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What motivates you to share information? The effect of interactive tailored information aids on information sharing about clinical trials

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Abstract

Cancer patients learn about research studies outside of the clinical environment, including websites, print and online advertisements, and interpersonal interactions. When cancer patients share credible information about clinical trials, they also frequently help clarify misunderstandings that may exist in their social networks. The present study investigated how an interactive tailored information aid on clinical trial participation motivated patients' information sharing behaviors. In this study of 312 cancer patients and survivors, an interactive tailored information aid improved patients' likelihood of sharing online and offline information more than a non-interactive tool. Information sharing was directly predicted by cognitive absorption and perceived visual informativeness. In addition, perceived utility and ease of use indirectly impact information sharing positively through the antecedent factors of user engagement and design aesthetics. Education level further moderated this effect; information sharing was higher among patients with more education. The implications of these findings are discussed and recommendations for future research are provided.

Keywords

Clinical trial recruitment; information sharing; information aid; interactivity; the Technology Acceptance Model

Most cancer patients are unaware that they may be eligible to join a wide variety of clinical trials and research studies; not unreasonably, patients expect such opportunities to be offered by their physician (Morgan, Mouton, Occa, & Potter, 2016; Morgan, Occa, Mouton, & Potter, 2017; Morgan, Occa, Potter, Mouton, & Peter, 2017; Occa & Morgan, 2018). However, some patients learn about research participation from other cancer patients and survivors rather than medical personnel (Krieger, 2014a; Wicks, et al., 2010). When patients share information about opportunities to participate in research with other cancer patients, this may increase the impact of outreach efforts. Improved outreach can facilitate accrual efforts and potentially reduce the time and cost of studies. Patients often find it difficult to understand the detailed information about research studies which is often relayed in clinical or research health care settings (Krieger, Palmer-Wackerly, Dailey, Krok-Schoen, Schoenberg & Pasket, 2015; Morgan, et al., 2016; Occa, & Morgan, 2018). However, studies have shown that decision aids or other technologically mediated informational support can help patients comprehend key scientific concepts that allow them to provide meaningful informed consent (Elwyn, et al., 2012; Gillies, Cotton, Brehau, Politi & Skea, 2015).

The goal of most decision support tools is to help patients and their family make treatment decisions that are more fully informed and concordant with the patient's preferences and values (Gillies, et al., 2015). As a result, decision aids facilitate mutual understanding and agreement between clinicians and patients about the best course of treatment, including whether treatment should include a clinical trial (Elwyn, et al., 2012; Gillies, et al., 2015). Decision aids can also decrease decisional conflicts, facilitate patient-clinician communication and shared decision; conversely, decision aids are associated with a lower proportion of people who remain undecided, reduced decisional regret, and enhanced decisional confidence and self-efficacy (Stacey, et al., 2017). All of these contributed to higher decision-making effectiveness on treatment. However, researchers have yet to explore the message characteristics that promptly lead users to disseminate information related to joining a research study or clinical trial.

Information sharing refers to the dissemination of knowledge and experiences (De Bruyn & Lilien, 2008; Wang & Noe, 2010). The effects of information sharing are wide-ranging. For example, through information sharing in online support communities, patients are able to develop more accurate understandings of their diseases and make optimal decisions (Moorhead, Hazlett, Harrison, Carroll, Irwin & Hoving, 2013; Wicks, et al., 2010). Additionally, by sharing their experiences individuals gain social support for their preferences for specific treatment plans (Argan, 2012; Moorhead, et al., 2013; Peng, Occa, McFarlane & Morgan, 2018). Unfortunately, just as accurate information can support informed decisions about research participation, a poor understanding of research participation across a patient's social network can negatively impact the decision-making process. Patients may find it difficult to garner support for study participation from friends

and family if they cannot explain basic concepts such as randomization, the use of placebos, and how patients are protected when they join a clinical trial (Krieger, 2014a; Krieger, 2014b; Krieger, et al., 2015; Krieger et al., 2017; Morgan et al., 2017; Morgan, Mouton, Occa, & Potter, 2016; Morgan, Occa, Mouton, & Potter, 2017; Morgan, Occa, Potter, Mouton, & Peter, 2017; Occa & Morgan, 2018; Occa, Morgan, & Potter, 2018). Thus, it is important to develop an effective tool that not only prepares patients for clinical trial participation, but also helps them share information about clinical trials with their friends, family, and other patients who might benefit from this information.

The present study examined the impact of an interactive tailored information aid on the willingness to share information. Information aids share certain goals of traditional decision aids, including empowering patients during the decision-making process but do not meet other criteria for true decision aids, such as the presentation of probabilities, or the presentation of all possible treatment options (Elwyn, et al., 2009). In other words, the information and guidance provided in most decision aids are focused on specific treatment options for specific diseases. However, in the context of research recruitment, it is the insufficient knowledge about clinical trials generally, instead of specific questions about the diseases and particular treatment options, that impedes participation (Krieger, 2014a; Krieger, 2014b). Further, when decisions need to be made immediately, patients are likely to reject a course of treatment (i.e. through a clinical trial) in the absence of comprehension of basic but difficult concepts (e.g., randomization, the use of placebos, and the protection over the patients) (Krieger, et al., 2015; Cameron, Pond, Xu, Ellis & Goffin, 2013)

Therefore, an information aid that summarizes information using lay language (Kraft, et al., 2016; Shneerson, Windle & Cox, 2013), uses simple design in the presentation of information (Shneerson, et al., 2013), and makes ample use of visual cues (Kraft, et al., 2016; Shneerson, et al., 2013) is expected to be more effective in clinical trial communication.

Furthermore, empirical studies have found that interactive, web-based decision-aid tools are effective in meeting patients' expectations. Specifically, interactive tools can provide tailored information that satisfies the decisional needs of patients (Carpentera, Studts & Byrne, 2011). For example, compared to a non-interactive website, an interactive decision-aid website improved patients' knowledge, self-efficacy, certainty about their choice, and values clarity (Politi, Kuzemchak, Kaphingst, Perkins, Liu & Byrne, 2016). However, it is unclear whether incorporating interactivity in information aids also facilitates information sharing behaviors.

Information sharing and clinical trial communication

Information sharing has been defined as the dissemination of "a fluid mix of framed experiences, values, contextual information, and expert insights" (Davenport & Prusak, 1998, p. 5). In organizational studies, information sharing between employees within a team enhances the impact of knowledge-based resources, which reduces costs and promotes team performance (Wang & Noe, 2010). In consumer studies, consumers are influenced by more the information provided by members of one's social network who have purchased

and used a particular product than by advertising and promotions (Davenport & Prusak, 1998). In other words, the transfer of beliefs and experiences among consumers, which is conceptualized as word of mouth (WOM) in marketing, is an effective way to influence consumers' buying intentions and behaviors (Davenport & Prusak, 1998).

Research on information sharing has received increasing attention in health communication. Researchers have discovered that Information sharing behaviors help patients improve self-presentation, regulate their emotions, gain new knowledge, bond socially, and persuade others (Berger, 2014; Yan, Wang, Chen & Zhang, 2016). Wicks and colleagues (2010) suggested that sharing promotes greater collective medical knowledge among patients. As a result, patients feel more empowered to deal with their diseases, experience greater psychological well-being, and become less likely to engage in risky behaviors. Further, positive word of mouth (WOM) increases the likelihood that patients will seek and receive medical treatment from physicians (Argan, 2012).

Interactivity and information sharing

The internet and interactive media facilitate individuals' information sharing behaviors (Lu, Lin, Hsiao & Cheng, 2010). The Technology Acceptance Model proposes that people accept or reject information technology based on their beliefs of usefulness and ease of use (Davis, 1989; Hsu & Lin, 2008). Perceived usefulness refers to the degree that an information technology enhances his or her capabilities; perceived ease of use indicates whether a person feels free of effort use of information technology is intuitive, requiring minimal effort (Davis, 1989; Hsu & Lin, 2008; Teo, Lim & Lai, 1999).

Online sources of information with higher perceived utility and ease of use align with principles described in uses and gratification theory, which assumes that individuals are goal-oriented and base their selections of media on whether content (and delivery of that content) will meet their needs (Hsu & Lin, 2008; Song & Zinkhan, 2008). In other words, websites incorporating high levels of interactivity are perceived useful and easy to use because they can help users efficiently make sense of large amounts of information that they need (Hsu & Lin, 2008; Lu, et al., 2010). When content and process expectations are satisfied, users tend to recommend interactive websites, and are more willing to share the information presented on these sites with others (Hsu & Lin, 2008).

Consistently, cancer patients have listed ease of use and informativeness as the most preferred features in information aid interventions (Shneerson, et al., 2013). Compared to non-interactive interventions (e.g., pamphlets, booklets, and on-screen DVDs), web-based interactive interventions are more effective in delivering information that is perceived to be relevant to patient concerns. Additionally, web-based interventions make it easier for patients to comprehend otherwise complex information (Antal, Bunnell, McCahan, Pennington, Wysocki & Blake, 2017; Shneerson, et al., 2013; Stacey, et al., 2014). Thus, we expected:

H1a: The use of interactive IAs will be associated with greater knowledge about clinical trials than non-interactive IAs;

H1b: Higher levels of knowledge about clinical trials will be positively associated with the likelihood of sharing information.

H2: Interactive IAs will be associated with higher perceptions of utility (H2a) and ease of use (H2b) than non-interactive IAs.

H3: Perception of utility will be positively related to knowledge (H3a) and the likelihood of sharing information (H3b).

H4: Perceptions of ease of use will be positively related to knowledge (H4a) and the likelihood of sharing information (H4b).

Additionally, this study builds on the Technology Acceptance Model to incorporate potential antecedent factors for perceived utility and perceived ease of use, including design aesthetics and user engagement. Research in human-computer interaction has found that the aesthetic features of interactive websites, including the simplicity of interface designs and meaningful visual cues increase message comprehension, perceptions of ease of use as well as enjoyment of use (Choi & Bakken, 2010; Lazard & Mackert, 2014; Occa, 2018; Shneerson, et al., 2013; Ruiz, Cook, & Levinson, 2009). For example, the use of animations and graphics in interactive online settings are found to be effective in helping users visually understand complex information (Bailenson, Yee, Blascovich, Beall, Lundblad & Jin, 2008; Kim & Sundar, 2012). In addition, graphic characters of physicians and patients are likely to be perceived as a representation of an ideal self that motivate the users to behave as those of the observed character models (Kim & Sundar, 2012; Bailenson, et al., 2008). Both graphics and animations have been shown to enhance learning among medical students and patients (Ruiz, et al., 2009; Occa, 2018).

Moreover, the mere presence of interactivity creates an immersive virtual environment which is characterized by a psychological state that the users are too involved in their online activities to notice the passage of time (Agarwal & Karahanna, 2000; Oh & Sundar, 2015). This psychological state is also conceptualized as cognitive absorption, which may encourage cognitive processing of information, cultivates users' perceptions that they can easily control the technology, and increases perceptions of technology utility (Agarwal & Karahanna, 2000; Liu & Shrum, 2009; Oh & Sundar, 2015; Occa, 2018). Therefore, the present study proposes that:

H5: The use of an interactive IA will be associated with higher cognitive absorption (H5a) and higher perception of visual informativeness (H5b) than a non-interactive IA. H6: Cognitive absorption will be positively related to knowledge (H6a) and the likelihood of sharing information (H6b).

H7: Perception of informativeness will be positively related to knowledge (H7a) and the likelihood of sharing information (H7b).

H8: Cognitive absorption will be positively related to perception of utility (H8a) and ease of use (H8b).

H9: Perception of visual informativeness will be positively related to perception of utility (H9a) and ease of use (H9b).

Earlier research indicates that the effect of the interactive tailored information aid on information sharing may be associated with users' experience of interactivity. Scholars have posited that users with less online experience and lower levels of digital literacy may be less enthusiastic about interactive interfaces (Shneerson, et al., 2013). As a result, their tendency to share information received from interactive information aids may be lower for people with certain characteristics. Previous studies have identified age, education, and annual income as crucial predictors of users' online experiences and digital literacy (Rafaeli & Ariel, 2007; Foster & Rosenzweig, 2010). For example, younger users were more technology-savvy and showed more positive attitudes toward interactive websites than older users (Gao, Rau & Salvendy, 2010; Foster & Rosenzweig, 2010). Similarly, we expect that those with higher education background and annual income will have more access to new technology and find the use of interactive websites more enjoyable (Gui & Argentin, 2011; Hargittai, & Hinnant, 2008; Foster & Rosenzweig, 2010). Based on these findings, this study hypothesizes:

H10: The likelihood of information sharing will be moderated by age (H10a), education levels (H10b) and annual income (H10c).

Method

Participants

A total of 312 participants participated in this study. The age of the participants ranged from 18 years old to 87 years old ($M_{\text{age}} = 55.6$, $SD = 14.05$). The average annual income of the participants was \$50,176.60 USD ($SD = 41707.75$). Additional demographic information is provided in Table 1.

Procedure

After IRB approval was granted, a Qualtrics survey link was sent to cancer patients and survivors. In the study, participants were first required to provide demographic data (e.g., gender, age, cancer stages). Then, participants were randomly assigned to either an interactive tailored information aid or a non-interactive website-based information aid on clinical trial participation. After viewing the IA, participants immediately responded to questions about their perceptions of the interactivity and questions that measured outcome variables (i.e., virality to share and virality to talk).

Measures

Knowledge.—We evaluated knowledge about clinical trial participation using a 9-item assessment developed by Cameron et al. (2013). Example items include “In a clinical trial, a patient will always get the experimental drug.” and “The standard treatment will be withheld if a placebo is given.” Participants indicated whether they thought each statement was true, false, or that they did not know. Correct responses were coded as “1.”

Perceived ease of use.—Participants' perception of ease of use was assessed by two items developed by Mun & Hwang (2003) (i.e., “The decision aid was easy for me to use” and “I found it easy to understand the decision aid”). Participants rated the statement on

a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), $M = 5.90$, $SD = 1.10$, Cronbach's alpha = .94.

Perceived utility.—Perceived utility was measured by asking participants about their perception of the content on several dimensions: “Useful/Useless; Valuable/Not valuable; Worthwhile/Worthless; Relevant to me/Not relevant to me” on a 7-point Likert scale. The scale was reliable, $M = 2.16$, $SD = 1.22$, Cronbach's alpha = .89.

Cognitive absorption.—21 items adapted from Agarwal and Karahanna (2000) were used to measure participants' cognitive absorption in the intervention on a 7-point Likert scale. This scale had high reliability ($M = 4.73$, $SD = .84$, Cronbach's alpha = .91). Example items include “Time seemed to go by very quickly when I was completing the decision aid” and “While completing the decision aid, I was absorbed in what I was doing.”

Visual informativeness.—Perceived visual informativeness was evaluated using 11 items developed by King, Jensen, Davis & Carcioppolo (2014). Sample items included “The visual information in the decision aid was clear” and “I spent more time looking at the pictures in the decision aid than the text”. Participants rated each statement on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). This scale achieved high reliability ($M = 4.78$, $SD = 1.03$, Cronbach's alpha = .92).

Information sharing.—Participants' likelihood to share information was evaluated by assessing their willingness (1) to talk about the information aid with friends and family; and (2) to share a link to the information aid. Willingness to talk about the information aid was measured by asking participants to indicate their likelihood to “discuss the information presented on the decision aid in your offline life with someone” and “talk about articles posted on the decision aid with someone you know (either online or in person).” The willingness to share the information aid was measured with 2 items: whether they would recommend the information aid to someone on Twitter, Facebook, Instagram and YouTube, and their likelihood of sharing a link to one of the posts on the information aid through an online tool, such as email or social media such as on Twitter, Facebook, Instagram, YouTube, or via email. This 4-item measure was reliable ($M = 4.03$, $SD = 1.51$, Cronbach's alpha = .88).

Stimuli

Based on the literature identifying the most significant barriers to clinical trial participation, and data from previous research studies, the interactive information aid (which we call the Authors' Information Aid for the review purposes of this manuscript) tailored a series of responses a set of seven questions. These include whether a patient has health insurance, to what level a patient trusts his or her cancer doctors and researchers, and whether a patient has a strong preference for either established treatments or the newest treatments. Each participant's response was branched to provide him or her with specific messages about the validity of patients' attitudes, available resources, the (in)compatibility with research participation, and additional information that is relevant to his or her concerns. For example, for patients who lack insurance, the Authors' Information Aid tells users that while there

are fewer available clinical trial opportunities, trials which cover all treatment costs do exist. After the final question, the interactive information aid offers a short report with specific information tailored to patients' circumstances and values as well as an embedded link to an animation about clinical trial participation. Additionally, graphics representing physicians, scientists, patients, and the clinical trial process were presented in each page (See Appendix A for sample screenshots).

The non-interactive Informational Aid in this study was developed by National Institutes of Health (<https://www.nih.gov/health-information/nih-clinical-research-trials-you/basics>). This information aid was of similar length as the interactive tailored information aid but provided standardized answers to a set of common questions (i.e., what are clinical trials and why do people participate, what do the terms placebo, randomization, and blinded mean in clinical trials and how is my safety protected) about clinical trial participation. Because the information contained in the Authors' Information Aid was taken from this NIH website, the content was highly parallel.

Results

Our first hypothesis predicted that cancer patients would acquire more knowledge about clinical trials and be more likely to subsequently share information about clinical trial participation when it is presented through an interactive tailored information aid than a non-interactive information aid. With previous knowledge about clinical trials controlled ($b = -1.23$, $SE = .09$, $t(304) = -12.96$, $95\% CI[-1.42, -1.04]$), the results suggested that there was no significant differences between the interactive tailored information aid and the non-interactive information aid on patients' knowledge about clinical trials ($b = .01$, $SE = .02$, $t(304) = .67$, $95\% CI[-.02, .04]$). Additionally, knowledge about clinical trials was not correlated to patients' motivation for information sharing ($b = -.01$, $SE = .28$, $t(304) = .96$, $95\% CI[-.56, 1.64]$). H1 was thus not supported.

Hypotheses 2 to 6 proposed the indirect effect of perceived utility, perceived ease of use, cognitive absorption and perceived visual informativeness on patients' knowledge about clinical trials and the likelihood to share information in the interactive tailored information aid condition than in the non-interactive information aid condition. Supporting H5, cognitive absorption ($b = .18$, $SE = .04$, $t(304) = 4.15$, $95\% CI[.23, 1.30]$) and perceived visual informativeness ($b = .13$, $SE = .05$, $t(304) = 2.38$, $95\% CI[.02, .24]$) was found to be significantly different between interactive tailored information aid condition and non-interactive information aid condition. Compared to patients who read the the non-interactive information aid, patients who used the interactive tailored information aid indicated that they were significantly more cognitively absorbed and perceived the visual cues to be more informative. Perceived utility ($b = .05$, $SE = .12$, $t(2, 303) = .40$, $p = .69$) and perceived ease of use ($b = .13$, $SE = .11$, $t(302) = 1.21$, $p = .23$) did not differ between the two experimental conditions; H2 and H3 were not supported

The follow-up analysis supported the H6b and H7b that cognitive absorption ($b = .68$, $SE = .12$, $t(304) = 5.65$, $95\% CI[.44, .91]$) and perceived visual informativeness ($b = .29$, $SE = .08$, $t(304) = 3.51$, $95\% CI[.13, .46]$) significantly predicted participants' higher likelihood

of information sharing. However, higher cognitive absorption ($b = .01$, $SE = .03$, $t(304) = .54$, 95% $CI[-.04, .06]$) and perceived visual informativeness ($b = .02$, $SE = .02$, $t(304) = 1.06$, 95% $CI[-.02, .05]$) was not associated with higher levels of knowledge about clinical trials. Therefore, H6a and H7a were not supported.

In addition, as shown in Table 2, perceived utility mediated the indirect relationship between cognitive absorption and likelihood of information sharing (H8a) and the indirect relationship between perceived informativeness and likelihood of information sharing (H9a). Perceived ease of use only significantly mediated the relationship between perceived visual informativeness and likelihood of information sharing (H9b), but did not mediate the relationship between cognitive absorption and likelihood of information sharing (H8b).

Hypothesis 10 predicted the moderating effect of age (H10a), education (H10b), annual income (H10c) on the likelihood to share information within the interactive tailored information aid than the non-interactive information aid. Supporting H10b, the moderated regression analysis showed that education level significantly moderated patients' motivation for sharing behaviors ($F(1, 308) = 5.76$, $p = .02$, $adjusted R^2 = .02$). More specifically, as education level increased, the patients receiving the interactive tailored information aid were more likely to recommend the information aid and share the links presented on the information aid online. By contrast, the patients using non-interactive information aid were less likely to engage online information sharing behaviors as education level increases.

With regard to the moderation effect of age, although older patients generally reported significant lower likelihood to share information ($b = -.02$, $SE = .01$, $t(311) = -3.67$, $p = .0003$), the moderated regression analysis showed that age did not significantly moderate patients' information sharing behaviors across the two experimental conditions, $F(1, 307) = 1.09$, $p = .30$, $adjusted R^2 = .003$. Additionally, no main effect ($b < .001$, $SE < .001$, $t(296) = .49$, $p = .62$) or moderating effect ($F(1, 292) = .002$, $p = .49$, $adjusted R^2 = .002$) of annual income was found on the likelihood of information sharing. The H10a and H10c were not supported.

Discussion

This study investigated the effect of an interactive tailored information aid on patients' likelihood of disseminating information about clinical trials. Prior research suggests that there are widespread misunderstandings about clinical trials and that patients have difficulty gaining support from friends and families for research participation (Krieger, et al., 2015; McEachan, et al., 2011; Occa & Morgan, 2018). Effective online interactive information aids hold the potential to not only educate patients and their families but also to facilitate motivation to share information about clinical trials to others (Gilles, et al., 2015).

The results showed that an interactive information aid did not directly trigger greater information sharing about clinical trial participation compared to in non-interactive formats. However, in line with the assumptions of the Technology Acceptance Model, our study found that when other variables were accounted for, greater information sharing behaviors were observed among cancer patients and survivors in the interactive information aid

condition. Specifically, the use of interactive information aids in the present study increased with perceived utility via greater cognitive absorption and perception of visual informativeness as well as with perceived ease of use via a vis greater perceived visual informativeness (Agarwal & Karahanna, 2000; Hsu & Lin, 2008).

These findings supported previous findings that technology acceptance (i.e., perceived utility and perceived ease of use) of interactive tailored information aid improved as a result of several antecedents, including design aesthetic and cognitive absorption (Choi & Bakken, 2010; Lazard & Mackert, 2014). Our interactive information aid used avatars and animations to present tailored information about clinical trial participation. In addition to providing aesthetic value, these avatars and animations offered visual cues to help participants process and comprehend the information (Occa, 2018). Furthermore, the interactive information aid created greater affective engagement and may have resulted in higher levels of cognitive elaboration than the non-interactive information aid (Liu & Shrum, 2009; Occa, 2018). Taken together, these dynamics resulted in more favorable attitudes towards the interactive tailored information aid (than the non-interactive information aid) as well as a greater willingness to share the information through email or social media and talk about it with others in interpersonal contexts (Hsu & Lin, 2008; Lu, et al., 2010).

Additionally, contrary to our predictions, we found that knowledge about clinical trials did not differ across the interactive versus non-interactive information aid conditions and was not a significant mediator linking interactive technology use with information sharing. The information presented in our interactive information aid offered is tailored to the information needs of individual patients, specifically focused on circumstances related to insurance status, personal values such as altruism, and misconceptions about specific aspects of clinical trial participation. Thus, because the IA was not designed to advance general knowledge about clinical trial participation, participants assigned to this condition were no more likely to increase their knowledge than participants in the non-interactive condition (which did present general information, albeit in a less engaging way). Furthermore, this finding does not contradict the premise that technology acceptance contributes to a higher likelihood of information sharing because the interactive IA improved comprehension of the information. Previous researchers have indicated that too much information offered by traditional educational interventions can lead to confusion and distress (Elwyn, et al., 2012; Gillies, et al., 2015; Cameron, et al., 2013). By contrast, the interactive information aid is sufficient to foster information sharing because it deepens the understanding of information relevant to individuals' specific values and concerns and reduces information overload.

This study also found that while more educated patients were more likely to use the interactive information aid and were more likely to be willing to share this information with others, contrary to our expectations, age and annual income did not affect the likelihood of information sharing whether in online or offline contexts. There are two likely explanations for this unexpected result. First, it is worth noting that recent studies have observed that older populations and low-income consumers are increasingly adopting new technologies as developers design simpler interfaces and lower costs associated with adoption (Berkowsky, Sharit & Czaja, 2018; Shneerson, et al., 2013; Hunsaker & Hargittai, 2018; Foster & Heeks, 2013). For example, the interactive tailored information aid in this study was developed to

be easy and free to use. Therefore, the assumed digital divide among different generations and income level may be less of an issue, at least in this context (Berkowsky, et al., 2018; Foster & Heeks, 2013). Education, however, is still an important predictor of access to interactive technology (Gui & Argentin, 2011; Gao, Rau & Salvendy, 2010; Tate & Warschauer, 2017). More educated people may be more discerning and they are likely to be adept at seeking information (Neter & Brainin, 2012). Therefore, they may not be impressed with information presented in a website unless it offers more novelty (Foster & Rosenzweig, 2010). Further, a decision aid that presents information in a straightforward manner (i.e., a non-interactive, non-tailored website) isn't likely to motivate educated individuals to share this information since it lacks novelty and therefore does not generate excitement (Neter & Brainin, 2012; Foster & Rosenzweig, 2010). Unfortunately, less educated individuals may have lower capacity to learn how to implement a new technology, which in turn, may lead to lower willingness to adopt the new technology (Tate & Warschauer, 2017) or to subsequently share it. However, more work is needed to examine other factors that relate to new technology access and what kind of improvements to interactive technologies may help to remove these barriers.

This study supports the strategic use of interactivity and design features that promote perceptions of utility and ease of use by providing compelling visuals and by fostering cognitive engagement because these design features promote the sharing of information (Shneerson, et al., 2013), creating greater efficiencies in campaign implementation. However, we should point out several limitations that can be addressed by future research. First, we expect that one advantage of using interactive information aids is that they lead to improvements in understanding a subset of key concepts but no general knowledge. Future research should focus on building a measure of knowledge that reflects the comprehension of the specific information learned from using interactive information tool; this will permit an “apples-to-apples” comparison of the knowledge generated by both types of interventions. Second, additional theorizing about the role of perceived ease of use in the Technology Acceptance Model is needed. We observed a weaker effect for perceived ease of use on technology acceptance relative to the perceived utility. This result, while consistent with existing literature (Saadé & Bahli, 2005; Sun & Zhang, 2006), nonetheless raises questions about the relationship between perceptions of utility and ease of use. Last, it is possible that there are other factors that also influence cancer patients' information sharing behaviors. While the use of interactivity can satisfy patients' intrinsic expectations for pleasant and enjoyable experiences, information sharing behaviors are likely to be affected by expectations that receivers will also find a tool interesting and enjoyable. Extrinsic expectations, including subjective norms, will influence the likelihood of information sharing. If patients perceive that members of their social networks disapprove of a topic or might dislike a specific presentation format, they may be less likely to engage in information sharing behaviors (Yan, et al., 2016). Subsequent research should further examine the impact of both intrinsic and extrinsic factors on patients' information sharing motivations.

Conclusion

This study provides evidence that interactive tailored IAs can stimulate discussions about clinical trial participation. Taken together, the results point to the conclusion that

interactivity is an important element to incorporate into information aids because it helps to satisfy patients' expectations for information technology use (Shneerson et al., 2013). Cancer patients and survivors in our study who used the interactive information aid reported greater engagement with information about clinical trial participation than those who used the non-interactive information aid, and this cognitive absorption appeared to enhance subsequent evaluation of information utility and ease of use, which motivated sharing and discussion of the clinical trial information. Because clear, accurate, and engaging information about clinical trials is critical to patients' meaningful informed consent to participate in research studies, greater efforts should be made to further develop information aids tailored to the needs of patients, their families, and other members in their social networks.

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Table 1:

Demographics of the participants

Variable	Category	N (%)
Race/ethnicity	Hispanic	18 (3.9%)
	Non-Hispanic	435 (94.6%)
	Prefer not to say	7 (1.5%)
	African American	34 (7.4%)
	Asian or Pacific Islander	4 (0.9%)
	Hispanic/Latinx	8 (1.7%)
	White	397 (86.3%)
	Multiracial	3 (0.7%)
	Other/prefer not to say	9 (2.0%)
	Sex	Female
Male		124 (27%)
Education level	Some high school	11 (2.4%)
	High school	79 (17.2%)
	Some college	168 (36.5%)
	College	127 (27.6%)
	Master's degree	63 (13.7%)
	Doctoral degree	3 (0.7%)
	Professional degree	4 (0.9%)
	Other	5 (1.1%)
Cancer stage at diagnosis	0	36 (7.8%)
	I	127 (27.6%)
	II	97 (21.1%)
	III	62 (13.5%)
	IV	40 (8.7%)
Cancer stage	0	87 (18.8%)
	I	21 (4.5%)
	II	12 (2.6%)
	III	17 (3.7%)
	IV	23 (5%)
	Not sure/N/A	69 (14.9%)
	Free of cancer	230 (49.7%)

Table 2:

Summary of indirect paths of two experimental conditions

Indirect path	b	SE	[LLCI, ULCI]
Knowledge – Information sharing	–.0002	.01	[–.01, .01]
Utility - Information sharing	–.002	.03	[–.06, .05]
Utility – Knowledge - Information sharing	<.001	.0004	[–.001, .001]
Ease of use - Information sharing	.01	.01	[–.01, .04]
Ease of use – Knowledge - Information sharing	.0001	.002	[–.003, .004]
Perceived informativeness - Information sharing	.08	.05	 [.01, .08]
Perceived informativeness – Knowledge - Information sharing	<.001	.001	[–.002, .002]
Cognitive absorption - Information sharing	.13	.04	 [.06, .21]
Cognitive absorption – Knowledge - Information sharing	<.001	.002	[–.004, .003]
Perceived visual informativeness - Utility - Information sharing	.02	.01	 [.003, .05]
Perceived visual informativeness - Utility – Knowledge - Information sharing	<.001	.0004	[–.001, .001]
Perceived visual informativeness - Ease of use - Information sharing	.01	.005	 [.0001, .02]
Perceived visual informativeness - Ease of use – Knowledge - Information sharing	<.001	.001	[–.001, .001]
Cognitive absorption - Utility - Information sharing	.05	.02	 [.02, .10]
Cognitive absorption - Utility – Knowledge - Information sharing	<.001	.001	[–.002, .002]
Cognitive absorption - Ease of use - Information sharing	.01	.02	[–.03, .06]
Cognitive absorption – Ease of use – Knowledge -Information sharing	.0001	.002	[–.005, .01]