



Playing to beat the blues: Linguistic agency and message causality effects on use of mental health games application



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ABSTRACT

This study examined the effects of exposure to specific message features on the usage of mental health video games applications. Based on linguistic agency and disease causality, participants with mild depression read messages assigning agency to depression or to humans and depicting depression as external or internal before accessing a video game designed for handling depression symptoms. Assigning internal causality language led to greater game usability and higher intentions of using the games. Game performance and time spent playing the games, was higher for external causality language. Overall, findings from this study demonstrate the effectiveness of specific message prompt features to promote video game experience for mental health apps.

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1. Introduction

The use of video games as a way of treating physical or psychological conditions is becoming increasingly common (Wilkinson, Ang, & Goh, 2008). Playing video games leads to positive structural brain changes in regions associated with several mental health disorders (Kühn, Gleich, Lorenz, Lindenberger, & Gallinat, 2014). For example, video games also provide motivational incentives that can help people with mood disorders (Granic, Lobel, & Engels, 2014). In a meta-analysis of game interventions for depression, Li, Theng, and Foo (2014) find that game-based interventions are beneficial for people with depression. Fernández-Aranada et al. (2012) tested the effectiveness of PlayMancer, a video game designed to change attitudinal, behavioral, and emotional processes of patients with impulse-control disorders. Patients using PlayMancer in a pilot test showed new coping styles, additional generalization patterns and more self-control strategies. In another study using the role-playing game SPARX, participants showed reduction in depression (Merry et al., 2012).

Video game based mental health interventions present a unique opportunity as an alternative to face-to-face therapy among young adults (Pinto, Hickman, Clochesy, & Buchner, 2013). According to survey data from Pew Research Center (2008), 76% college students

in the sample reported playing video games (Lenhart, Jones, & MacGill, 2008). This age group is also the most vulnerable to mental health disorders given that three quarters of all lifetime mental disorders start during this age, with the onset age of mood disorders being 24 years (Kessler et al., 2005). Data gathered by the American College Health Association (2016) reveals that among a sample of over 16,000 college students across the U.S, 38% college students reported feeling depressed while only 14% had sought medical help for depression (ACHA, 2016). While young adults' hesitate in seeking medical help for mood disorders, they have high comfort level with technology, which means that this age group can benefit the most from video game based mental health applications (Hunt & Eisenberg, 2010; Pinto et al., 2013).

However, there is a lack of studies focusing on how to increase engagement with video game apps devised for treating mental health issues (Mohr, Burns, Schueller, Clarke, & Klinkman, 2013). In particular, attrition or number of people not completing a course of treatment is a common problem associated with mental health video game apps (Doherty, Coyle, & Sharry, 2012). Instances of attrition include premature discontinuation, non-usage, and non-adherence (Swift & Greenberg, 2012), and they illustrate the extent to which an individual completes or drops-out from technology-enabled interventions.

Several recommendations have been made to manage treatment non-adherence when implementing interventions by means of behavioral technologies (Mohr et al., 2013). These recommendations include improving usability, increasing incentives, and

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augmenting adherence via the use of reminders (Mohr et al., 2013). In particular, message reminders and prompts are effective in promoting health behavior. For instance, Jones, Lekhak, and Kaewluang (2014) meta-review evaluates the effectiveness of mobile phones and SMS to deliver self-management interventions (e.g., information, reminders, monitoring), and find that message prompts delivered through mobile phones may lead to short-term smoking cessation rates and increases in adherence to appointments (Jones et al., 2014). However, in a study examining adherence to a mental health intervention among high school students in Norway, researchers sent daily, weekly or no message prompts through email to participants and found that message prompts did not boost treatment adherence (Lillevoll, Vangberg, Griffiths, Waterloo, & Eisemann, 2014). Participants simply ignored the emails, and thus the effect of message prompts on boosting adherence was insignificant (Lillevoll et al., 2014). Adherence-boosting messages sent on mobile phones through short messaging services (SMS) skirt the drawbacks of email prompts since messages sent on mobile phones are harder to ignore compared with emails (Lillevoll et al., 2014).

Though the studies above have increased our knowledge about the effects of messages seeking to increase treatment adherence, there are fewer studies investigating the persuasive effects of message prompts in the context of health technology interventions such as video game health applications. Considering this, we examine the effect of message prompts appearing just before using a mental health app on participants' subsequent game behaviors and attitudes. Unlike previous research, the messages in this study are not simple reminders for engaging in a particular behavior. Instead, the messages tested in this study build upon linguistic agency and locus of causality research in order to influence intentions, perceived self-efficacy, engagement, and performance when using a mental health app.

2. Linguistic agency effects

Linguistic agency is a message factor that is receiving increased attention as a way of influencing health behavior (Bell, McGlone, & Dragojevic, 2014a, 2014b; McGlone, Bell, Zaitchik, & McGlynn, 2013). Linguistic agency refers to the ascription of action or change to one or more entities involved in an event (Dowty, 1991). Agency assignment linguistically encodes the causality for an event, and assigning causality to a non-human agent (e.g., a virus that is *coming to get you*) may convey a clear and present threat and human passivity in the event (Dowty, 1991). For instance, linguistic agency assignment can influence how people assess the perceived severity of and susceptibility to threats described in persuasive messages (McGlone et al., 2013).

Several studies document the effectiveness of linguistic agency in enhancing perceived threat in fear appeals (Bell et al., 2014a, 2014b; McGlone et al., 2013). For instance, participants exposed to a message assigning agency to radon gas report higher intentions of installing radon gas detection equipment relative to those exposed to a message assigning agency to humans (Dragojevic, Bell, & McGlone, 2014). It is possible that language agency assignment to radon gas metaphorically brought it to life by depicting it as a living predator (e.g., *radon gas lurks in the air, it can easily invade your body*), which in turn increases the perceived threat posed by the gas (Dragojevic et al., 2014). In another study, agency for viral transmission was assigned to H1N1 virus (e.g., *influenza virus can infect people when they touch infected doorknobs*) or to humans (e.g., *people can contract the virus when they touch infected doorknobs*, McGlone et al., 2013). Intentions to get vaccinated were higher for the virus agency assignment condition than for the human agency language condition. Additionally, perceived response efficacy was

also rated higher for agency assignment to threat (McGlone et al., 2013). Agency for viral transmission likely increased perceived threat and made vaccination appear as a viable option for protection (McGlone et al., 2013).

Considering the above, we examine how messages varying in linguistic agency subsequently affect user experience and treatment adherence when using a health game app targeting depression. Before playing a health game app, participants will read messages assigning agency to depression (e.g., *depression is taking over your life*), agency to humans (e.g., *you are letting depression take over your life*), or assigned no agency (e.g., *depression is known to occur in people*). Based on the above, we predict that exposure to a message assigning agency to depression will encourage people to adopt the app as a viable option to control depression. Technology adoption can be operationalized through actual behavior (use of technology) or through intention to adopt. According to the technology acceptance model (TAM) intention to adopt technology is an immediate antecedent of actually using the technology, given sufficient control over the actual behavior (Davis, 1993). Influence of external variables (e.g., system characteristics) on intention is mediated by perceived usefulness and perceived ease of use (Venkatesh & Davis, 2000). In this study, usability is operationalized as perceived usefulness as well as perceived ease of use of the app. Thus:

H1. Exposure to messages ascribing agency to depression will increase (a) perceived game usability, (b) game performance, (c) time spent with a depression themed health game app and, (d) intention to use the app compared with ascribing agency to humans or no agency ascription.

3. Message causality effects

In addition to linguistic agency effects, we examine the effects of exposure to messages attributing internal or external causes to depression on engagement with usability, intention to use, game performance and time spent with a depression themed health application. Message causality has not been examined in the context of using health game apps. Same as linguistic agency, we expect this factor to influence how people use a mental health game app. When people try to make sense of events, one important distinction is whether people believe an outcome to be caused by external or internal factors that are either stable or unstable (i.e., exogenous or endogenous factors, Abrahamson, Seligman, & Teasdale, 1978). Examples of exogenous causes of depression are life events such as a difficult work environment, break ups, loss of a loved one, physical trauma, etc. In comparison to this, endogenous causes of depression locate the threat within the individual (e.g., "Chemical imbalance in your brain can trigger depression").

It is possible that messages describing depression as caused endogenously may increase interest in mental health video game apps. Beliefs in internal causes, such as attributing depression to a chemical imbalance in the brain locates depression causality inside the individual. By virtue of believing that depression is located within them, the currently tested health game app may be perceived as more effective in treating depression owing to its capacity for inducing changes in the brain (Goldstein & Rosselli, 2003). External causes, (e.g., "stress at work can cause depression"), being environmental in nature may be considered less responsive to mental health video games.

H2a. Exposure to messages ascribing endogenous causality to depression will increase (i) perceived game usability, (ii) game performance, (iii) time spent with a depression themed health game app, and (iv) intention to use the app compared with

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