyond simple clicking or hovering. Digital media offer unprecedented opportunities for both users and content providers—users can control what they want to see, while content providers can create more interactive, engaging content and precisely track users' behaviors. With the rise of new media, we have an abundance of media technology that could aid the communication process between users and message sources. Users can personalize their media settings, choose what they want to see, be involved in social networks, and control the pace and format of information they want to receive.

Interactivity is perhaps the most distinguishable feature of modern media technology that could summarize all these capabilities. Interactivity allows users to take a number of actions that control information flow instead of passively

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receiving it, providing various interaction techniques—e.g., users can swipe, zoom, and mouse over content on a website and click through several layers of hyperlinks to open hidden content. As the term itself implies, interactivity rests on the notion of active users who can control both media content and interface. Interactivity has been defined in several different ways—two-way, reciprocal communication and synchronicity [40, 50], personalization capability of the system [35, 78], the degree of user control [42, 58], and technological affordances that allow users to determine the medium, source, and message of communication [62]. In this chapter, we adopt the last mentioned definition of interactive media, with a focus on the three central elements of communication.

For communication researchers, interactive media call for a completely new way of studying user engagement. Researchers now want to take into account users' capabilities to change the content and form of mediated messages. The key question is, when interactive media allow users to intervene in the process of message delivery, are users more engaged with the media content? Or, do interactive media merely distract users from the content, with interface features that consume users' cognitive capacity? Over the last few decades, communication researchers have made significant progress in answering these questions. Scholars have debated whether the interactive components of the website can engage users or simply distract them [8, 13, 60–62]. Up to this point, previous studies in the field have focused on examining whether interactive media pose an opportunity or a challenge in terms of engaging users with the content that is transformed by new technology. For instance, scholars have examined the effects of interactive product websites on consumers' attitudes and behaviors [36, 38, 54] and the effects of online news websites on users' cognitive processing [23, 61, 65, 76].

In our view, the more significant question for future research is how we could design "truly interactive" media—interfaces that engage users with the content and thus further enhance the communication between the source and the receiver. Like user engagement with traditional media, user engagement with new media also aims to encourage users to pay attention to the message rather than any peripheral features surrounding the message and be affected by the message cognitively and emotionally. Building upon previous studies in the field of communication, we summarize various definitions of user engagement with media and move on to discuss the interface and content characteristics that could enhance user engagement with interactive media. Next, we discuss why engagement matters by pointing out persuasive outcomes that we could expect when we adopt and design interactive media. Data from an empirical study will then be used to demonstrate that user engagement, when defined according to both behavioral and psychological dimensions, can significantly mediate the effects of interactive media on attitudinal and behavioral outcomes in an anti-smoking website. The chapter will conclude that user engagement is a crucial mediator in the process of persuasion involving interactive media.

2 Defining User Engagement with Interactive Media

Although the term *user engagement* has been widely used in the field of communication, rigorous definitions of user engagement are scarce. Our literature review reveals that there are at least three common factors to define the concept of user engagement with media: (a) strong cognitive and emotional focus on media content; (b) attraction, curiosity, and interest toward the medium or interface; and (c) voluntary participation influenced by media content.

One of the most common ways of defining user engagement with media is the degree to which users become cognitively and affectively focused on media content. TV viewers are engaged when they are emotionally involved in a program and watch the whole program sequence with attention [18]. Consumers are engaged when they feel inspired by an ad [12] or become cognitively committed and emotionally attached to the ad or brand website [29, 43, 74]. Similarly, engagement with narrative has been defined as a story's success in "directing a reader's thought toward the story and its themes" [59, p. 437]. Narrative engagement is often called as "transportation," which refers to the feeling of being "lost" in a story whereby all mental systems and capacities become focused on events occurring in the narrative [10, 26]. Recently, Busselle and Bilandzic [11] developed a scale of *narrative engagement* that reflects the strength of the cognitive and emotional focus on the story: narrative understanding (ease in comprehending narrative), attentional focus (absence of distraction), emotional engagement (feeling for and with character), and narrative presence (sensation of leaving the actual world and entering the story).

Apart from user engagement driven by media content, researchers have also found that user engagement can be driven by the interface or task itself. User engagement with a multimedia system has been defined as a user's intrinsically motivated attraction to the system [15, 34] and "a state of playfulness which includes attention focus, curiosity, and intrinsic interest" with the presentation of multimedia [75, p. 65]. Extending the previous definitions, Sundar [62] points out at least three factors that engage users with an interactive website—customization, multimodality, and contingency. Customization refers to the ability to control users' own communication setting based on their preference. For instance, portal websites provide tools by which users can personalize the look and feel of the home page or synchronize the website with users' mobile devices or other applications. Multimodality refers to the degree to which the interface allows multiple input modes of communication, such as speech, touch, gaze, gesture, or a variety of mouse-based interaction. Finally, contingency refers to the degree to which a given message is contingent upon reception of the previous message and the ones preceding that. For instance, the tagging feature on Facebook allows users to exchange messages in a contingent manner by encouraging a response to the previous posting, eventually resulting in a threaded interaction of interdependent messages.

With the rise of social media, user engagement can be equated to social media engagement, which is described in more detail in McCay-Peet and Quan-Haase's chapter in this book. Social media engagement commonly refers to consumers'

voluntary information-sharing behaviors [19, 22, 24, 48]. In other words, user engagement in social networking and marketing is characterized as engagement of one user that drives the engagement of other users. Engaged users are known to generate electronic word of mouth (eWOM)—any positive or negative statements about a product or a company that spread to other users via the Internet [30] and thereby generating "viral" messages [27]. A number of measures have been suggested to capture this voluntary sharing behavior, including the number of comments and reviews on a company blog, the amount of consumer-generated media (CGM), and the frequency of forwarding the content to someone else [49]. Recently, the social media industry has used user engagement metrics based on cost-per-follower on Twitter [14] and cost-per-Like on Facebook [33].

There are relatively few studies that propose a definition of user engagement with all of the three factors summarized above—(a) strong cognitive and emotional focus on media content; (b) attraction, curiosity, and interest toward medium or interface; and (c) voluntary participation influenced by media content. Exceptions include a scale proposed by O'Brien and Toms [45] and a model of user engagement by Oh et al. [46]. O'Brien and Toms [45] proposed a comprehensive scale of user engagement in an e-commerce environment. They found that novelty and aesthetics of the website lead to focused attention to the website and involvement with a shopping task, which results in perceived usability of the system and willingness to use the system again and recommend it to others in the future. In their scale, *novelty* and *aesthetics* reflect users' attraction to the media system or interface, *focused attention* and *felt involvement* capture cognitive and emotional focus on media content, and the *endurability* of system use represents evaluations of success and voluntary participation to recommend the website to others.

Oh et al. [46] explicated the concept of user engagement as a construct that has four dimensions: physical interactions, cognitive experience, absorption, and outreach through one's social network. User engagement is a point on the user involvement continuum, which is marked by *physical interactions* with media and *cognitive experience* that lead to user *absorption* with content, finally cumulating as behavioral outcomes in the form of *outreach*.

In this framework, users are attracted by visual features, sounds, motion, touch, and the novelty of interface and physically interact with the interface features by watching, clicking, swiping, hovering, etc. This *physical interaction* can serve to expand their cognitive experience, "the extent to which the user processes preliminary information from the interface as well as the media content, which is marked by an activation of the users' sensory mechanisms." Next, the stage called *absorption* summarizes previous definitions related to strong cognitive and emotional focus on media content. *Absorption* refers to the stage where the individual is consciously involved in an interaction, and more specifically with the content of the interaction, with almost complete attention in the activity. Finally, behavioral participation is called outreach in this model—collective, voluntary behavior of users that shares their thoughts regarding a specific media content.

Table 1 summarizes the theoretical and operational definitions of user engagement based on the three common defining factors of user engagement: (a) cognitive

Table 1 Theoretical and operational definitions of user engagement based on three defining factors: Cog = cognitive and emotional focus on media content; Att = attraction, curiosity, and interest in medium or interface; and Vol = voluntary participation

Theoretical definition	Operational definition	Cog	Att	Vol	Object of engagement
A psychological state where the message recipient is cognitively and affectively invested in a narrative [56]	The degree to which viewers (a) make sense of the thread of the story and characters, (b) pay attention to the program, (c) feel that they are inside the world created by the story, and (d) are affected emotionally by the story [11]	x			Narrative
To be focused with a TV program cognitively and emotionally [18]	Watching a single video continuously [20]; watching a television show with other people and interacting with other platforms like the Internet or cell phones while watching a program [3, 18]	x		x	TV show
A positive, interactive psychological state where users' attention was willingly given and held [34]	The degree to which (a) the user perceives that his or her attention is focused on the interaction, (b) the user's curiosity is aroused during the interaction, and (c) the user finds the interaction intrinsically interesting [15]	x	x		Presentation
Cognitive and affective commitment to the brand as personified by the website or other computer-mediated entities [43]	The degree to which users are (a) personally engaged with the brand website by seeking stimulation, inspiration, self-esteem and enjoyment and (b) socially engaged with the website by participating with others and socializing on the website [12]	x		x	Website
Voluntary behaviors of forwarding the brand message toward their friends, family members, and work colleagues [19]	The degree to which users are involved in opinion seeking, opinion giving and opinion passing on social media [16]			x	Website

(continued)

Table 1 (continued)

Emotional, cognitive and behavioral connection that exists, at any point in time and possibly over time, between a user and a resource [4]	The degree to which users have focused attention to the website, perceive the website easy-to-use, aesthetically appealing, and evoking curiosity, feel involved during the task, and become willing to use the application in future or recommend it to others [45]	x	x	x	Website
A form of user experience which includes both (a) a psychological state where the user appraises the quality of media and becomes absorbed in media content and (b) a behavioral experience with which the user physically interacts with the interface and also socially distributes the content [46]	The degree to which users (a) physically interact with the interface, (b) cognitively process the preliminary information about the quality of the interface, (c) feel absorbed in the mediated content, and (d) are willing to distribute the content to other users [46]	x	x	x	Website

and emotional focus on media content; (b) attraction, curiosity, and interest in medium or interface; and (c) voluntary participation. This chapter defines user engagement based on all three components—user engagement is a psychological state where the user appraises the quality of media and becomes cognitively and emotionally absorbed in media content, followed by a behavioral experience with which the user physically interacts with the interface and also socially distributes the content.

3 What Determines User Engagement with Interactive Media

Whereas interactive and visually appealing interface features have been highlighted with the rapid development of media technology, there is no agreement among previous studies on what exactly determines user engagement with interactive media. Some scholars argue that interactive media lead to shallow processing and superficial interaction with media content [13] and often prevent users from being immersed in a narrative [73]. By contrast, other studies have found that interactive media can promote further processing of media content when users are highly involved with the topic, by demanding more user actions and thereby resulting in systematic processing of content [41]. On the other hand, the mere presence of interactivity can serve as a positive peripheral cue such that users with low involvement positively evaluate the credibility of website without further elaboration [63]. In fact, user engagement with interactive media is a complex phenomenon that involves several precursors and moderators.

3.1 Medium/Interface Characteristics

Scholars have suggested that visually attractive and easy-to-use interfaces can engage users with a website: interfaces that adopt real-world features such as 3D animation, gravity, or inertia lead to better task efficiency and greater learning outcomes [1, 37, 71]. The perceived attractiveness of the interface has been found to increase the system's perceived usability and even trustworthiness [39, 45]. The perceived usability of the system is said to enhance users' behavioral intention to use the website in the future and recommend it to other users [45] and system adoption [72].

The interactivity effects model proposed by Sundar [62] suggests that three forms of interactivity (i.e., modality interactivity, source interactivity, and message interactivity) are key precursors of user engagement. The three types of interactivity affect individuals' cognition, attitudes, and behavior by adjusting the level of user engagement with media content. Recently, a series of experimental studies

performed by Sundar and his colleagues found ample empirical evidence to support this model.

First, when interactivity provides a variety of ways for accessing content (*modality interactivity*) such as zooming, 3D carousel, and slideshow, it can affect users' preliminary assessment of the interface and lead to different levels of user engagement with content. Sundar et al. [68] examined the effects of six on-screen interaction techniques (click to download, drag, mouse over, slide, zoom, and 3D carousel) on users' assessment of the interface and their engagement with an informational website, as well as the effects of four combinations of the six interaction techniques (slide+click, slide+mouse over, drag+mouse over, and drag+zoom) on user engagement. Results from two experiments suggested that different interaction techniques indeed create significant differences in terms of the amount of interaction with the main content, users' memory and attitudes, and user engagement defined as cognitive absorption. They showed that users' preliminary interface assessment was a key precursor of the positive effects of modality interactivity on user engagement. Interface assessment includes three factors: the perceived naturalness in the ways users could control changes on the website (natural mapping), how intuitive the interaction with the website was (intuitiveness), and how easily they could use the website (ease of use). In other words, an interaction technique enhanced user engagement (i.e., losing tracking of time and being immersed in the activity) only when users perceived the interface as natural, intuitive, and easy to use.

Secondly, user engagement can be enhanced and maintained over time by source interactivity—the type of interactivity that provides users an opportunity to customize and create content [67]. *Source interactivity* has been defined as the degree to which the interface lets the user serve as the source of communication, e.g., customize one's portal or create one's own content [62]. Sundar et al. [67] created 12 different versions of a portal website and examined the effects of three different source interactivity tools—a functional customization tool that enables users to choose gadgets and feeds, a cosmetic customization tool that enables them to change background themes, and a blog tool that allows them to create a post and share it with confederates who were thought to be other users. After using the portal website for 2 weeks, users reported being more engaged with the website if they had a chance to create personal content on their blog, especially when the blog had a cosmetic customization tool or moderate amount of functional customization for gadgets and feeds.

Message interactivity, defined as the degree to which a website allows the exchange of messages between the user and the system (human-computer interaction) or between users (computer-mediated communication), has been found to imbue the sense of back-and-forth interaction, i.e., perceived contingency. This user perception can heighten user engagement with the content, which leads to other cognitive, attitudinal, and behavioral outcomes. Bellur and Sundar [5] investigated the effect of an interactive question and answer (Q&A) tool on college students' engagement with health information. The level of message interactivity was varied as the level of threadedness (looping mechanism) employed in the Q&A dialogue. In this study, user engagement was operationalized as three factors:

(a) fun and enjoyment, (b) immersion, and (c) the amount of control. The study found that the high message interactivity condition—where the system displayed the entire interaction history—led to greater perceptions of contingency (i.e., increased sense of dialogue and back and forth) and subsequently resulted in greater user engagement with the website than did the control condition.

Interaction history and synchronous chat were found to increase participants' user engagement with a movie search site [69]. The two message interactivity tools increased users' perceived contingency that subsequently led to greater user engagement, such as losing track of time and feeling immersed while browsing the website, especially when participants believed that they were chatting with a human agent, not an artificial one. The heightened user engagement was, in turn, associated with positive attitudes and behavioral intentions toward the website. Users evaluated the website with a human agent as more appealing, attractive, useful, and of high quality and were more willing to recommend the website to others and know more about the website in the future, even though the content of dialogue between participants and the chat agent remained the same across conditions.

In sum, medium/interface features that can induce user engagement include three species of website interactivity—modality interactivity that enhances the interface's naturalness, intuitiveness, and ease of use, source interactivity that allows users to create content and customize the interface, and message interactivity that boosts the sense of contingency of the interaction between the user and the website or among users.

3.2 Individual Difference: Power Usage

Previous studies also found that individual differences moderate users' attitudes toward websites. Although not many findings directly suggest that these individual differences have an effect on user engagement, related outcomes such as user attitudes toward the website are known to be affected by individual characteristics. Often, the three types of website interactivity (i.e., modality, source, and message interactivity) interact with a certain set of user characteristics and affect user engagement. In particular, power usage, the degree to which a user is competent to deal with new media technologies, has been found to moderate the effects of interactive media on user engagement.

Compared with novice users, power users are those who are highly experienced in new technology, have more competence, and fully exploit the potential of the technology [6, 53, 64]. Previous studies found that the effects of modality interactivity and source interactivity on user engagement and attitudes are moderated by power usage. Sundar et al. [68] showed that power users evaluated the same content as more credible and likeable when the interface provided simpler interaction techniques, such as mouseover or click, whereas non-power users preferred to explore newer techniques, such as 3D carousel or slider. This finding suggests

that power users would rather focus on the underlying site content with simpler techniques than spend time figuring out complicated tools.

As for source interactivity, power users are known to appreciate a customizable website. Sundar and Marathe [64] found that power users and non-power users react differently to a customizable news-aggregator website. Power users showed more positive attitudes toward the content and website when they customized the website, whereas non-power users showed more positive attitudes when the site personalized the content for them.

4 Why User Engagement Matters: Persuasive Potential of User Engagement with Interactive Media

How to engage users has been a key question for both media scholars and industries, but the effects of user engagement are yet to be fully discovered. When users feel engaged, what exactly happens to them cognitively? What are the cognitive and behavioral outcomes of user engagement? Several theoretical approaches have been suggested for examining the ways in which interactive media engage users, e.g., a curvilinear model of interactivity [8], the mediated moderation model of interactivity [9], a dual-process model of interactivity effects [41], and the model of interactivity effects on user engagement [62]. Although the outcome of user engagement can vary depending on how it is defined and when and where users are involved, these models all point out that engaged users would experience significant changes in their cognitive and emotional processing and attitudes and behaviors regarding media content. In the following sections, our literature review and empirical example will show that two types of user engagement are powerful mediators for persuasive outcomes—imagery engagement and cognitive engagement.

4.1 Imagery Engagement

One of the concepts closely related to user engagement is presence [21, 70]. Presence has been defined as a sense of "being there" in a mediated environment [7, 32]. An immediate outcome of feeling presence is cognitive and emotional focus on media content, i.e., user engagement. The mechanism by which presence leads to greater user engagement is based on a basic feature of human perception—we have not evolved enough to distinguish the mediated content from real-world objects [51]. When interactive media allow users to observe and control a virtual object in a manner that is similar to the way they perform the behavior in the real world, they can easily create real-life imagery in their minds.

This real-life imagery is a key factor to further engage users with media. The degree to which users construct vivid mental imagery of objects in a computer-

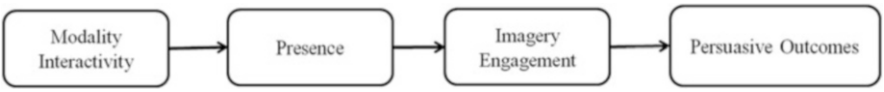

Fig. 1 Effect of imagery engagement

mediated environment can be called *imagery engagement*. In cognitive psychology, it has been known that visually imagined things are more powerful to govern people's actual behaviors than are the things from purely logical reasoning [55]. When it comes to media, visual imagery constructed in users' minds as a result of reading or watching a narrative is an indicator of the degree to which users are engaged in the story [26]. When technology engages users with a real-world-like stimulus and elicits imagery engagement, it can persuade users—it enhances credibility of messages [57]; forms more confident, enduring, and resistant attitudes [25]; induces stronger beliefs and more positive attitudes about claims made on the website [17, 36]; and even leads to greater behavioral intention to actually perform the simulated behavior [54].

Thus, when users can interact with objects and products through modality interactivity that simulates real-world phenomena, the interaction can create feeling of presence in users' minds. Subsequently, the feeling of presence may shape more vivid mental imagery in users' minds, which can lead to more persuasiveness. Figure 1 describes this hypothesized effect of imagery engagement.

4.2 Cognitive Engagement

Engaged users are also said to devote all available perceptual resources to process the stimulus at hand, which generates *cognitive engagement*. Cognitive engagement can be defined as the degree to which users feel attraction, curiosity, and fun during interaction. Especially, modality interactivity is said to increase the degree to which we can mentally represent the mediated information [52, 62]. Anti-drug or anti-smoking campaign websites often employ modality interactivity that heightens user experience. For instance, when individuals move a mouse from left to right along a slider that shows a drastic change in a drug-addicted brain, users are adjusting their motor response to drag their mouse, at the same time perceptually coding the visual changes according to their mouse movement, and finally, cognitively processing the graphical information that shows areas of activity in the addict's brain.

During this process, individuals' perceptual bandwidth [52] will be expanded compared with the situation where they passively receive stimuli from media, especially when the interface enables users to have natural, easy-to-use, and intuitive interaction with the system [68]. O'Brien and Toms [44] also point out that usability of the website is a prerequisite for user engagement. Thus, as long as modality interactivity creates a more natural, intuitive, and easy-to-use interface, the increased

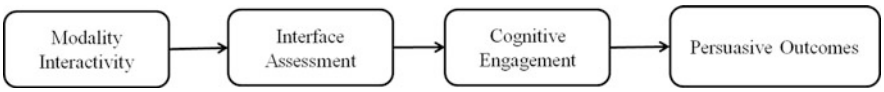

Fig. 2 Effect of cognitive engagement

perceptual bandwidth through interactivity will be fully used to mobilize their perceptual, motor, and cognitive abilities, which in turn creates further engagement with the website. However, if interaction with the system is error-prone or not intuitive enough, it would be more difficult for users to be completely immersed in the browsing experience.

When users' perception and cognition are fully activated, they appreciate the interaction further, feeling more fun and control. Xu and Sundar [79] created a high-interactivity condition where a website allowed users to spin, zoom, and mouse over the product image and a low-interactivity condition where the users were only allowed to scroll through different product images. As a result of interacting with the product image in the high-interactivity condition, users reported having more fun and feeling in control, which led to more positive attitudes and greater behavioral intention than in the low-interactivity condition. Thus, cognitively engaged users not only explore the content fully but also enjoy the task more and have more positive attitudes toward the whole website afterwards. Figure 2 summarizes the effect of cognitive engagement discussed so far. Interface assessment includes intuitiveness, naturalness, and ease of use.

In sum, user engagement matters because it enhances the persuasive potential of interactive media by inducing imagery engagement and cognitive engagement. The following empirical study suggests that these two types of user engagement indeed mediate the relationship between interactive media and persuasive outcomes on an anti-smoking website.

5 An Empirical Example

User engagement has been measured in previous studies, but there were relatively few studies that comprehensively measured both behavioral and psychological aspects of user engagement. To rectify previous methodological shortcomings, this study measured physical interaction with the website as well as self-reported user engagement, and examined if the mediators can indeed enhance the persuasive effects of an anti-smoking website by using a bootstrapping method [28]. A 2 (Modality interactivity: Control vs. Slider) X 3 (Message interactivity: Low vs. Medium vs. High) full-factorial, between-subjects lab experiment was conducted to collect data. Only the procedure and outcomes directly related to the effect of modality interactivity will be discussed in this chapter. Full details of the study can be obtained from Oh and Sundar [47].

5.1 Participants and Procedure

Participants were recruited from undergraduate classes at Penn State, in exchange for extra credit (N = 167). The final sample included 97 females (58.1 %) and 70 males (41.9 %), with an average age of 19.6. First, a 5-min, self-administered online questionnaire that included smoking status measures along with a consent form was sent to participants. The second part of the study was administered in a media laboratory. Participants were given a browsing task on an anti-smoking website. The questionnaire software randomly assigned each participant to one of the six conditions. Instructions asked participants to fully browse the website and spend as much time as they needed. They were told that the site contained three different topics and asked to explore all three topics and learn as much as they could. On average, participants spent 317.08 s browsing the entire website (SD = 149.07, Min = 30.37 s, Max = 682.98 s). After they finished browsing the site, they were asked to fill out another online questionnaire. The entire study session lasted approximately 40 min.

5.2 Stimulus

Six prototype websites (2 (Modality interactivity: Control vs. Slider) X 3 (Message interactivity: Low vs. Medium vs. High)) were constructed for this study. The six prototypes differed only in their interactive features. With the exception of the interactivity features employed, all six versions of the prototype shared the same content and the same page layout. The prototype website was titled "Tobacco-Free State College." The prototype website had three different topical health outcomes linked to smoking: "How smoking affects your looks," "How smoking affects your brain," and "How smoking affects your respiratory system." The name of the website, "Tobacco-Free State College," was located at the top left corner of the web page. Right next to the logo of "Tobacco-Free State College," the site provided a simple mission statement, "To protect the people in State College from the dangers of tobacco."

Modality interactivity was operationalized as the presence (Slider condition) or absence (Control condition) of sliders. In the Control condition, each of the three topics contained two to three static images related to the topic (i.e., looks, brain, and respiratory system affected by smoking) (Fig. 3). In the Slider condition, a drag-and-slide bar was located under the same-sized images. Images of a female's face, brain activity, and lungs changed as participants moved the slider horizontally across the bar. Instead of showing images discretely like in the Control condition, the images were morphed into one so that they showed gradual change upon slider movement across the horizontal axis (Fig. 4).

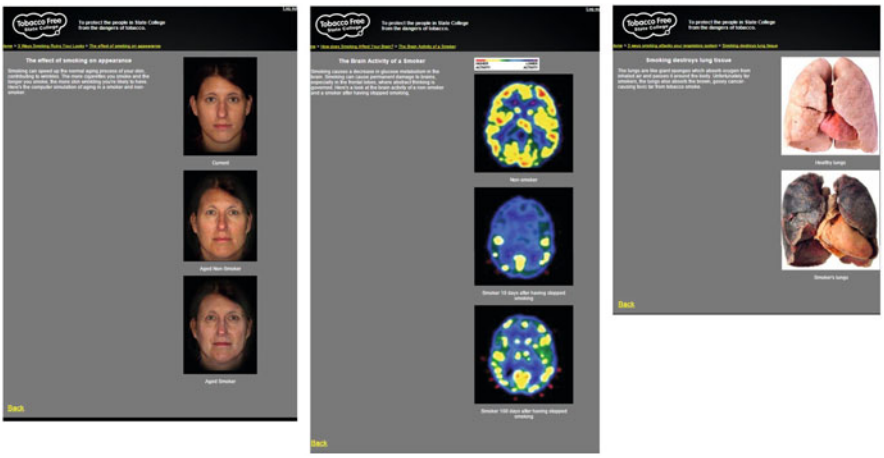

Fig. 3 Control condition

Fig. 4 Slider condition

5.3 Measurement

5.3.1 User Engagement

Imagery engagement was measured by three items adapted from Schlosser [54]. Three questions asked participants to what extent they could construct vivid mental imagery of negative outcomes of smoking while browsing the website ranging from 1 (not at all) to 9 (a lot), such as "How much did the website's features help you imagine the effects of smoking?", "How easily could you picture the effects of smoking in your mind?", and "How easily did the website let you visualize the effects of smoking?" (M = 7.44, SD = 1.26, Cronbach's α = 0.88). *Cognitive engagement* was measured by six items obtained from Agarwal and Karahanna [2]: "I had fun interacting with the site," "The site's features provided me a lot of enjoyment," "I was bored (reverse-coded)," "I felt as if my curiosity was excited," "I felt as if my imagination was aroused," and "I felt that my interest was evoked" (M = 5.43, SD = 1.53, α = 0.88). Finally, this study measured physical interaction with the interface. *The number of clicks on the slider* was measured by the frequency of dragging and releasing the slider bar. Thus, it was measured for only those in the

Slider condition (N = 78). On average, participants clicked the slider 4.46 times (*SD* = 2.54, *Min* = 0, *Max* = 13).

5.3.2 Persuasive Outcomes

For *attitudes toward anti-smoking messages*, participants indicated how well six adjectives from Sundar [61] (believable, informative, insightful, objective, interesting, and clear) describe the persuasive messages on a 9-point scale ($M = 7.22$, $SD = 1.22$, $\alpha = 0.82$). Attitudes toward the website comprised nine items selected from Sundar [61] and Sundar et al. [66]. Participants were asked to indicate how well nine adjectives (appealing, useful, positive, good, favorable, attractive, pleasant, likeable, and interesting) described the website on a 9-point Likert scale ($M = 6.54$, $SD = 1.58$, $\alpha = 0.93$). Participants' behavioral intention was measured by three items adapted from Hu and Sundar [31]. Participants responded to six statements on a 9-point Likert scale, indicating the likelihood that they would perform the following behaviors: "recommend this website to others," "forward this website to my acquaintances," "visit this website again in the future," "visit other websites similar to the one that I just browsed," and "save this web page for future browsing" ($M = 3.53$, $SD = 2.31$, $\alpha = 0.96$).

5.3.3 Mediators

As described in Figs. 1 and 2, presence and interface assessment were proposed as precursors to user engagement. Presence was measured using three items obtained from Witmer and Singer [77] on a 9-point Likert-type scale: "How well could you move or manipulate objects while browsing? (ranging from 1 = not very well to 9 = very well)," "How much did the visual aspects of the website involve you? (ranging from 1 = not at all to 9 = a lot)," and "How completely were all of your senses engaged while browsing? (ranging from 1 = not completely to 9 = completely)" ($M = 6.52$, $SD = 1.76$, Cronbach's $\alpha = 0.76$). Interface assessment comprised three statements:64 "My interaction with the website was intuitive," "The ways that I used to control the changes on the website seemed natural," and "The website was easy to use" ($M = 7.06$, $SD = 1.30$, Cronbach's $\alpha = 0.63$).

5.4 Results

5.4.1 Imagery Engagement

The indirect effects of modality interactivity on attitudes toward the anti-smoking messages through presence and imagery engagement were examined. We used a bootstrapping procedure with 5000 bootstrap samples and bias-corrected confidence

intervals [28]. The analysis revealed a significant indirect effect through both mediators (B = 0.11, SE = 04, 95 % CI from 0.04 to 0.23). Modality interactivity (i.e., the slider) increased the feeling of presence during the browsing task such that participants felt as if they were able to manipulate a real-world object. The enhanced feeling of presence enabled participants to more easily visualize the effects of smoking. Subsequently, this heightened imagery engagement led to more positive attitudes toward the anti-smoking messages that were delivered by the website such that the messages were believable, informative, insightful, objective, etc. Thus, imagery engagement mediated the relationship between modality interactivity and participants' attitudes toward the persuasive messages (Fig. 5).

5.4.2 Cognitive Engagement

The mediating effects of interface assessment and cognitive engagement were also significant for attitudes toward anti-smoking messages (B = 0.04, SE = 0.02, 95 % CI from 0.01 to 0.10). Participants in the Slider condition evaluated the website as more natural, easier, and more intuitive. This heightened interface assessment predicted greater cognitive engagement in the browsing task such that the website provided more fun and excited curiosity while browsing than did the Control condition. Finally, increased cognitive engagement was associated with greater agreement that the anti-smoking messages on the site were believable, informative, insightful, objective, etc. In sum, cognitive engagement mediated the relationship between modality interactivity and participants' attitudes toward the persuasive messages (Fig. 5).

5.4.3 Physical Interaction

Finally, the number of clicks on the slider was also positively associated with imagery engagement, which led to three different persuasive outcomes: attitudes toward anti-smoking messages, attitudes toward the website, and participants' behavioral intentions regarding the website. The more participants clicked the slider, the more they felt that they could easily picture the effects of smoking in their mind while browsing the website. This enhanced imagery engagement led to more positive attitudes toward anti-smoking messages such that the messages are believable, informative, insightful, objective, etc. (B = 0.04, SE = 0.02, 95 % CI from 0.01 to 0.08). It also created more positive attitudes toward the website such that the website was useful, positive, good, favorable, attractive, etc. (B = 0.04, SE = 0.02, 95 % CI from 0.01 to 0.09), and greater behavioral intention to recommend or forward the website to others (B = 0.09, SE = 0.04, 95 % CI from 0.03 to 0.20). Figures 5 and 6 summarize the findings of our study.

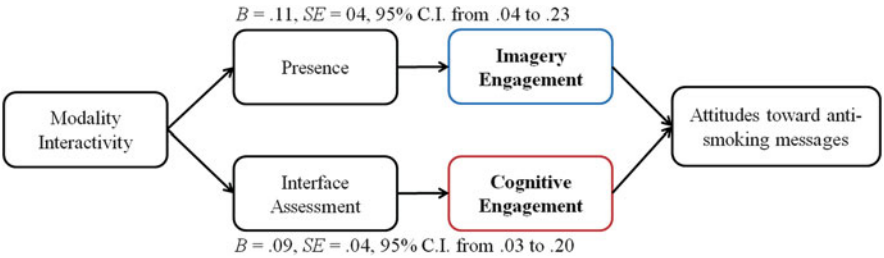

Fig. 5 The effects of modality interactivity mediated by imagery and cognitive engagement on attitudes

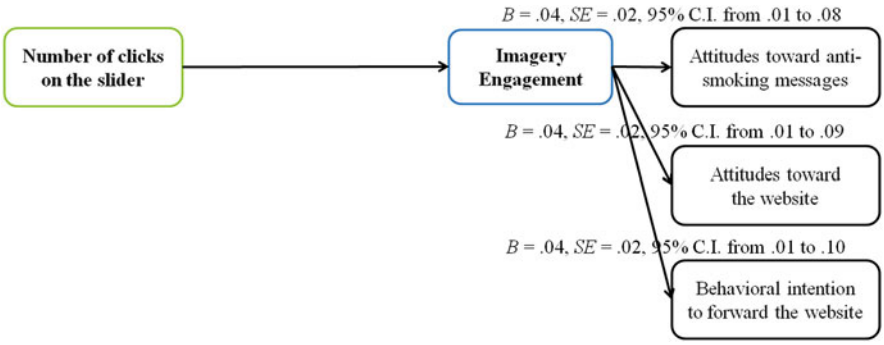

Fig. 6 The effects of physical interaction mediated by imagery engagement on attitudes and behavioral intention

5.4.4 Summary

The three different indicators of user engagement—imagery engagement, cognitive engagement, and physical interaction—all led to persuasive outcomes, using a simple interactive tool, the slider. Participants reported feeling more engaged when the website was equipped with the slider—they reported having more vivid images of the negative outcomes of smoking in their mind and feeling that their imagination and enjoyment were more stimulated by the website. Imagery engagement and cognitive engagement successfully translated into better attitudes toward the persuasive messages delivered by the website, compared with the Control condition, even though the content of persuasive messages in both conditions was exactly the same. Further, the study showed that physical interaction was indeed associated with imagery engagement. Participants reported having more vivid images of negative effects of smoking as they operate the slider, which in turn led to positive attitudes toward the entire website, positive attitudes toward anti-smoking messages, and greater behavioral intention to forward and recommend the website to others.

6 Conclusions

This chapter has summarized previous works regarding user engagement in communications, focusing on the importance of user engagement in the context of interactive media. The three most common, significant factors to define user engagement with media are (a) cognitive and emotional focus on media content; (b) attraction, curiosity, and interest in the medium or interface; and (c) voluntary participation of users to distribute media messages. Recent studies about interactive media have proposed and examined three types of interactivity that lead to these cognitive, affective, and behavioral aspects of user engagement—modality, source, and message interactivity. Data from our experimental study demonstrates that user engagement indeed plays a key role in the process of persuasion involving interactive media.

A particular challenge for practitioners is how to integrate conceptual works of user engagement into design principles. The three types of interactivity described in this chapter—modality interactivity, source interactivity, and message interactivity—suggest several practical implications for website designers. As shown in the empirical example, deploying a slide-based interaction technique can add significant value to a website, especially when the goal of the communication is consistent with what a slider can visualize. Source interactivity is a powerful vehicle to engage users over time when it provides them with the ability to create content and with tools that customize media use settings. Message interactivity is able to provide back-and-forth interaction tools to support user-website interaction, such as real-time chat tools or interaction history, and users are particularly engaged when the website delivers the humanness of communication through message interactivity.

Our empirical study shows that imagery engagement, cognitive engagement, and physical interaction all lead to persuasion. The persuasive potential of imagery and cognitive engagement with interactive media has implications in many contexts. A health campaign website that realistically describes symptoms of diseases, a political campaign website that allows users to virtually interact with a realistic avatar of a candidate, and an advertising website that provides 3D product experience could be successful examples of evoking imagery and cognitive engagement through interactive media.

The importance of user engagement with interactive media is not only limited to the area of persuasion. Psychological and behavioral aspects of user engagement with media are important for all areas that involve mediated content through technology. Future studies ought to focus on rigorously examining the effects of specific technological variables on different aspects of user engagement. For example, studies on modality interactivity could investigate how users engage cognitively as well as behaviorally with the newer interaction techniques introduced by emergent technologies such as augmented reality. Investigations into message interactivity can explore the alluring, almost addictive, power of message exchanges through multi-platform messaging applications (e.g., KakaoTalk, WhatsApp), while

studies on source interactivity could investigate the greater user agency afforded by increasing customizability of newer media and the relative tension that exists between customization and personalization. In this ever-changing media environment, future studies on user engagement with interactive media will guide us to further understand how to take advantage of new communication technologies.

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